



Bristol Water

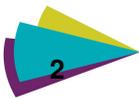
Strategic Environmental Assessment of the Revised Draft Water Resources Management Plan 2019

Revised Environmental Report



August 2018

Amec Foster Wheeler Environment & Infrastructure UK Limited (now Wood Environment & Infrastructure Solutions UK Limited)



Report for

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Document revisions

No.	Details	Date
1	Draft Environment Report	November 2017
2	Revised Environmental Report	November 2017
3	Final Environmental Report (R)	March 2018
4	Revised Environmental Report (draft)	August 2018
5	Revised Environmental Report (Final)	August 2018



Non-Technical Summary

This Non-Technical Summary presents the findings of the Strategic Environmental Assessment (SEA) of the Bristol Water revised draft Water Resources Management Plan contained in the accompanying Environmental Report.

Introduction

Bristol Water's Water Resources Management Plan (WRMP) provides a comprehensive assessment of available water supplies and the demand for water well into the future, and sets out Bristol Water's strategy for water resource and demand management to ensure supplies of safe, clean drinking water are maintained to customers throughout the company's region. Bristol Water completed a draft Water Resources Management Plan (WRMP19) for the period 2020 to 2045. This was issued for a 12 week consultation on 8th March 2018. Following an analysis of the submissions, and further modelling, Bristol Water has now produced a revised draft WRMP.

This Non-Technical Summary (NTS) provides an overview of the Environmental Report produced as part of the Strategic Environmental Assessment (SEA) of the WRMP. The SEA is being carried out on behalf of Bristol Water by Wood Environmental & Infrastructure Solutions Limited (Wood), formerly Amec Foster Wheeler Environment and Infrastructure UK Ltd to assess the likely significant economic, social and environmental effects of the WRMP and to identify ways in which adverse effects can be avoided, minimised or mitigated and how any positive effects can be enhanced.

The following sections of this NTS:

- ▶ provide an overview of the WRMP process;
- ▶ describe the SEA process together with how it is to be applied to the WRMP;
- ▶ summarise the key economic, social and environmental issues relevant to the assessment of the WRMP;
- ▶ outline the approach to undertaking the assessment of the WRMP;
- ▶ summarise the potential effects of feasible options for balancing water demand and supply in the Bristol Water supply area;
- ▶ summarise the potential effects of the preferred options for balancing water demand and supply in the Bristol Water supply area; and
- ▶ outline information about the WRMP process including how to respond to consultation on the Environmental Report.

What is the Water Resources Management Plan?

Bristol Water provides water supplies to 1.1 million people and all the associated businesses in an area of approximately 2,400 square kilometres centred on Bristol and the towns and villages within a 20-mile radius of the city. The water supply area stretches from Thornbury and Tetbury in the north, to Street and Glastonbury in the south, and from Weston-Super-Mare in the west to Frome in the east.

Bristol Water relies on 68 water sources, including reservoirs, rivers, springs, wells and boreholes. About 88% of the water supply comprises surface waters while 12% comes from groundwater. Water resources within the Bristol Water supply area alone are not sufficient to meet customer demand for water and therefore approximately Around half of the water supplied within the Bristol Water supply area is sourced from within it, with the rest being transferred into the zone from outside the area.

Along with all water companies in England and Wales, there is a statutory requirement for Bristol Water to prepare, maintain and publish a WRMP that sets out how the balance between water supply and demand, and security of supply will be maintained over the coming 25 years in a way that is economically, socially and environmentally sustainable. These are reviewed on a rolling 5 year basis and Bristol Water is currently preparing its WRMP for the period 2020 to 2045. Once published, WRMP19 will replace the current 2014 WRMP.

The Supply Demand Balance (SDB) is applied to water resource zones (WRZ) which are defined in the Water Resource Planning Guideline¹ as “an area within which the abstraction and distribution of supply to meet demand is largely self-contained (with the exception of agreed bulk transfers)... Within a WRZ all parts of the supply system and demand centres (where water is needed) should be connected so that all customers in the WRZ should experience the same risk of supply failure and the same level of service for demand restrictions”. Bristol Water’s supply area is operated as a single WRZ. Where the SDB identifies that the WRZ is in deficit over the lifetime of the plan, the WRMP will present management options to address the deficit and maintain the balance of supply and demand.

The process of management option development includes a review of as many potential solutions as possible (the ‘unconstrained list’ of options) to identify ‘feasible’ (constrained) options for each WRZ where deficits are predicted. These ‘feasible’ options are then reviewed to identify ‘preferred options’ to resolve any supply deficits in relation to financial, environmental and social costing.

The SDB for the Bristol Water supply area for the draft WRMP identified a deficit over the lifetime of the plan. Following screening of the unconstrained options, 21 feasible options were identified for potential consideration to address the deficit. The types of feasible options considered in preparing WRMP19 were broadly categorised as follows:

- ▶ production and resource options;
- ▶ customer demand options; and
- ▶ distribution options.

Informed by the environmental, social and economic assessments and ongoing discussion with stakeholders, the list of feasible options was refined to identify the preferred options for the draft WRMP. The preferred options together with the scale of implementation and yield, as proposed in the draft WRMP were:

- ▶ Option R32: Resource Reduction of bulk transfer agreement with Wessex Water (yield 11.4 Ml/d);
- ▶ Option D21: Active Leakage Control (yield 4.5 Ml/d);
- ▶ Option D22: Pressure Management (yield 2.1 Ml/d); and
- ▶ Option P20: Reduced leakage from raw water mains (yield 3.9-5.5 Ml/d).

Following consultation on the draft WRMP and the responses from the regulators and consultees, further changes were made to the WRMP, including:

- ▶ Further reductions in leakage to ensure alignment with the Ofwat challenge of 15% reductions during AMP7 and then going beyond this by 2045;
- ▶ Increasing the take up of water metering, from 66% by the start of 2020 to 87% by 2045;
- ▶ Increasing water efficiency to achieve a reduction in per capita consumption (PCC) from 141 litres/head/day in 2020 to 129 litres/head/day in 2045 and 110 litres/head/day in 2050;
- ▶ Further reductions in leakage from raw water systems and at water treatment works;

¹ Environment Agency and Natural Resources Wales (2016) *Final Water Resources Planning Guideline* [available at: <https://naturalresources.wales/media/678739/ea-nrw-and-defra-wg-ofwat-technical-water-resources-planning-guidelines.pdf>].

- ▶ Updated assessment of the deployable output (reliable supply) of water sources in line with the new national methodology for drought resilience (that was issued after completion of the draft WRMP).

Applying the changes to the SDB, Bristol Water are now forecasting a small residual supply deficit of 0.2 MI/d at 2035 rising to 9.18 MI/d at 2045. Bristol Water propose to address this by the use of three revised preferred options.

- ▶ D21.1: Active Leakage Control (yield of 2.83 MI/d in 2024/25);
- ▶ D21.2: Active Leakage Control (yield of an additional 0.5 MI/d in 2029/30 and an additional 1 MI/d by 2034/35);
- ▶ P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement) (yield of 5.5MI/d).

These three options provided a combined yield of 9.83 MI/d.

Further information in respect of the preparation of the WRMP is set out in Section 1.4 of the Environmental Report.

What is Strategic Environmental Assessment?

SEA became a statutory requirement following the adoption of European Union Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. This was transposed into legislation on 20 July 2004 as Statutory Instrument 2004 No.1633 - The Environmental Assessment of Plans and Programmes Regulations 2004. The purposes of the SEA of the WRMP are to:

- ▶ identify the potentially significant environmental effects of the WRMP in terms of the feasible (constrained), preferred and revised water resources management options being considered by Bristol Water;
- ▶ help identify appropriate measures to avoid, reduce or manage adverse effects and to enhance beneficial effects associated with the implementation of the WRMP wherever possible;
- ▶ give the statutory SEA bodies, stakeholders and the wider public the ability to see and comment upon the effects that the draft WRMP may have on them, their communities and their interests, and encourage them to make responses and suggest improvements; and
- ▶ inform Bristol Water's selection of water management options to be taken forward into the final WRMP.

What are the key economic, social and environmental issues for the Water Resources Management Plan?

As part of the SEA process, a review has been undertaken to identify the key economic, social and environmental issues which are relevant to the assessment of the WRMP. These issues have been identified from a variety of sources, including a review of baseline data and other relevant plans and programmes. A summary of the issues identified as being most relevant to the assessment of the WRMP are shown in **Table NTS.1**.

Table NTS.1 Key Sustainability Issues Relevant to the WRMP

SEA Topic	The key sustainability issues arising from the review of the plans, programmes and policies and baseline
Biodiversity, flora and fauna	<ul style="list-style-type: none"> • The need to protect and enhance sites designated for nature conservation. • The need to protect and enhance non-designated sites. • The need to take opportunities to improve connectivity between fragmented habitats to create functioning habitat corridors and to improve the resilience of habitats. • The need to continue to increase and improve the condition of priority habitats and habitats of priority species, and restore populations of these species and other specially protected species. • The need to avoid activities likely to cause irreversible damage to natural heritage. • The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services. • The need to prevent the spread/introduction of invasive non-native species. • The need to recognise the importance of allowing wildlife to adapt to climate change.
Geology, land use and soils	<ul style="list-style-type: none"> • The need to maintain or improve the quality of soils/agricultural land. • The need to protect and enhance sites designated for their geological interest. • The need to maintain and enhance soil function and health. • The need to make use of Previously Developed Land (PDL), and to reduce the prevalence of derelict land. • The need to manage land more holistically at the catchment level, benefiting landowners and other stakeholders, the environment and sustainability of natural resources.
Water	<ul style="list-style-type: none"> • The need to further improve the quality of the region's river, estuarine and coastal waters taking into account WFD objectives. • The need to maintain the quantity and quality of groundwater resources taking into account Water Framework Directive (WFD) objectives. • The need to ensure the risk of flooding is not increased, and options for flood avoidance and resilience are investigated. • The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters. • The need to ensure sustainable abstraction to protect the water environment and meet society's needs for a resilient water supply. • The need to ensure that people understand the value of water.
Air Quality and climate	<ul style="list-style-type: none"> • The need to minimise emissions of pollutant gases and particulates and enhance air quality. • The need to reduce the need to travel and promote sustainable modes of transport. • The need to reduce greenhouse gas emissions arising from implementation of the WRMP. • The need to take into account, and where possible adapt to, the potential effects of climate change. • The need to increase environmental resilience to the effects of climate change.
Human Environment	<ul style="list-style-type: none"> • The need to ensure water supplies remain affordable especially for deprived or vulnerable communities, reflecting the importance of water for health and wellbeing. • The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas. • The need to maintain resilient, reliable public water supplies. • The need to ensure water quantity and quality is maintained for a range of uses including tourism, recreation, navigation and other uses such as agriculture. • The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists for access to green infrastructure and the natural and historic environment, as well as protecting and enhancing recreational resources. • The need to accommodate an increasing population and local housing growth through provision of essential services including water supply. • Sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and wellbeing and the economy.
Material assets and resource use	<ul style="list-style-type: none"> • The need to minimise the consumption of resources, including water and energy. • The need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill. • The need to continue to reduce leakage from the water supply system to help reduce demand for water. • The need to continue to encourage more efficient water use by consumers.
Archaeology and	<ul style="list-style-type: none"> • The need to conserve or enhance sites of archaeological importance and cultural heritage interest,

SEA Topic	The key sustainability issues arising from the review of the plans, programmes and policies and baseline
cultural heritage	<ul style="list-style-type: none"> and their setting, particularly those which are sensitive to the water environment. The need to protect water-dependent heritage sites during drought conditions.
Landscape and visual	<ul style="list-style-type: none"> The need to protect and improve the natural beauty of the area's AONBs and other areas of natural beauty. The need to protect and improve the character of landscapes and townscapes.

The key sustainability issues listed in **Table NTS.1** above have informed the framework that has been used to assess the effects of the draft and revised draft WRMP.

Section 2 of the Environmental Report summarises the review of plans and programmes relevant to the WRMP and SEA that is contained at Appendix B. Section 3 presents the baseline analysis of social, economic and environmental characteristics, along with how these are likely to change in the future.

How have the effects of the Draft and Revised Draft Water Resources Management Plan been assessed?

An assessment framework has been developed to assess the economic, social and environmental effects of the draft and revised draft WRMP. This framework sets out a number of assessment objectives relating to the key issues identified in **Table NTS.1**. For each objective, guide questions are provided. The guide questions focus the assessment on specific aspects of the objective that reflect issues identified from a review of baseline and contextual information relating to the Bristol Water operational area. Indicative significance thresholds have also been developed for each assessment objective.

This information and the proposed approach to assessment was presented in the first output of the SEA of the WRMP, a Scoping Report. This Report was issued for consultation to the SEA statutory consultees for a five week period beginning the 3rd April 2017. Three responses were received to this consultation (see **Appendix C**). Following receipt of these responses, the approach to assessment was refined. The final twelve assessment objectives against which each of the options has been assessed are shown in **Table NTS.2**.

Table NTS.2 Assessment Framework

Topic Area	SEA Objective	Guide Questions
Biodiversity	1. To protect and enhance biodiversity, key habitats and species, working within environmental capacities and limits.	<i>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</i>
		<i>Will the option protect and enhance non-designated sites and local biodiversity?</i>
		<i>Will the option provide opportunities for new habitat creation or restoration and link existing habitats as part of the development process?</i>
		<i>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</i>
		<i>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</i>
		<i>Will the option prevent the spread/introduction of invasive non-native species?</i>
Geology, Land Use and Soils	2. To ensure the appropriate and efficient use of land and protect and enhance soil	<i>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</i>

Topic Area	SEA Objective	Guide Questions
	quality and geodiversity.	<p><i>Will the option utilise previously developed land?</i></p> <p><i>Will the option protect and enhance protected sites designated for their geological interest and wider geodiversity?</i></p> <p><i>Will the option minimise the loss of best and most versatile agricultural land?</i></p> <p><i>Will the option minimise conflict with existing land use patterns?</i></p> <p><i>Will the option minimise land contamination?</i></p>
Water - Quantity	3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.	<p><i>Will the option minimise the demand for water resources?</i></p> <p><i>Will the option result in changes to river flows?</i></p> <p><i>Will the option result in changes to groundwater levels?</i></p>
Water - Quality	4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.	<p><i>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</i></p> <p><i>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</i></p> <p><i>Will the option support the achievement of protected area objectives?</i></p> <p><i>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</i></p> <p><i>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</i></p>
Water – Flood Risk	5. To reduce the risk of flooding.	<p><i>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</i></p> <p><i>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</i></p> <p><i>Will the option be at risk of flooding now or in the future?</i></p>
Climate Change	6. To limit the causes and potential consequences of climate change.	<p><i>Will the option reduce or minimise greenhouse gas emissions?</i></p> <p><i>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</i></p> <p><i>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</i></p> <p><i>Will the option increase environmental resilience to the effects of climate change?</i></p>
Human Environment - Health	7. To ensure the protection and enhancement of human health.	<p><i>Will the option ensure the continuity of a safe and secure drinking water supply?</i></p> <p><i>Will the option affect opportunities for recreation and physical activity?</i></p> <p><i>Will the option maintain surface water and bathing water quality within statutory standards?</i></p> <p><i>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</i></p>
Human Environment - Social and Economic	8. To maintain and enhance the economic and social well-	<p><i>Will the option ensure sufficient infrastructure is in place for predicted population increases?</i></p>

Topic Area	SEA Objective	Guide Questions
Well-Being	being of the local community.	<i>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</i>
		<i>Will the option help to meet the employment needs of local people?</i>
		<i>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</i>
		<i>Will the option improve access to local services and facilities (e.g. sport and recreation)?</i>
		<i>Will the option contribute to sustaining and growing the local and regional economy?</i>
		<i>Will the option avoid disruption through effects on the transport network?</i>
		<i>Will the option be resilient to future changes in resources (both financial and human)?</i>
Material Assets and Resource Use - Water Resources	9. To ensure the sustainable and efficient use of water resources.	<i>Will the option lead to reduced leakage from the supply network?</i>
		<i>Will the option improve efficiency in water consumption?</i>
Material Assets and Resource Use – Waste and Resource Use	10. To promote the efficient use of resources.	<i>Will the option seek to minimise the demand for raw materials?</i>
		<i>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</i>
		<i>Will the option encourage the use of sustainable design and materials?</i>
		<i>Will the option reduce or minimise energy use?</i>
Cultural Heritage	11. To conserve and enhance cultural and historic assets.	<i>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings</i>
		<i>Will the option avoid or minimise damage to archaeologically important sites?</i>
		<i>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</i>
		<i>Will the option affect public access to, or enjoyment of, features of cultural heritage?</i>
Landscape	12. To conserve and enhance landscape character.	<i>Will the option avoid adverse effects on, and enhance where possible, protected/designated landscapes (including woodlands) such as National Parks or AONBs?</i>
		<i>Will the option protect and enhance landscape character, townscape and seascape?</i>
		<i>Will the option affect public access to existing landscape features?</i>
		<i>Will the option minimise adverse visual impacts?</i>

The SEA has used a three stage process to assess the effects of the draft and revised draft WRMP. The first stage is a high level assessment of all feasible (constrained) water management options (including supply side, demand side and leakage options) against the 12 SEA objectives. The second stage is a more detailed assessment (where information permits) of the preferred options identified in the draft WRMP. The third stage is an assessment of the revised preferred options that, in combination, form Bristol Water's final proposed programme of options.

Each of the feasible options has been assessed against the 12 SEA objectives to identify its potential effects. The assessment has included consideration of the nature of the effect, its timing and geographic scale, the sensitivity of the people or environmental receptor that could be affected, and how long any effect might last. Where quantified information has been available for the feasible option, the assessment has also been informed by reference to defined threshold values. The assessment of effects has been based on the following scale:

Score	Description	Symbol
Significant Positive Effect	Significant positive effect of the Water Resources Management Plan option on this objective	++
Minor Positive Effect	Positive effect of the Water Resources Management Plan option on this objective	+
Neutral	Overall neutral effect of the Water Resources Management Plan option on this objective	0
Minor Negative Effect	Negative effect of the Water Resources Management Plan option on this objective	-
Significant Negative Effect	Significant negative effect of the Water Resources Management Plan option on this objective	--
No Relationship	There is no clear relationship between the Water Resources Management Plan option and the achievement of the objective or the relationship is negligible.	~
Uncertain	The Water Resources Management Plan option has an uncertain relationship to the objective or the relationship is dependent on the way in which the aspect is managed. In addition, insufficient information may be available to enable an assessment to be made.	?
Mixed Effect	Mixed positive and negative effect of the Water Resources Management Plan option on this objective	+/-

The potential effects (positive, negative or neutral) and the significance of the effects of each of the preferred and revised preferred options against each of the SEA objectives has been recorded in separate matrices, along with commentary setting out the reasons for the assessment results.

To ensure a consistent approach to interpreting the significance of effects, a series of quantitative and semi-quantitative 'thresholds' have been defined (shown in **Appendix D**) to provide direction on what constitutes a significant effect. These have been employed for both the assessment of the feasible options and preferred options.

Section 4 of the Environmental Report provides further information in relation to the approach to the assessment of the WRMP.

Habitats Regulations Assessment

The Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations') require that competent authorities assess the potential impacts of plans and programmes on the Natura 2000 network of European protected sites to determine whether there will be any 'likely significant effects' (LSE) on any European site as a result of the plan's implementation (either on its own or 'in combination' with other plans or projects); and, if so, whether these effects will result in any adverse effects on the site's integrity. The process by which the impacts of a plan or programme are assessed against the conservation objectives of a European site is known as Habitats Regulations Assessment (HRA). WRMPs are not explicitly included within this legislation, although Natural England has previously stated that this requirement should extend to plans such as the WRMP. The Habitats Regulations require every Competent Authority, in the exercise of any of its functions, to have regard to the requirements of the Habitats Directive. Water companies have a statutory duty to prepare WRMPs and are therefore the Competent Authority for a HRA.

Alongside the SEA, Wood has undertaken a HRA of the revised draft WRMP. The findings of the HRA have been used to inform the assessment of options as part of the SEA process (as summarised in the following sections), and in particular the assessment of options against SEA Objective 1: To protect and enhance biodiversity, key habitats and species, working within environmental capacities and limits.

What are the findings of the SEA?

The potential effects of the 21 Feasible Options

The feasible options were assessed against each of the 12 SEA objectives to identify its potential impact. This included six customer demand options, six production options, six resource options and three distribution options.

Customer demand feasible options

A table summarising the assessments of the customer demand feasible options is presented in **Table NTS.3**.

No significant positive or significant negative construction or operational effects have been identified during the assessment. Most options were assessed as having neutral effects against all SEA objectives during construction (options C26-01, C26-02 and C26-03) which reflects the absence of construction activity or the very minor and localised scale of construction activity associated with the installation of water efficiency devices. Operational effects have been assessed as neutral against ten of the twelve SEA objectives with only minor positive effects expected against water quantity (Objective 4) and water resources (Objective 9) reflecting benefits of water savings.

Table NTS.3 Customer Demand Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C26-01	Enhanced water efficiency communications campaign (different messages for different seasons)	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0
C26-02	Water efficiency on different key stages (primary, secondary, further and higher education)	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0
C26-03	Household water efficiency devices installation programme	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0
C08	Selective metering of domestic customers based on (a) high consumption e.g. sprinkler use and/or (b) zones of high demand	C	0	0	0	0	0	-	0	0	0	-	0	0
		O	0	0	+	0	0	0/?	0	0	+	0/?	0	0
C12	Enhanced promotion of free water meters to unmeasured households beyond the promotion assumed in baseline demand forecast	C	0	0	0	0	0	-	0	0	0	-	0	0
		O	0	0	+	0	0	0/?	0	0	+	0/?	0	0

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C20	Installation of rainwater harvesting in new build households	C	0	0	0	0	0	-	0	0	0	-	0	0
		O	0	0	+	0	0	0/?	0	0	+	0/?	0	0

Production feasible options

A table summarising the assessments of the production feasible options is presented in **Table NTS.4**.

Significant positive or significant negative effects identified for the construction phase include:

- ▶ Significant positive effects on economic and social wellbeing (Objective 8) from option (P10). This reflects the potential for significant capital investment to generate supply chain benefits and employment opportunities as well as increased spend in the local economy by contractors and construction workers;
- ▶ Significant negative effects on climate change (Objective 6) from options P10 and P20. Given the scale of construction activity associated with the implementation of these options, the emissions of greenhouse gases from vehicle movements, construction plant and the embodied carbon in construction materials to be used in the options is anticipated to be significant; and
- ▶ Significant negative effects on waste and resource use (Objective 10) from options P10 and P20 as material use, energy requirements and waste generation would be substantial.

All other effects during construction were assessed as minor positive/negative or neutral.

No significant positive or significant negative effects associated with the operation of the options have been identified during the assessment.

Table NTS.4 Production Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P01-01:	Increase performance of existing sources (P01-01R) to increase deployable output to near licensed volume	C	0/?	+	0	0	0	-	0	+	0	-	0	-
		O	0	0	0/?	0/?	0	-	+	+	0	-	0	0
P01-02	Increase performance of existing sources (P01-02R) to increase deployable output to near licensed volume	C	0	+	0	0	0	-	0	+	0	-	0	0
		O	0	0	0/?	0/?	0	-	+	+	0	-	0	0
P06-01:	Catchment Management for Chew and Blagdon Reservoir to manage outage risk from algal blooms	C	0	0	0	0	0	-	0	0	0	-	0	0
		O	+	+	0	+	0	0	0	0	0	+	0	0
P08	P08R WTW (increased production)	C	0	+	0	0	0	0	0	0	0	-	0	0
		O	0/?	0	-/?	0	0	0	+/?	+	0	0	0	0
P10	P10R WTW (increased production)	C	0	+	0	0	0	--	-	++/-	0	--	0	0
		O	0	0	-/?	0	0	0	+	+	0	0	0	0

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P20	Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	C	0/?	0	0	0	0	--/?	-	+/-	0	--/?	0	-/?
		O	0	0	+	0	0	+/?	+	+	+	+	0	0

Resources feasible options

A table summarising the assessments of the resources feasible options is presented in **Table NTS.5**.

Significant positive or significant negative effects identified for the construction phase include:

- ▶ Significant positive effects on economic and social wellbeing (Objective 8) for options R08-02, R11 and R23-01. This is associated with the potential for capital investment to generate supply chain benefits and employment opportunities as well as increased spend in the local economy by contractors and construction workers and
- ▶ Significant negative have been identified on one or more objectives for all options (except for option R32), namely biodiversity (Objective 1), geology and soils (Objective 2), flood risk (Objective 5), climate change (Objective 6), waste and resource use (Objective 10) and landscape (Objective 12). This is due to due to potential loss of/disturbance to habitats and species (Objective 1), loss of greenfield land (Objective 2), flood risk due to the location of some development sites and pipeline works within Flood Zones 2 and 3 (Objective 5), anticipated emissions of greenhouse gases from vehicle movements, construction plant and the embodied carbon in raw materials (Objectives 6 and 10) and potential for works to affect landscape character and/or visual amenity (Objective 12). Only option R11 has been assessed as having significant negative effects on all of these six objectives.

All other effects during construction were assessed as minor positive/negative or neutral.

Significant positive or significant negative effects identified for the operational phase include:

- ▶ Significant positive effects on human health (Objective 7) and economic and social wellbeing (Objective 8) for options R11 and R32 as they will help to ensure the continuity of a safe and secure drinking water supply which may in turn support economic and population growth. All other options were assessed as having minor positive effect on these objectives due to the smaller capacity/deployable output of these options;
- ▶ Significant positive effects on climate change (Objective 6) and waste and resource use (Objective 10) for option R32. The implementation of this option would result in water being transferred over a shorter distance than under current operation which would generate substantial energy savings and a significant reduction in greenhouse gas emissions;
- ▶ Significant negative effect on climate change (Objective 6) for option R08-02. This reflects the greenhouse gas emissions associated with operation (pumping and treatment) of a new supply source on the middle River Avon.

All other effects during operation were assessed as minor positive/negative or neutral.

Table NTS.5 Resource Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R08-02:	New water sources within Bristol Water CAMS area for the location R08-02R	C	-/?	-	0	0	-	--	-	++/-	0	--	-/?	-/?
		O	0	0	-/?	0	0	--	+	+	0	-	0/?	0/?
R08-03	New water sources within Bristol Water CAMS area for the location R08-03R	C	-	-	0	0	-	--	-	+/-	0	--	-	-
		O	0/?	0	-	0	-	0	+	+	0	0	0	-
R11	Resource Cheddar Reservoir Standard WRMP14 Design	C	--	--	0/?	-/?	--	--	-	++/-	0	--	-/?	--
		O	+/-/?	0	-/?	-/?	+/-	0	++	++	0	0	-	-
R23-01	Purchase Water from Third Parties from Water Companies	C	-/?	-	0	0	-	--	-	++/-	0	--	-	-
		O	0/?	0	0	0	0	-	+	+	+	-	0	0
R24	Bring R24R source back into supply	C	-/?	0	0	0	-	--	-	0	0	--	-	-

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
		O	0	0	?	?	-	-	+	+	0	-	0	0
R32	Resource Reduction of bulk transfer agreement with Wessex Water	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	0	0	0	0	++	++	++	+/?	++	0

Distribution feasible options

A table summarising the assessments of the distribution feasible options is presented in **Table NTS.6**.

Significant positive or significant negative effects identified for the construction phase include:

- ▶ Significant positive effect on economic and social wellbeing (Objective 8) for option D23. This reflects the anticipated high capital investment which will generate supply chain benefits and employment opportunities as well as increased spend in the local economy by contractors and construction workers.
- ▶ Significant negative effects on climate change (Objective 6) and waste/resource use (Objective 10) for option D23. This is due to the potential significant carbon emissions from vehicle movements and embodied carbon in replacement pipes and significant resource use and waste generation. Some uncertainty remains at present as carbon emissions are unquantified and the full scale of works is unknown.

No significant positive or significant negative effects have been identified with respect to the operation of the distribution options. Once operational, the options will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise, and therefore the options are likely to have neutral operational effects across the majority of objectives.

Table NTS.6 Distribution Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D21	Active Leakage Control	C	?	0	0	0	0	-/?	0	-	0	-	0	0/?
		O	0	0	+	0	0	+	+	0	+	0	0	0
D22	Pressure Management	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	+	+	0	+	0	0	0
D23	Asset Renewal	C	0/?	0	0	0	0	--/?	0/?	++	0	--/?	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0

The Potential Effects of the Preferred Combination of Options of the Draft WRMP

Bristol Water identified four preferred options balancing water demand and supply deficit for the draft WRMP. The following section summarises the findings of more detailed assessments of the preferred options presented in the draft WRMP. The findings of the detailed assessments of the preferred options during construction and operation are presented in **Table NTS.7** and **Table NTS.8**, and summarised in **Table NTS.9**. The findings are discussed in more detail below.

Construction

The preferred options were assessed as having neutral effects against the majority of the objectives during construction. Significant negative effects were only identified for option P20 against climate change (Objective 6) and waste and resources (Objective 10). This is due to an increase in greenhouse gas emissions arising from embodied carbon associated with new pipeline and emissions from plant and vehicle movements to repair and replace leaking mains (Objective 6) and due to increase in resource use and construction waste along with fuel usage for vehicles and plant (Objective 10), although against both objectives, some residual uncertainty remains due to the uncertain nature of the scale and location of the work to be undertaken.

Operation

The preferred options are assessed as having neutral or positive effects against all objectives during operation. Option R32 would involve the termination of the existing bulk supply agreement to Wessex Water in order to recover up to 11.4 Ml/d and is assessed as having significant positive effects on Objectives 6 (climate change), 7 (human health), 8 (economic and social wellbeing) and 10 (waste and resource use). This is due to a reduction in annual greenhouse gas emissions (Objective 6), ensuring a continual supply of clean drinking water (Objective 8), support economic growth in the area (Objective 8) and energy savings (Objective 10).

TableNTS.7 Preferred Combination of Options for the Draft WRMP – Construction Effects

Option	Yield (Ml/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R32: Resource Reduction of bulk transfer agreement with Wessex Water	11.4	0	0	0	0	0	0	0	0	0	0	0	0
D21: Active Leakage Control	4.5	0/?	0	0	0	0	-/?	0	-	0	-	0	0/?
D22: Pressure Management	2.1	0	0	0	0	0	0	0	0	0	0	0	0
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	3.9-5.5	0/?	0	0	0	0	--/?	-/?	+/-	0	--/?	0	-/?
Preferred combination of options	21.9-23.5	0/?	0	0	0	0	--/?	0/?	+/-	0	--/?	0	0/?

Table NTS.8 Preferred Combination of Options for the Draft WRMP – Operational Effects

Option	Yield (M/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R32: Resource Reduction of bulk transfer agreement with Wessex Water	11.4	0	0	0	0	0	++	++	++	+/?	++	0	0
D21: Active Leakage Control	4.5	0	0	+	0	0	+	+	0	+	0	0	0
D22: Pressure Management	2.1	0	0	+	0	0	+	+	0	+	0	0	0
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	3.9-5.5	0	0	+	0	0	0	0	0	+	0	0	0
Preferred combination of options	21.9-23.5	0	0	+	0	0	++	++	++	+/?	++	0	0

TableNTS.9 Summary of the Preferred Combinations of Options for the Draft WRMP – Construction and Operational Effects

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
Preferred combination of options (21.9 – 23.5 Ml/d)	C	0/?	0	0	0	0	--/?	0/?	+/-	0	--/?	0	0/?
	O	0	0	+	0	0	++	++	++	+/?	++	0	0

The Potential Effects of the Revised Combination of Revised Preferred Options of the Revised Draft WRMP

Bristol Water identified three revised preferred options for the revised draft WRMP. The following section summarises the findings of more detailed assessments of the revised preferred options presented in the revised draft WRMP. The findings of the detailed assessments of the revised preferred options during construction and operation are presented in **Table NTS.10** and **Table NTS.11**, and summarised in **Table NTS.12**. The findings are discussed in more detail below.

Construction

The revised preferred options were assessed as having neutral effects against the majority of the objectives during construction. Significant negative effects were only identified for option P20 against climate change (Objective 6) and waste and resources (Objective 10). This is due to an increase in greenhouse gas emissions arising from embodied carbon associated with new pipeline and emissions from plant and vehicle movements to repair and replace leaking mains (Objective 6) and due to increase in resource use and construction waste along with fuel usage for vehicles and plant (Objective 10), although against both objectives, some residual uncertainty remains due to the uncertain nature of the scale and location of the work to be undertaken.

Operation

The revised preferred options are assessed as having neutral or positive effects against all objectives during operation. Minor positive effects were identified for Objectives 3 (water quantity), 6 (climate change), 7 (human health), 8 (economic and social wellbeing), 9 (water resources) and 10 (waste and resource use). This is due to savings made by leakage reduction (Objectives 3 and 9), a reduction in annual greenhouse gas emissions (Objective 6), the greater resilience (Objective 7), ensuring a continual supply of clean drinking water (Objective 8), support economic growth in the area (Objective 8) and energy savings (Objective 10). The uncertainty against Objective 6 reflects the uncertainty associated with the operation of P20, and the extent to which the option would result in a decrease in demand for water abstraction and subsequent treatment with the commensurate reduction in energy demand and greenhouse gas emissions.

TableNTS.10 Revised Preferred Combination of Options for the Revised Draft WRMP – Construction Effects

Option	Yield (Ml/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D21.1: Active Leakage Control	2.83	0/?	0	0	0	0	-/?	0	-	0	-	0	0/?
D21.2: Active Leakage Control	1.5	0/?	0	0	0	0	0	0	-	0	0	0	0/?
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	5.5	0/?	0	0	0	0	--/?	-/?	+/-	0	--/?	0	-/?
Preferred combination of options	9.83	0/?	0	0	0	0	--/?	0/?	+/-	0	--/?	0	0/?

Table NTS.11

Revised Preferred Combination of Options for the Revised Draft WRMP– Operational Effects

Option	Yield (Ml/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D21.1: Active Leakage Control	2.38	0	0	+	0	0	+	+	0	+	0	0	0
D21.2: Active Leakage Control	1.5	0	0	+	0	0	+	+	0	+	0	0	0
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	5.5	0	0	+	0	0	0	0	0	+	0	0	0
Preferred combination of options	9.83	0	0	+	0	0	+/?	+	+	+	+	0	0

TableNTS.12

Summary of the Revised Preferred Combinations of Options for the Revised Draft WRMP – Construction and Operational Effects

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
Preferred combination of options (9.83 Ml/d)	C	0/?	0	0	0	0	--/?	0/?	+/-	0	--/?	0	0/?
	O	0	0	+	0	0	++	++	++	+/?	++	0	0

Summary of Effects

The summary of the construction and operational effects of the revised preferred combination of options outlined in **Table NTS.12** illustrates the balance that has been struck between the negative effects associated with the construction phase and the resulting significant positive effects from their subsequent operation. It is worth noting that the identified cumulative effects of construction maybe overly cautious as the effects are actually spread over the plan period 2020 – 2045 (as different options are implemented through the lifetime of the Plan) with largely short term effects occurring as each option is implemented.

Using the findings of the SEA

The assessments have helped to highlight the range of potential environmental and social effects associated with the draft and revised draft WRMP, including those that had been quantified and those that could only be identified qualitatively. The assessments outlined in this report highlighted where there are the potential significant negative and positive effects of the WRMP. Further, the assessments have helped to identify where there are more minor effects and how some of the potential negative impacts can be mitigated and positive effects enhanced. The selection of the revised preferred options have drawn on the findings of the assessment, where relevant, to select options that address the SDB deficit in the least environmental disruptive way.

What are the next steps in the SEA process?

This revised Environmental Report has been completed to assess the changes to the WRMP. It also includes changes made in response to comments received from the consultation.

The revised draft WRMP has been submitted to the Secretary of State for Environment, Food and Rural Affairs. A statement of response will also be submitted containing all the consultation submissions received and Bristol Water's response. The statement of response and revised draft WRMP will be set to the Environment Agency for review. A decision will then be taken as to whether the revised draft WRMP can be published or whether further work is required before it can be published.

As soon as is reasonable practicable after the publication of the final WRMP, Bristol Water will also publish a Post Adoption Statement which is the final output of the SEA process. This will summarise

- ▶ how environmental considerations have been integrated into the plan or programme;
- ▶ how the Environmental Report has been taken into account;
- ▶ how opinions expressed in response to consultation have been taken into account;
- ▶ how the results of any transboundary consultations entered into have been taken into account;
- ▶ the reasons for choosing the plan or programme as adopted, in the light of the other reasonable alternatives dealt with; and
- ▶ the measures that are to be taken to monitor the significant environmental effects of the implementation of the plan or programme.

As the WRMP is implemented, Bristol Water will monitor its effects on the environment through their existing processes, helping to ensure that the potential impacts identified in the SEA are considered in practice.

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1. Introduction

1.1 Overview

Bristol Water provides water supplies to 1.1 million people and all the associated businesses in an area of approximately 2,400 square kilometres centred on Bristol and the towns and villages within a 20-mile radius of the city.

Since 2007 all water companies have had a statutory duty to prepare, maintain, and publish a Water Resources Management Plan (WRMP) under the *Water Industry Act 1991*, as amended by the *Water Act 2003* and the *Water Act 2014* (although informal water resources planning has been a fundamental activity for water companies for decades). A WRMP sets out how the water company intends to maintain the balance between water supply and demand to ensure the security of supply over the coming 25 years in a way that is economically, socially, and environmentally sustainable. WRMPs are revised every 5 years and Bristol Water is currently preparing its next plan (WRMP19) which will consider the period 2020 to 2045 (and beyond). As part of the preparation of WRMP19, Bristol Water completed a draft Water Resources Management Plan (WRMP19) for the period 2020 to 2045. This was issued for a 12 week consultation on 8th March 2018. Following an analysis of the submissions, and further modelling, Bristol Water has now produced a revised draft WRMP.

Strategic Environmental Assessment (SEA) is a statutory requirement² for plans and programmes that could have significant environmental effects. The objective of SEA is to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development³.

Government⁴, industry⁵ and regulator⁶ guidance set out that there is a requirement for water companies, as responsible authorities, to determine whether their WRMPs fall within the scope of the SEA regulations and whether an SEA must be undertaken. Bristol Water has determined that an SEA of WRMP19 is required based on the scope of the potential effects that could arise. In addition, it is noted that the latest Water Resources Planning Guideline states that “SEA is mandatory if [the water company operates] wholly or mainly in Wales”.¹² Whilst Bristol Water operates mainly in the South West of England, as part of the options assessment process it will be considering the potential for water resource options from Wales, should these be considered feasible, and so undertaking an SEA is consistent with the intention of this guidance.

Wood Environment & Infrastructure Solutions UK Limited (Wood) formerly Amec Foster Wheeler Environment and Infrastructure UK Ltd has been commissioned by Bristol Water to undertake the SEA of the WRMP. The SEA is being undertaken to assess the likely economic, social and environmental effects of the WRMP and identify ways in which adverse effects can be avoided, minimised or mitigated and how any positive effects can be enhanced. In doing so, it will help to inform the selection of water management options within the plan. More information about SEA and the rationale for applying it to Bristol Water’s developing WRMP is provided in **Section 1.5**.

The Conservation of Habitats and Species Regulations 2017 (the Habitat Regulations) require the identification and assessment of the potential effects of the WRMP on the Natura 2000 network of European protected sites⁷ to determine whether there will be any likely significant effects as a result of implementing the plan (either on its own or in combination with other plans or projects) and whether any effects will result in adverse impacts on the integrity of the site. The Bristol Water operational area incorporates a number of European protected sites. If it is considered likely (after screening) that any of the proposed water management options will result in adverse effects on any of these sites, then an Appropriate Assessment will

² *The Environmental Assessment of Plans and Programmes Regulations 2004 (SI 1633)*

³ Article 1 of the European Union Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment

⁴ ODPM et al (2005) *A Practical Guide to the Strategic Environmental Assessment Directive*.

⁵ UKWIR (2012) *Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans (WR/02/A)*.

⁶ Environment Agency and Natural Resources Wales (2016) *Final Water Resources Planning Guideline*.

⁷ A European site is any classified Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar site, or candidate SACs and potential SPAs (as derived from the *Habitats Directive* and the *Conservation of Habitats and Species Regulations 2017*).

need to be undertaken. If this is the case, the outcome of the assessment will be used to inform the detailed assessments undertaken later in the SEA process.

1.2 Purpose of this Environmental Report

This Environmental Report has been produced as part of the process of developing the Bristol Water revised draft WRMP. It complies with the requirements of the Strategic Environmental Assessment Directive as interpreted in the UK by *The Environmental Assessment of Plans and Programmes Regulations 2004*. These regulations are a statutory requirement for plans or programmes which could have significant environmental implications, and the process helps to identify where there are potential impacts and how any negative impacts might be mitigated. The assessment has been used to inform the choice of options within the WRMP to manage the supply and demand of water in the Bristol Water area over the 25 year planning period (2020 – 2045).

This Environmental Report sets out:

- ▶ A review relevant plans, programmes, policies and strategies which could influence the revised draft WRMP (**Section 2**);
- ▶ The baseline information that sets the context for the assessment (**Section 3**);
- ▶ Details of the methods employed in undertaking the assessment (**Section 4**);
- ▶ The potential effects of feasible options for balancing water demand and supply for the Bristol Water supply area (**Section 5**);
- ▶ The potential effects of the preferred and revised preferred options for balancing water demand and supply for deficit WRZs and the cumulative effects for Bristol Water supply area (**Section 6**) and where adverse effects have been identified, mitigating measures have been proposed; and
- ▶ Information about the WRMP process going forward, including indicative proposals for monitoring (**Section 7**).

1.3 Water Resources Management Planning

Requirements for a Water Resources Management Plan

The Water Industry Act 1991, as amended by the Water Act 2003, requires all water companies to prepare, maintain and publish statutory WRMPs. The plans set out how water companies intend to maintain the balance between water supply and demand and ensure security of supply over the next 25 years and beyond in a way that is economically, socially and environmentally sustainable.

Part III of the Water Industry Act 1991 states the following role for water companies in water supply:

“37.—(1) It shall be the duty of every water undertaker to develop and maintain an efficient and economical system of water supply within its area and to ensure that all such arrangements have been made—

(a) for providing supplies of water to premises in that area and for making such supplies available to persons who demand them; and

(b) for maintaining, improving and extending the water undertaker's water mains and other pipes, as are necessary for securing that the undertaker is and continues to be able to meet its obligations under this Part.

37A.—(2) A water resources management plan is a plan for how the water undertaker will manage and develop water resources so as to be able, and continue to be able, to meet its obligations under this Part.”

The Water Resources Planning Guideline⁸ produced by the Environment Agency and Natural Resources Wales provides a framework for the development and presentation of water company plans. Ofwat also uses WRMPs to assess the supply-demand balance as part of the Periodic Review of price limits.

Water Resources Management Planning Stages

The Water Resources Planning Guideline sets out the process for developing a WRMP. This highlights the following key stages:

- ▶ **Early engagement:** Before preparing its draft WRMP, the water company should undertake early engagement with its board, regulators, customers and interested parties. During this stage, the methods and approaches to the development of the WRMP should be discussed with the Environment Agency with a view to preparing a method statement.
- ▶ **Pre-consultation:** Pre-consultation must be undertaken with the Environment Agency and Secretary of State for the Environment, Food and Rural Affairs (if the plan affects sites in England) and Natural Resources Wales and Welsh Ministers (if the plan affects sites in Wales), Ofwat and any licensed water supplier that supplies water to premises in the plan area. Pre-consultation may also be undertaken with other stakeholders at this stage.
- ▶ **Write draft WRMP:** The draft WRMP is prepared taking into account issues raised during consultation and following any written direction from the Secretary of State.
- ▶ **Submit draft WRMP:** The draft WRMP is submitted to the Secretary of State, along with a statement declaring any aspects of the plan the water company believes to be commercially confidential.
- ▶ **Publish draft WRMP:** Once instructed to do so by the Secretary of State, the draft WRMP is published for public consultation in accordance with the Water Resources Management Plan Regulations 2007.
- ▶ **Carry out public consultation:** The water company has 26 weeks to consult on its draft WRMP and produce a statement of response. Typically, draft plans are consulted on over a 12 week period but this depends on the complexity of the plan.
- ▶ **Publish statement of response:** The water company is required to provide a statement of response to the representations received during consultation and any forwarded by the Secretary of State. A water company may decide to publish a revised draft WRMP at this stage.
- ▶ **Submit draft final WRMP:** The statement of response must be submitted to the Secretary of State together with the revised draft final WRMP (if appropriate). The Secretary of State will in turn send the response to the Environment Agency for review. The Secretary of State will review the draft plan, the representations made and statement of response, along with technical advice from the regulators and decide whether it can be published. Further work may be required before the plan is published. If necessary, a public hearing or public inquiry will be held to resolve any issues that are particularly complex or controversial or where the draft WRMP has caused particular local interest.
- ▶ **Publish final WRMP:** The final WRMP is published when the Secretary of State directs the water company to do so.

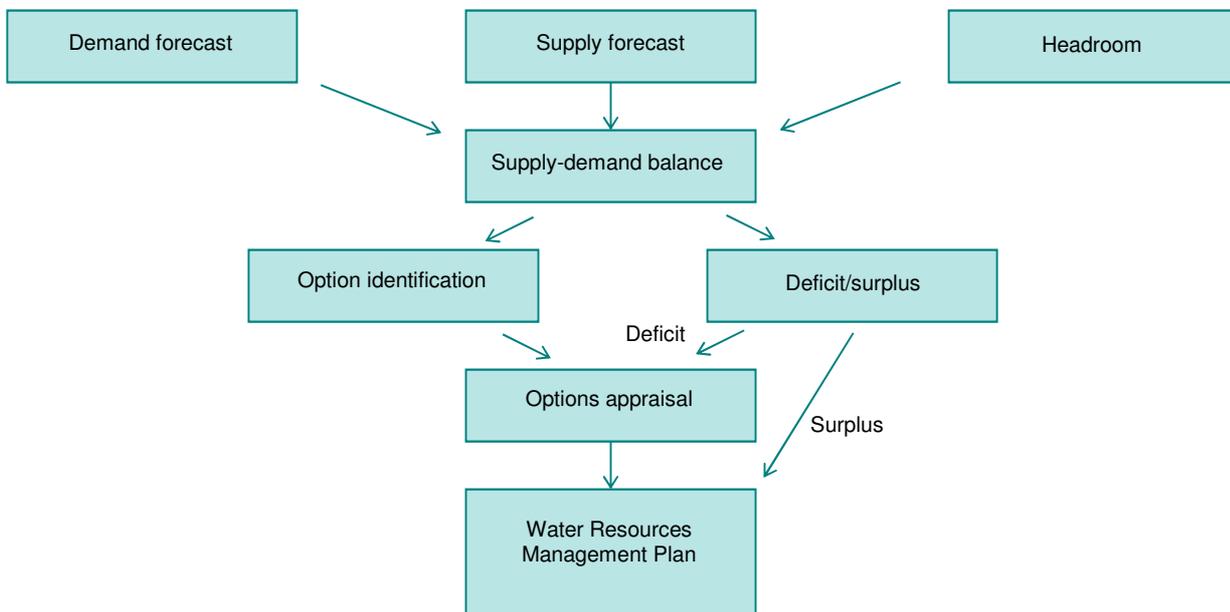
Figure 1.1 shows the key elements in developing a WRMP. The process of developing a WRMP requires an estimation of baseline supply forecast to be prepared, along with an estimation of baseline demand forecast. The uncertainties within the forecast are assessed and the target headroom allowance required is then estimated. The calculation of the baseline supply demand balance for each year of the plan's period are then used to determine if there are any years or critical periods where there is likely to be a supply-demand balance deficit.

⁸ Environment Agency and Natural Resources Wales (2016) *Final Water Resources Planning Guideline* [available at: <https://naturalresources.wales/media/678424/ea-nrw-and-defra-wg-ofwat-technical-water-resources-planning-guidelines.pdf> (accessed October 2017)].

Once this information has been established, a long list of demand and supply options which could be used to manage the supply demand balance deficit is considered. Options are discounted based on their unfeasibility using economic, technological and environmental criteria until a feasible (constrained) list of options that could be used is determined. The capital, operating and social and environmental costs (including carbon costs) of each of the feasible options are assessed using industry standard methodologies. Investment modelling is then undertaken which takes account of the capital, operation and social and environmental costs of the options to determine a least-cost water resources strategy. Further scenario modelling and sensitivity testing is then applied to the strategy to determine the robustness of the proposals.

The preferred planning solution for managing supply and demand to meet the required balance and target headroom was presented in the draft WRMP for formal consultation. Following an analysis of the consultation submissions, and further modelling, Bristol Water has now produced a revised draft WRMP. Where there are changes to the preferred options in the plan, further justification of their inclusion and timing for implementation has been provided.

Figure 1.1 Summary of the Water Resources Management Planning Stages



1.4 Bristol Water's Water Resources Management Plan

Bristol Water provides water supplies to 1.1 million people and all the associated businesses in an area of approximately 2,400 square kilometres centred on Bristol and the towns and villages within a 20-mile radius of the city. The water supply area stretches from Thornbury and Tetbury in the north, to Street and Glastonbury in the south, and from Weston-Super-Mare in the west to Frome in the east. Bristol Water relies on 68 water sources, including reservoirs, rivers, springs, wells and boreholes.

About 88% of the water supply managed by Bristol Water comprises surface waters while 12% comes from groundwater. Around half of the water supplied within the Bristol Water supply area is sourced from within it, with the rest being transferred into the zone from outside the area.

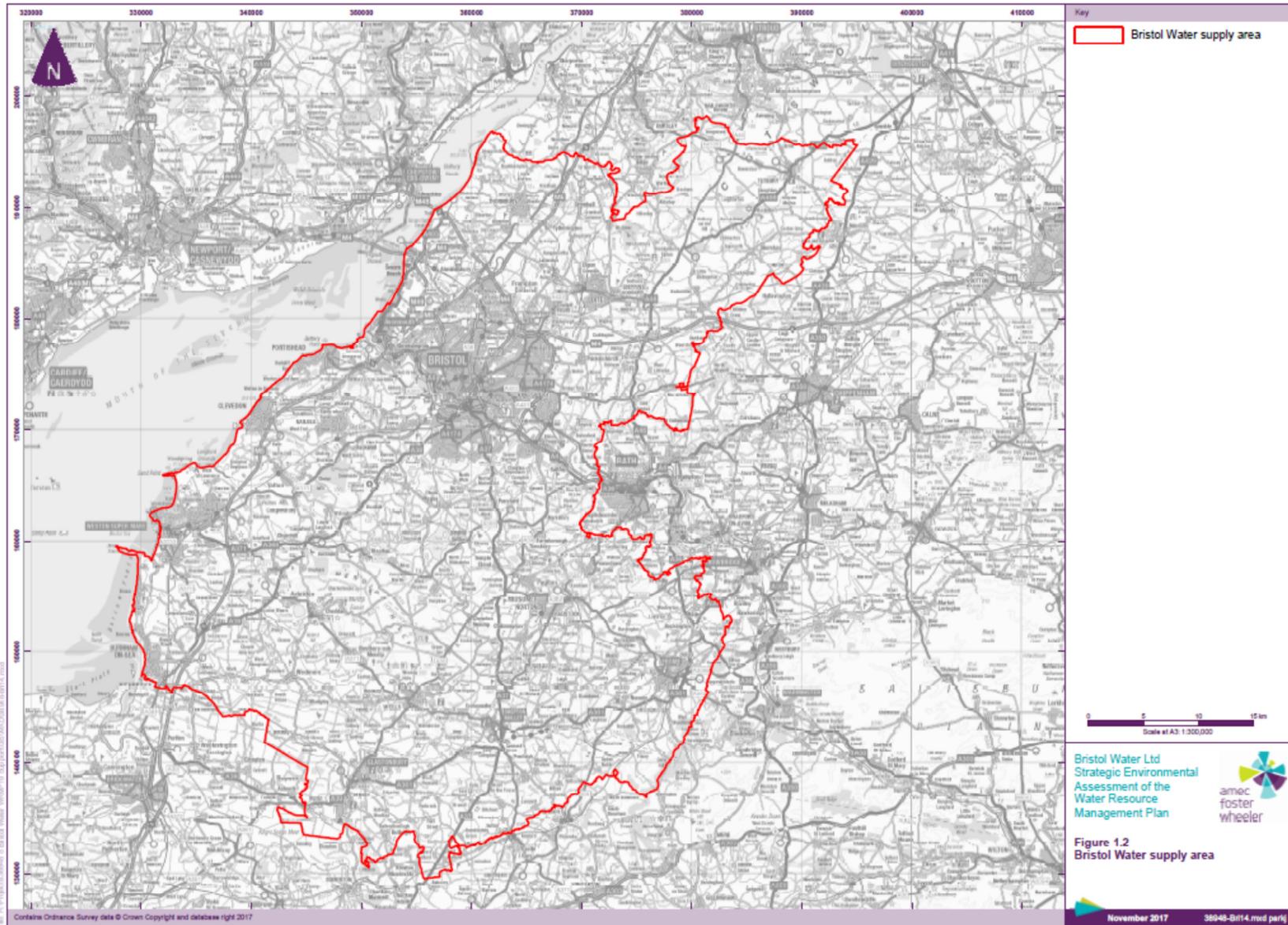
An estimated 46% of water is sourced from the Gloucester & Sharpness canal to supply the largest northern treatment works. The Gloucester & Sharpness canal is supplied by the River Severn and other local rivers, the Cam and the Frome.

The Mendip Reservoirs and associated surface water abstractions account for approximately 42% of the available licensed resource. The largest is Chew Valley Reservoir which holds up to 20,460 million litres.

The remaining water sourced from within the water resource zone is derived from groundwater and accounts for approximately 12% of available licensed resource.

Bristol Water has one water resource zone (WRZ) for the Company's whole supply area, within which all available resources are shared and all customers experience the same risk from any shortage of water. This water supply area is shown in **Figure 1.2**.

Figure 1.2 Bristol Water Supply Area



The Current Water Resources Management Plan

Bristol Water's current WRMP (WRMP14) was published in June 2014 and describes in detail the company's assessment of the availability of water supplies in its supply area and the demand for water by its customers over the 2015 – 2040 period. The WRMP14 sets out Bristol Water's strategy for water resources and demand management to ensure adequate water supplies are available to serve its customers.

Water Resources Management Plan 2019

Bristol Water is preparing the WRMP for the period from 2020 to 2045 (and beyond). As described in **Section 1.3**, the WRMP process identifies potential shortages in the future availability of water and sets out the possible solutions required to maintain the balance between water supply and future demand.

For each Water Resource Zone (WRZ) where deficits are predicted (noting that Bristol Water currently operates on the basis of one WRZ), options are identified to resolve that deficit. The process of option development includes a review of as many potential solutions as possible (the 'unconstrained list' of options) to identify 'feasible' (constrained) options. Robust and objective screening criteria are used to assess the list of unconstrained options and filter this to produce a smaller list of feasible options. These 'feasible' options are then reviewed (using the findings of the relevant assessments, modelling and environmental and social costings) to identify 'a preferred programme of options' to resolve any supply deficits.

Following screening of the unconstrained options, 21 feasible options were identified for potential consideration in this WRZ. The types of feasible options considered in preparing WRMP19 were broadly categorised as follows:

- ▶ production and resource options;
- ▶ customer demand options; and
- ▶ distribution options.

Examples of some of the types of options considered in preparing the current WRMP and that were considered by Bristol Water for the WRMP are highlighted in **Table 1.1**.

Table 1.1 Example WRMP Options

Production and resource options	Customer demand Options	Distribution Options
Improve yield of existing sources with upgrade of pressurised membrane system	Provision of water saving devices	Active leakage control
Development of new impounding/pumping storage reservoir	Schools education and efficiency programme	Pressure management
Bulk supply from neighbouring water companies (and/or third parties multiple schemes)	Enhanced water efficiency communications campaign	Asset renewal
New water sources within Bristol Water Catchment Management Strategy	Enhanced promotion of free water meters to unmeasured households	

In developing the WRMP, Bristol Water is committed to ensuring supplies are resilient over the long term. In consequence, as part of the options being considered, specific options that address resilience have also been considered. This included further collaboration with other sectors (e.g. agriculture), for example to develop a joint approach to enhancing water quality and natural resilience of a catchment.

Informed by the environmental, social and economic assessments and ongoing discussion with stakeholders, the list of feasible options was refined to identify the preferred options for the draft WRMP.

Four preferred options were identified for the draft WRMP which provided a combined yield of between 21.9 to 23.5 MI/d:

- ▶ R32: Resource Reduction of bulk transfer agreement with Wessex Water (yield of 11.4 MI/d);
- ▶ D21: Active Leakage Control (yield of 4.5 MI/d);
- ▶ D22: Pressure Management (yield of 2.1 MI/d);
- ▶ P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement) (yield of 3.9-5.5MI/d).

Following consultation on the draft WRMP and the responses from the regulators and consultees, further changes were made to the WRMP, including:

- ▶ Further reductions in leakage to ensure alignment with the Ofwat challenge of 15% reductions during AMP7 and then going beyond this by 2045;
- ▶ Increasing the take up of water metering, from 66% by the start of 2020 to 87% by 2045;
- ▶ Increasing water efficiency to achieve a reduction in per capita consumption (PCC) from 141 litres/head/day in 2020 to 129 litres/head/day in 2045 and 110 litres/head/day in 2050;
- ▶ Further reductions in leakage from raw water systems and at water treatment works;
- ▶ Updated assessment of the deployable output (reliable supply) of water sources in line with the new national methodology for drought resilience (that was issued after completion of the draft WRMP).

Applying the changes to the SDB, Bristol Water are now forecasting a small residual supply deficit of 0.2 MI/d at 2035 rising to 9.18 MI/d at 2045. Bristol Water propose to address this by the use of three revised preferred options.

- ▶ D21.1: Active Leakage Control (yield of 2.83 MI/d in 2024/25);
- ▶ D21.2: Active Leakage Control (yield of an additional 0.5 MI/d in 2029/30 and an additional 1 MI/d by 2034/35);
- ▶ P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement) (yield of 5.5MI/d).

These three options provided a combined yield of 9.83 MI/d.

1.5 Strategic Environmental Assessment

Overview

SEA became a statutory requirement following the adoption of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. This was transposed into legislation on 20 July 2004 as Statutory Instrument 2004 No.1633 - The Environmental Assessment of Plans and Programmes Regulations 2004.

The objective of the SEA Directive is *“to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development”*.

Throughout the course of the development of the plan, policy or programme, the aim of SEA is to identify the potential impact of options proposed in the plan in terms of their environmental, economic and social effects. If any adverse effects are identified, these options can then be avoided or proposals modified to manage or mitigate adverse effects.

Applying SEA to Water Resources Management Plans

The SEA Directive requires “*an environmental assessment ... of certain plans and programmes which are likely to have significant effects on the environment*” (Article 1). Plans and programmes are defined as those:

- ▶ “*which are subject to preparation and/or adoption by an authority at national, regional or local level or which are prepared by an authority for adoption, through a legislative procedure by Parliament or Government; and*
- ▶ *which are required by legislative, regulatory or administrative provisions*” (Article 2(a)).

Guidance produced by the European Commission (EC)⁹ indicates that in preparing long-term plans for ensuring water resources, privatised utilities companies can be considered an authority because they are providing services that would be carried out by public authorities in a non-privatised regime. The preparation of a WRMP is a statutory requirement and therefore meets the requirements of Article 2(a) of the Directive.

Plans and programmes that may have significant effects on the environment are identified as those:

- ▶ “*which are prepared for... water management... and which set the framework for future development consent of projects listed in Annexes I and II to Directive 85/337/EEC [the Environmental Impact Assessment Directive]; or*
- ▶ *which, in view of the likely effect on sites, have been determined to require an assessment pursuant to Article 6 or 7 of Directive 92/43/EEC [the Habitats Directive]”* (Article 3, paragraph 2(a)).

Broadly, this includes plans that may include development of infrastructure to source, store, or transfer water, or may affect sites that have European designations (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and Ramsar sites and candidate sites).

Government¹⁰, industry¹¹ and regulator¹² guidance set out that there is a requirement for water companies, as responsible authorities, to determine whether their WRMPs fall within the scope of the SEA regulations and whether an SEA must be undertaken. Bristol Water has determined that an SEA of WRMP19 is required based on the scope of the potential effects that could arise. In addition, it is noted that the latest Water Resources Planning Guideline states that “*SEA is mandatory if [the water company operates] wholly or mainly in Wales*”.¹² Whilst Bristol Water operates mainly in the South West of England, as part of the options assessment process it will be considering the potential for water resource options from Wales, should these be considered feasible, and so undertaking an SEA is consistent with the intention of this guidance.

Stages of Strategic Environmental Assessment

SEA comprises five key stages:

- ▶ **Stage A:** Scoping;
- ▶ **Stage B:** Develop and Refine Alternatives and Assess Effects;
- ▶ **Stage C:** Prepare Environmental Report;
- ▶ **Stage D:** Consult on the Draft Plan and Environmental Report and Prepare the Post Adoption (SEA) Statement; and
- ▶ **Stage E:** Monitor Environmental Effects.

⁹ EC (2003) *Implementation of Directive 2001/42 on the Assessment of the Effects of Certain Plans and Programmes on the Environment*.

¹⁰ ODPM et al (2005) *A Practical Guide to the Strategic Environmental Assessment Directive*.

¹¹ UKWIR (2012) *Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans (WR/02/A)*.

¹² Environment Agency and Natural Resources Wales (2016) *Final Water Resources Planning Guideline*.

The processes and interrelationships between the key stages of SEA and development of WRMPs are shown in **Figure 1.3**.

The first stage of SEA (**Stage A**) is the production of a Scoping Report. This reviews plans and programmes that could affect the WRMP or be affected by it, outlines baseline information for the plan area and sets out the proposed framework for assessing potential environmental effects.

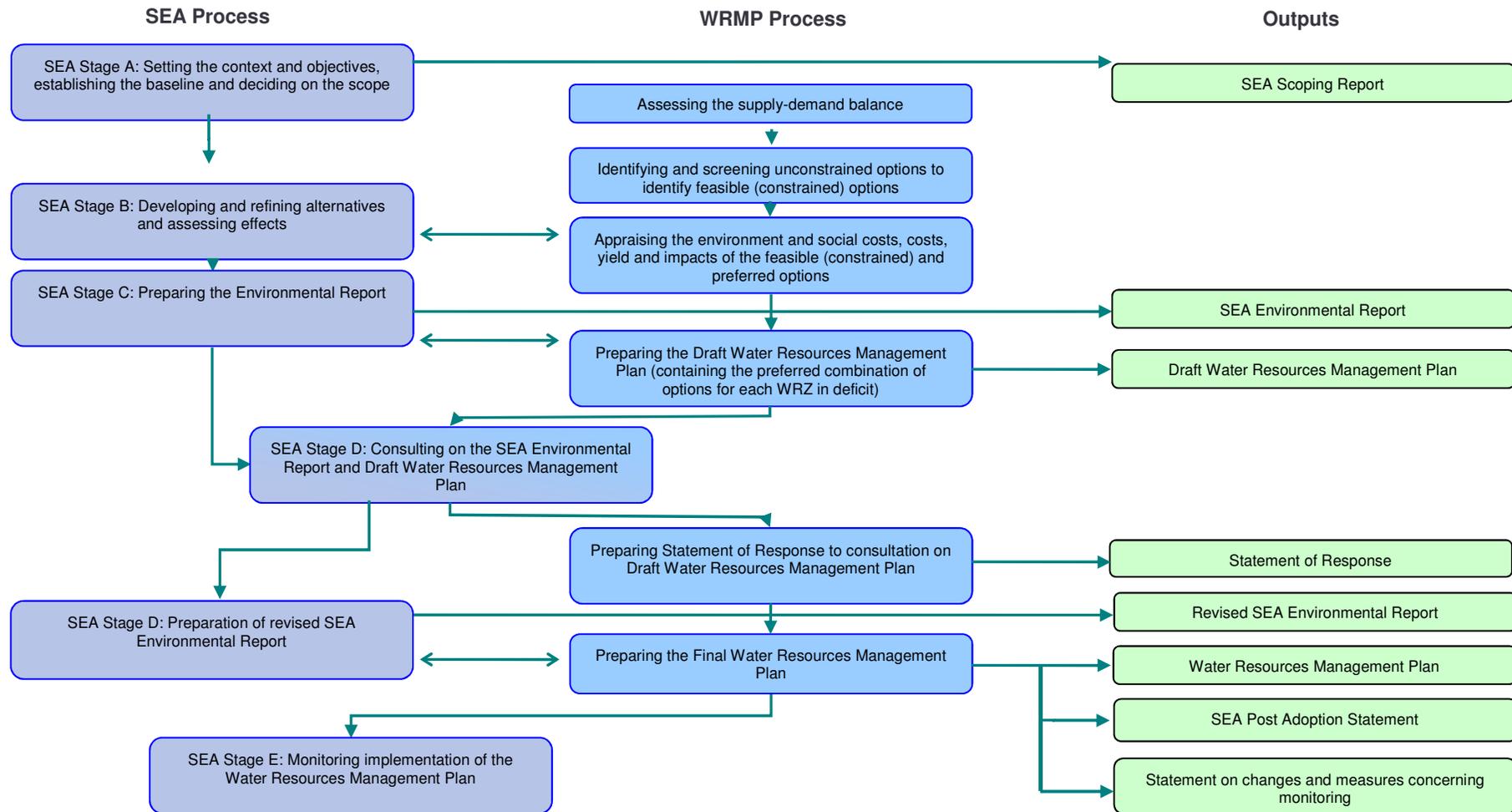
Bristol Water published the SEA Scoping Report for the WRMP for a consultation period of five weeks ending on 7th May 2017. Three responses were received to the consultation (from the Environment Agency, Natural England and Cadw). The comments received from these organisations are shown in **Appendix C**. The responses resulted in amendments to the baseline information and assessment framework that has been used to assess the options.

The draft WRMP was subject to assessment using the amended assessment framework (**Stage B**). The SEA assessed the effects of the draft WRMP in two stages, commensurate with the development of the plan itself. The first stage comprised a high level assessment of all feasible (constrained) water management options. Where information has permitted, a more detailed assessment was then undertaken of the preferred options identified in the draft WRMP. The findings of the assessment were presented in the Environmental Report (**Stage C**) to accompany the draft WRMP. The Environmental Report has then been revised to include an assessment of the revised preferred options that, in combination, form Bristol Water's final proposed programme of options.

The draft WRMP and accompanying documents including the Environmental Report were published for consultation (**Stage D**) which concluded on 31st May 2018. Following consultation, Bristol Water has prepared a Statement of Response to the representations received during the consultation period setting out how and why the draft WRMP has or has not been revised to take account of the consultation responses. Bristol Water has also completed and submitted a revised draft WRMP to the Secretary of State. This Environmental Report relates to the revised draft WRMP. Following direction from the Secretary of State, Bristol Water will publish the final WRMP and implement it accordingly. In conjunction with publishing the final WRMP, Bristol Water will also issue a Post Adoption Statement. This will set out the results of the consultation and SEA process and the extent to which the findings of the SEA have been accommodated in the final WRMP.

The SEA then requires monitoring of any resulting environmental effects of the WRMP (**Stage E**).

Figure 1.3 Linking the SEA and WRMP Development



1.6 Consultation Responses to the draft WRMP and Environmental Report

Bristol Water issued the draft WRMP19 for public consultation from the 8th March to 31st May 2018. The draft WRMP was accompanied by a range of documents and assessments including the Environmental Report, the HRA Report, the WFD Assessment and the Ecosystem Services Assessment.

Two responses (from the Environment Agency and Natural England) were received to the Environmental Report. Comments were made on:

- ▶ the potential to supplement the review of plans and programmes with additional plans;
- ▶ the scope of the SEA;
- ▶ the integration of the SEA with the preparation of the WRMP;
- ▶ the assessment of specific options and the treatment of specific assessment topics.

More detail (and the responses to them) are provided in **Appendix C**.

Where relevant and appropriate, this revised Environmental Report has been amended to reflect the comments made on the previous Environment Report.

1.7 Habitats Regulations Assessment and Water Framework Directive Assessment

Habitats Regulations Assessment

The *Conservation of Habitats and Species Regulations 2017* (the 'Habitats Regulations') requires that competent authorities assess the potential impacts of plans and programmes on the Natura 2000 network of European protected sites¹³ to determine whether there will be any 'likely significant effects' on any European site as a result of the plan's implementation (either on its own or 'in combination' with other plans or projects); and, if so, whether these effects will result in any adverse effects on the site's integrity. The process by which the impacts of a plan or programme are assessed against the conservation objectives of a European site is known as Habitats Regulations Assessment (HRA)¹⁴. WRMPs are not explicitly included within this legislation, although Natural England has previously stated that this requirement should extend to plans such as WRMPs. The Habitats Regulations require every Competent Authority, in the exercise of any of its functions, to have regard to the requirements of the Habitats Directive. Water companies have a statutory duty to prepare WRMPs and are therefore the Competent Authority for HRA of their WRMPs.

The HRA determines whether there will be any 'likely significant effects' on any European site as a result of the Plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity. The HRA has been an integral part in the development of the draft and revised draft WRMP. The outcomes of the HRA have also been incorporated into this SEA Environmental Report as part of the assessment of feasible and preferred options within the SEA process, and in particular, assessment against the biodiversity objective.

A copy of the HRA report, which contains further detail in relation to the findings of the HRA assessment, is available via the Bristol Water website <https://www.bristolwater.co.uk/about-us/water-resources/>.

¹³ A European Site is any classified Special Protected Area (SPA) and any Special Area of Conservation (SAC) from the point where the Commission and the Government agree the site as a Site of Community Importance. SPAs and SACs have been created under the EC Birds Directive and Habitats Directive. In the UK they form part of a larger European network called Natura 2000. HRA is also required, as a matter of Government policy, for potential SPAs (pSPAs), possible SACs (pSACs) and listed Ramsar Sites for the purpose of considering development proposals affecting them (National Planning Policy Framework paragraph 118). As such, pSPAs, pSACs and Ramsar Sites must also be considered by any HRA. Within this report "European site" is used as a generic term for all of the above designated sites.

¹⁴ 'Appropriate Assessment' has been historically used as an umbrella term to describe the process of assessment as a whole. The whole process is now more accurately termed 'Habitats Regulations Assessment' (HRA), and 'Appropriate Assessment' is used to indicate a specific stage of HRA.

Water Framework Directive Assessment

A separate Water Framework Directive (WFD) Assessment of the WRMP has been undertaken that seeks to ensure that the WRMP is compliant with the objectives of the WFD. This has included an assessment of existing abstractions, changes to abstractions (within licence limits) and proposed new abstractions (specifically, feasible (constrained) and preferred water resource management options, where relevant). All construction and operational aspects of options in the WRMP have been considered in the WFD Assessment in order to determine whether there is serious damage to, or deterioration of the status of, waterbodies under the WFD.

Similarly to the HRA, the WFD Assessment is reported separately from the SEA of the draft and revised draft WRMP, but informs the SEA Environmental Report as part of the assessment of feasible and preferred options, particularly in respect of the potential effects on water quality and biodiversity. A copy of the full WFD Assessment is available via the Bristol Water website <https://www.bristolwater.co.uk/about-us/water-resources/>.

1.8 Environmental Report Structure

Reflecting the five scoping tasks set out in **Section 1.5** above, this Environmental Report is structured as follows:

- ▶ **Non-Technical Summary** - Provides a summary of the Environmental Report;
- ▶ **Section 1: Introduction** - Includes a summary of the WRMP and report contents;
- ▶ **Section 2: Review of Plans and Programmes** - Provides an overview of the review of those plans and programmes relevant to the WRMP which is contained at **Appendix B**;
- ▶ **Section 3: Baseline Analysis** - Presents the baseline analysis of social, economic and environmental characteristics and identifies the key sustainability issues relevant to the WRMP;
- ▶ **Section 4: Approach to the Assessment** - Outlines the approach to the SEA of the WRMP including the assessment framework;
- ▶ **Section 5: Assessment of Feasible Options** – Presents the summary findings of the feasible options assessment (detailed assessment matrices are contained at **Appendix E**);
- ▶ **Section 6: Assessment of Preferred and Revised Preferred Options** - Presents the summary findings of the preferred and revised preferred options assessment (detailed assessment matrices are contained at **Appendix F** and **Appendix G**);
- ▶ **Section 7: Next Steps and Proposals for Monitoring** - Details the next steps in the SEA process including how environmental effects will be considered in future and the monitoring of effects.

Compliance with the SEA Regulations

This Environmental Report has been prepared to meet the requirements of the SEA Directive and associated regulations. The Quality Assurance Checklist is presented in **Appendix A**. **Table 1.2** indicates the location in this report of the relevant information required under the SEA regulations.

Table 1.1 Information Provided in this Report to Meet the Requirements of the SEA Regulations

SEA Requirement	Section of this Report where Relevant Information is Presented
An outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes.	Sections 1.4 and 2 and Appendix B
The relevant aspects of the current state of the environment and how it	Section 3

SEA Requirement	Section of this Report where Relevant Information is Presented
will change without implementation of the plan or programme.	
The environmental characteristics of areas likely to be significantly affected.	Section 3
Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds and the Habitats Directive.	Section 3 (also see HRA report)
The environmental protection objectives, established at International, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation.	Sections 2.3 and 4.3 and Appendix B
The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects, on issues such as biodiversity, population, human health, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the inter-relationship between these issues.	Sections 5 and 6 and Appendix E, Appendix F and Appendix G
The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme.	Section 6.4 and Appendix E, Appendix F and Appendix G
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	Section 6.5
A description of the measures envisaged concerning monitoring.	Section 7.3
A non-technical summary of the information provided.	Non-technical summary

1.9 This Environmental Report

SEA regulation 13 states

“(1) Every draft plan or programme for which an environmental report has been prepared in accordance with regulation 12 and its accompanying environmental report (“the relevant documents”) shall be made available for the purposes of consultation”.

In compliance with this regulation, the draft WRMP was accompanied by an Environmental Report.

However, consistent with the WRMP guidance and the stages in the development of the WRMP, the revised draft WRMP is not being issued for consultation. In consequence this revised Environmental Report is not being issued for consultation. However, it is being provided to the regulators to demonstrate that the likely significant effects on the environment of the revised preferred options in the revised draft WRMP have been identified, described and assessed.

2. Review of Plans and Programmes

2.1 Introduction

The SEA regulations require a report containing “an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes” (Schedule 2(1)) as well as “The environmental protection objectives, established at international (European) Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation” (Schedule 2(5)).

One of the first steps in undertaking the SEA of the WRMP is therefore to identify and review other relevant plans and programmes which could influence the plan. These may be plans and programmes at an international/European, national, regional or sub-regional level, commensurate with the scope of the WRMP. The review aims to identify the relationships between the WRMP and these other documents i.e. how the WRMP could be affected by the other plans’ and programmes’ aims, objectives and/or targets, or how it could contribute to the achievement of their environmental and sustainability objectives. It is also a valuable source of information to support the completion of the social, economic and environmental baseline analysis and to determine the key issues for the WRMP and SEA (see **Section 3**).

The completed review of plans and programmes has been used to provide the policy context for the subsequent assessment process and helps to inform the development of objectives that underpin the assessment framework (see **Section 4**).

2.2 Review of Plans and Programmes

The SEA Scoping Report included a review of plans and programmes, consistent with the requirements of the SEA Directive. Consultation responses to the Scoping Report identified additional plans and programmes for consideration in the review which have been subsequently included in this Environmental Report. Over 100 international/European, national, regional/sub-regional and local level plans and programmes have been reviewed. These are listed in **Table 2.1**, with the results of the review provided in **Appendix B**.

Table 2.1 Plans and Programmes Reviewed for the SEA of the WRMP

Plans and Programmes Reviewed for the SEA of the WRMP
International / European Plans and Programmes
<ul style="list-style-type: none"> • The Bonn Convention (or CMS) 1975 • Bern Convention (1979) • Ramsar Convention (1971) • UNESCO World Heritage Convention (1972) • Kyoto Protocol 1997 • Aarhus Convention (1998) • The Convention for the Protection of the Architectural Heritage of Europe (Granada Convention 1987) • The European Convention on the Protection of Archaeological Heritage (Valetta Convention 1992) • World Commission on Environment and Development (1987): Our Common Future (The Brundtland Report) • United Nations Convention on Biodiversity (the Rio Convention, 1992) • The World Summit on Sustainable Development (WSSD), Johannesburg, September 2002 - Commitments arising from Johannesburg Summit (2002) • European Landscape Convention 2000 (became binding March 2007) • The Paris Agreement (2016)
European Union (EU) Directives, Strategies & Policy Packages
<ul style="list-style-type: none"> • European Commission (EC) (2006) Thematic Strategy for Soil Protection EU Directives on Environmental Impact Assessment

Plans and Programmes Reviewed for the SEA of the WRMP

(Codified Directive 2011/92/EU and Revised Directive 2014/52/EU)

- EC (2011) A Resource- Efficient Europe- Flagship Initiative Under the Europe 2020 Strategy, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (COM 2011/21)
 - EC (2011) A Roadmap for Moving to a Competitive Low Carbon Economy in 2050
 - EC (2013) Strategy on Adaptation to Climate Change
 - EC (2014) A Policy Framework for Climate and Energy in the Period from 2020 to 2030
 - EC (2015) 'Closing the loop - An EU Action Plan for the Circular Economy' policy package
- EU (1991) Directive 91/271/EEC for Urban Waste-water Treatment
- EU (1991) Nitrates Directive (91/676/EEC)
- EU (1992) Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) & Subsequent Amendments
- EU (1998) Drinking Water Directive (98/83/EC)
- EU (1999) Directive on the Landfill of Waste (99/31/EC)
- EU (2000) Water Framework Directive (2000/60/EC)
- EU (2001) Directive on the Assessment of the Effects of Certain Plans and Programmes on the Environment (SEA Directive) (2001/42/EC)
- EU (2001) National Emissions Ceiling Directive 2001/81/EC
- EU (2002) Environmental Noise Directive (Directive 2002/49/EC)
- EU (2002) Directive 2002/91/EC on the Energy Performance of Buildings
- EU (2004) Environmental Liability Directive (2004/35/EC)
- EU (2005) Thematic Strategy on Air Pollution
- EU (2006) Bathing Waters Directive 2006/7/EC
- EU (2006) Mining Waste Directive 2006/21/EC
- EU (2006) Animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals (2006/88/EC)
- EU (2006) Directive 2006/118EC on the protection of groundwater against pollution and deterioration
- EU (2006) Renewed EU Sustainable Development Strategy
- EU (2007) Floods Directive 2007/60/EC
- EU (2007) The Eel Directive 2007/1100/EC
- EU (2008) Air Quality Directive (2008/50/EC) and previous directives (96/62/EC; 99/30/EC; 2000/69/EC & 2002/3/EC)
- EU (2008) Marine Strategy Framework Directive 2008/56/EC
- EU (2008) Directive on Waste (Directive 75/442/EEC, 2006/12/EC 2008/98/EC as amended)
- EU (2008) Environmental Quality Standards Directive 2008/105/EC
- EU (2009) Directive on the Conservation of Wild Birds (09/147/EC) (codified version of Council Directive 79/409/EEC as amended)
- EU (2009) Renewable Energy Directive (2009/28/EC)
- EU (2009) Birds Directive (2009/147/EC)
- EU (2010) Energy 2020 - A Strategy for Competitive, Sustainable and Secure Energy
- EU (2010) Europe 2020 : A strategy for smart, sustainable and inclusive growth
- EU (2010) The Industrial Emissions Directive (2010/75/EU)
- EU (2011) EU Biodiversity Strategy to 2020 – towards implementation
- EU (2011) A Roadmap for Moving to a Competitive Low Carbon Economy in 2050
- EU (2012) Energy Efficiency Directive (2012/27/EU)
- EU (2014) Seventh Environmental Action Programme
- EU (2015) Invasive Alien Species Regulation (1143/2014/EU)

National Plans and Programmes

- Department of Business, Energy and Industrial Strategy (BEIS) (2010) CRC Energy Efficiency Scheme
- BEIS (2011) National Policy Statements for Energy Infrastructure
- Department for Communities and Local Government (DCLG) (2014) National Planning Policy for Waste
- Department for Environment, Food and Rural Affairs (Defra) (2000) Waterways for Tomorrow
- Defra (2005) Making Space for Water: Taking forward a new Government strategy for flood and coastal erosion risk management in England (first Government response to 2004 consultation)
- Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
- Defra (2009) The Groundwater (England and Wales) Regulations 2009
- Defra (2010) Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network
- Defra (2011) Shoreline Management Plan Guidance
- Defra (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services
- Defra (2012) National Policy Statement for Waste Water
- Defra, Scottish Government, Welsh Government (2015) The Great Britain Invasive Non-native Species Strategy
- Environment Agency (2008) Better Sea Trout and Salmon Fisheries: Our Strategy for 2008-2021
- Environment Agency (2016) Creating a Better Place: Our Ambition to 2020
- Environment Agency (undated) Restoring Sustainable Abstraction Programme
- Environment Agency (2013) Areas of Water Stress: Final Classification

Plans and Programmes Reviewed for the SEA of the WRMP

- Environment Agency (various) Drought Plans
- Environment Agency and Natural Resources Wales (2016) Final Water Resources Planning Guideline
- HM Government (1975) Salmon and Freshwater Fisheries Act
- HM Government (1975) Reservoirs Act
- HM Government (1981) Wildlife and Countryside Act
- HM Government (1991) Water Resources Act
- HM Government (1994) UK Biodiversity Action Plan
- HM Government (2000) Countryside Rights of Way Act 2000
- HM Government (2003) Water Act 2003
- HM Government (2005) UK Sustainable Development Strategy
- HM Government (2006) Natural Environment and Rural Communities Act 2006
- HM Government (2006) Climate Change and Sustainable Energy Act 2006
- HM Government (2008) Climate Change Act 2009
- HM Government (2009) Marine and Coastal Access Act 2009
- HM Government (2009) The Eels (England and Wales) Regulations 2009 (as amended 2011)
- HM Government (2010) Flood and Water Management Act 2010
- HM Government (2011) UK Marine Policy Statement
- HM Government (2014) Water Act 2014
- HM Government (2015) Infrastructure Act 2015
- HM Government (2016) Environmental Permitting (England and Wales) Regulations 2016 SI 1154
- HM Government (2017) Conservation of Habitats & Species Regulations 2017
- HM Treasury (2016) National Infrastructure Delivery Plan
- Ministry for Housing, Communities and Local Government (MHCLG) (2018) National Planning Policy Framework
- Natural England (2011) UK Geodiversity Action Plan
- Ofwat (2008) Water Supply and Demand Policy
- Ofwat (2016) Water 2020
- JNCC and Defra (2012) UK Post-2010 Biodiversity Framework
- Countryside Council for Wales (2001) Register of Landscapes of Historic Interest
- Valuing Our Environment Partnership (2010) Valuing the Welsh Historic Environment
- Welsh Government (1998) Technical Advice Note 14: Coastal Planning
- Welsh Government (2006) Environment Strategy for Wales
- Welsh Government (2008) People, Places, Futures: The Wales Spatial Plan 2008 Update
- **Welsh Government (2008) The Wales Transport Strategy**
- Welsh Government (2009) One Wales One Planet: The Sustainable Development Scheme for Wales
- Welsh Government (2009) Technical Advice Note 5: Nature Conservation and Planning
- Welsh Government (2009) Technical Advice Note 16: Sport, Recreation and Open Space
- Welsh Government (2010) Climate Change Strategy for Wales
- Welsh Government (2010) Towards Zero Waste, One Wales: One Planet – Overarching Waste Strategy Document for Wales
- Welsh Government (2010) The Biodiversity Framework for Wales
- Welsh Government (2011) Welsh Government Policy Statement: Preparing for a Changing Climate
- Welsh Government (2011) National Strategy for Flood and Coastal Erosion Risk Management in Wales
- Welsh Government (2012) Energy Wales: A Low Carbon Transition
- Welsh Government (2013) Historic Environment Strategy for Wales
- Welsh Government (2013) Partnership for Growth: The Welsh Government Strategy for Tourism 2013 – 2020
- Welsh Government (2015) Water Strategy for Wales
- Welsh Government (2015) The Welsh National Marine Plan – Initial Draft
- Welsh Government (2015) Well-being of Future Generations (Wales) Act 2015
- Welsh Government (2015) Nature Recovery Plan
- Welsh Government (2015) Wales Rural Development Programme 2014-2020
- Welsh Government (2015) National Transport Finance Plan 2015
- Welsh Government (2016) Technical Advice Note 12: Design
- Welsh Government (2016) Planning Policy Wales (Edition 9)
- Welsh Government (2016) Historic Environment (Wales) Act 2016
- Welsh Government (2016) The Environment (Wales) Act 2016
- Welsh Government (2016) The State of Natural Resources Report (SoNaRR)
- Welsh Government (2016) Guiding Principles for Developing Water Resources Management Plans
- Welsh Government (2017) Natural Resources Policy

Regional/Sub-regional Plans and Programmes

- Bath and North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council (2016) The Joint Spatial Plan: Towards the Emerging Spatial Strategy
- Bristol Avon Catchment Partnership (2012) Catchment Plan
- Bristol City Council (2013) Bristol Health and Wellbeing Policy 2013
- Bristol City Council (2014) Air Quality Progress Report
- Bristol City Council (2015) Our Resilient Future: A Framework For Climate And Energy Security
- Cotswolds AONB Management Plan 2014-2018

Plans and Programmes Reviewed for the SEA of the WRMP

- Defra (2010) Eel Management Plans for the United Kingdom. Severn River Basin District
- Environment Agency (2009) Water Resources Strategy Regional Action Plan for South West Region
- Environment Agency and Defra, (2015) River Basin Management Plan Severn River Basin District
- Environment Agency and Defra, (2015) South West River Basin District River Basin Management Plan
- Environment Agency and Defra, (2015) River Basin Management Plan Thames River Basin District
- Environment Agency, Catchment Abstraction Management Strategy (various dates for relevant catchments)
- Environment Agency (2012) Bristol Avon Catchment Flood Management Plan
- Environment Agency (2016) South West River Basin District, Flood Risk Management Plan 2015-2021
- Local Planning Authority (various) Local Plans/Local Development Plans
- Local Geodiversity Action Plans (LGAPs)
- Natural England Site Improvement Plans: South West (SIPs)
- Severn Estuary Coastal Group (2017) Severn Estuary Shoreline Management Plan 2 (SMP2)
- South West Regional Biodiversity Partnership (2007) South West Biodiversity Implementation Plan
- Water Company (various) Drought Plans:
 - Bristol Water Drought Plan;
 - Severn Trent Water (2013) Drought Plan;
 - Thames Water (2013) Drought Plan;
 - Welsh Water Drought Plan
 - Wessex Water (2013) Drought Plan
- Water Company (various) Water Resources Management Plans:
 - Bristol Water final Water Resources Management Plan;
 - Welsh Water final Water Resources Management Plan;
 - Wessex Water final Water Resource Management Plan.
 - Severn Trent Water final Water Resource Management Plan

2.3 Policy Objectives Relevant to the Water Resources Management Plan

The review of plans and programmes presented in **Appendix B** has identified a number of objectives and policy messages relevant to the WRMP. Reflecting the topics identified in Annex I of the SEA Directive and Schedule 2 of the SEA regulations, these objectives and messages are set out for the following topic areas:

- ▶ Biodiversity;
- ▶ Geology, Land Use and Soils;
- ▶ Water;
- ▶ Air Quality and Climate;
- ▶ Human Environment (including population and human health);
- ▶ Material Assets and Resource Use;
- ▶ Cultural Heritage; and
- ▶ Landscape.

The policy objectives and messages identified from the review of plans and programmes are summarised in **Table 2.2**. It is important that the assessment takes these into account as this will help to highlight any areas where the WRMP will help or hinder the achievement of the objectives of the other plans. Only the key sources are included; however, it is acknowledged that many other plans and programmes could also be included. The relevance of the key objectives and policy measures to the assessment of the WRMP is also indicated in **Table 2.2**.

Table 2.2 Key Policy Objectives Identified in Other Plans and Programmes relevant to the Assessment of the WRMP

Key Objectives and Policy Messages	Key Sources	Relevant to the Assessment of the WRMP?
Biodiversity		
Conservation and enhancement of the levels and variety of biodiversity, including designated sites, priority species and habitats	Rio Convention on Biodiversity; Bern Convention; Bonn Convention; Habitats Directive; Invasive Alien Species Regulation; Ramsar Convention on Wetlands; Birds Directive; EU Biodiversity Strategy to 2020; Marine Strategy Framework Directive; Biodiversity 2020; Natural Environment White Paper; Eel Regulations: Wildlife and Countryside Act; UK Biodiversity Action Plan; Marine and Coastal Access Act; Conservation of Habitats & Species Regulations; UK Marine Policy Statement; Countryside and Rights of Way Act; National Planning Policy Framework; Planning Policy Wales (Edition 9); Environment Strategy for Wales; TAN5: Nature Conservation and Planning; Environment (Wales) Act; Well-being of Future Generations (Wales) Act; Natural England Site Improvement Plans: South West (SIPs); River Basin Management Plan (various); Catchment Abstraction Management Strategy (various); Natural Resources Policy; Nature Recovery Plan; Local Biodiversity Action Plans (BAP) including Species and Habitats Action Plans (various); Local Planning Authority Local Plans (various); AONB Management Plans.	Yes
Geology, Land Use and Soils		
Protection and enhancement of geology and soil quality	Thematic Strategy for Soil Protection; National Planning Policy Framework; Planning Policy Wales (Edition 9); TAN5: Nature Conservation and Planning; Natural Resources Policy; UK Geodiversity Action Plan; Local Geodiversity Action Plans (LGAPs); Local Planning Authority Local Plans (various); AONB Management Plans; River Basin Management Plan (various).	Yes
Water		
Protection and enhancement of all water supplies and resources	Bathing Waters Directives; Drinking Water Directive; Nitrates Directive; Urban Waste Water Directive; Water Framework Directive; Environmental Quality Standards Directive; Restoring Sustainable Abstraction Programme; Future Water; National Planning Policy Framework; Planning Policy Wales; Water Strategy for Wales; Strategic Policy Position Statement on Water; River Basin Management Plans (various); Water Company Drought Plans (various); Water Company Water Resource Management Plans (various); Local Planning Authority Local Plans (various).	Yes
Promoting the sustainable and efficient use of water	Water Framework Directive; Water for People and the Environment; Managing Water Extraction; Restoring Sustainable Abstraction Programme; Water Act; Water for Life: White Paper; Water Supply and Demand Policy; National Planning Policy Framework; Planning Policy Wales (Edition 9); Water Strategy for Wales; Strategic Policy Position Statement on Water; Natural Resources Policy; River Basin Management Plans (various); Water Company Drought Plans (various); Water Company Water Resource Management Plans (various)); Local Planning Authority Local Plans (various).	Yes
Minimising flood risk and improving flood control infrastructure	Floods Directive; Water Framework Directive; Shoreline Management Plan Guidance; National Flood and Coastal Erosion Risk Management Strategy for England; Flood and Water Management Act; National Planning Policy Framework; Planning Policy Wales (Edition 9); TAN15: Development and Flood Risk; National Strategy for Flood and Coastal Erosion Risk Management in Wales; Flood Risk Management Plans (various); River Basin Management Plans (various); Bristol Avon Catchment Flood Management Plan, Severn Estuary SMP2, Local Planning Authority Local Plans (various).	Yes
Air Quality and Climate		
Ensuring air quality is maintained or enhanced and that emissions of air pollutants are kept to a minimum	Ambient Air Quality and Cleaner Air for Europe; National Emissions Ceiling Directive; Industrial Emissions Directive; Air Quality Strategy for England, Scotland, Wales and Northern Ireland; Air Pollution: Action in a Changing Climate; Air Quality Plans; National Planning Policy Framework; Planning Policy Wales (Edition 9); Local Planning Authority Local Plans (various)	Yes
Minimising the effects of climate change on natural resources,	Strategy on Adaptation to Climate Change; National Adaptation Programme; Water for People and the Environment; UK Sustainable Development Strategy; National Flood and Coastal Erosion Risk Management Strategy for England;	Yes

Key Objectives and Policy Messages	Key Sources	Relevant to the Assessment of the WRMP?
inhabitants and the economy	Adapting to Coastal Change; National Planning Policy Framework; People, Places, Futures: The Wales Spatial Plan 2008 Update; Planning Policy Wales (Edition 9); Environment Strategy for Wales; Climate Change Strategy for Wales; National Strategy for Flood and Coastal Erosion Risk Management in Wales; Natural Resources Policy; Water Resources Management Plans (various); River Basin Management Plans (various); Flood Risk Management Plans (various); Local Planning Authority Local Plans (various).	
Minimising emissions of greenhouse gases that may cause climate change	Kyoto Protocol; Paris Agreement; Europe 2020; A Roadmap for Moving to a Competitive Low Carbon Economy in 2050; Climate Change Act; Renewable Energy Roadmap; National Planning Policy Framework; UK Sustainable Development Strategy; UK Renewable Energy Strategy; Environment Strategy for Wales; Climate Change Strategy for Wales; Environment (Wales) Act; Planning Policy Wales (Edition 9); Energy Wales; Local Planning Authority Local Plans (various).	Yes
Human Environment		
Addressing deprivation and reducing inequality	World Summit on Sustainable Development; Europe 2020; Sustainable Development Strategy; National Planning Policy Framework; Bristol Development Framework: Core Strategy; Bath and North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council (2016) The Joint Spatial Plan: Towards the Emerging Spatial Strategy; Local Planning Authority Local Plans (various).	Yes
Promoting improvements to health and well-being	Aarhus Convention; Sustainable Development Strategy; World Summit on Sustainable Development; Seventh Environmental Action Programme to 2020; National Planning Policy Framework; Planning Policy Wales (Edition 9); TAN 16: Sport, Recreation and Open Space; Local Planning Authority Local Plans (various); Bristol Health and Wellbeing Policy 2013.	Yes
Providing high quality services, community facilities and social infrastructure that is accessible to all	National Planning Policy Framework; Local Planning Authority Local Plans (various).	Yes
Achieving sustainable economic growth and promoting key sectors in the local economy	World Summit on Sustainable Development; Europe 2020; UK Marine Policy Statement; Sustainable Development Strategy; National Planning Policy Framework; Local Planning Authority Local Plans (various).	Yes
Improving and expanding the tourism economy	National Planning Policy Framework; Local Planning Authority Local Plans (various); AONB Management Plans (various).	No
Maximising job opportunities for all and enhancing the quality of employment opportunities	Europe 2020; National Planning Policy Framework; Local Planning Authority Local Plans (various).	Yes
Minimising noise pollution	Environment Noise Directive; Guidelines for Community Noise; National Planning Policy Framework; Local Planning Authority Local Plans (various).	Yes
Promoting sustainable transport	Sustainable Development Strategy; A Roadmap for Moving to a Competitive Low Carbon Economy in 2050; National Planning Policy Framework; Planning Policy Wales (Edition 9); Local Planning Authority Local Plans (various).	No
Material Assets and Resource Use		
Minimising waste production, promoting re-use and recycling	Waste Framework Directive; Landfill of Waste Directive; Waste Management Plan for England; National Planning Policy for Waste; Toward Zero Waste; Local Planning Authority Local Plans (various).	Yes
Promoting the most effective and efficient use of natural resources	World Summit on Sustainable Development; Seventh Environmental Action Programme to 2020; Energy 2020; Europe 2020; UK Sustainable Development Strategy; National Planning Policy for Waste; Towards Zero Waste; Natural Resources Policy; Local Planning Authority Local Plans (various); Water Resources Strategy and Action Plan for England and Wales.	Yes
Promoting the use of sustainable/renewable energy	Seventh Environmental Action Programme to 2020; Energy 2020; A Roadmap for Moving to a Competitive Low Carbon Economy in 2050; Renewable Energy Directive; Sustainable Development Strategy; Carbon Plan; Climate Change Act;	Yes

Key Objectives and Policy Messages	Key Sources	Relevant to the Assessment of the WRMP?
	UK Renewable Energy Strategy; UK Renewable Energy Roadmap; UK Sustainable Development Strategy; National Planning Policy Framework; Local Planning Authority Local Plans (various).	
Promoting the use of sustainable design and construction and encouraging energy efficiency	Energy 2020; Energy Efficiency Directive; A Roadmap for Moving to a Competitive Low Carbon Economy in 2050; Renewable Energy Directive; UK Sustainable Development Strategy; National Planning Policy Framework; Local Planning Authority Local Plans (various).	Yes
Cultural Heritage		
Protecting and enhancing cultural heritage and archaeological sites	World Heritage Convention; Heritage Protection for the 21st Century - White Paper; Ancient Monuments and Archaeological Areas Act; Planning (Listed Buildings and Conservation Areas) Act; National Planning Policy Framework; Local Planning Authority Local Plans (various).	Yes
Landscape		
Protecting and enhancing the quality and distinctiveness of natural landscapes and environmental resources	European Landscape Convention; National Planning Policy Framework; Planning Policy Wales (Edition 9); AONB Management Plans; Local Planning Authority Local Plans (various).	Yes

3. Baseline Analysis

3.1 Introduction

The SEA regulations require a report containing ‘*The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme*’ (Schedule 2(2)), ‘*The environmental characteristics of areas likely to be significantly affected*’ (Schedule 2(3)), and ‘*Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds(1) and the Habitats Directive*’ (Schedule 2(4)).

This section of the report identifies and characterises current environmental baseline conditions, along with how these are likely to change in the future. Only with a knowledge of existing conditions, and a consideration of their likely evolution, can the effects of the WRMP be identified and assessed and its subsequent success or otherwise be monitored. This is also useful in determining the key issues for each topic that have been included in the SEA, through the SEA objectives and guide questions.

The analysis is presented for the following topics:

- ▶ Biodiversity;
- ▶ Geology, Land Use and Soils;
- ▶ Water;
- ▶ Air Quality and Climate;
- ▶ Human Environment (including population and human health);
- ▶ Material Assets and Resource Use;
- ▶ Cultural Heritage; and
- ▶ Landscape.

The data have been drawn from a variety of sources, including a number of the plans and programmes reviewed as part of the SEA process (see **Section 2.2** and **Appendix B**). Where appropriate, figures are referenced in this overview. The key sustainability issues arising from the review of baseline conditions are summarised for each topic.

3.2 Bristol Water Supply Area

The spatial scope of the assessment is defined as the Bristol Water supply area. This is broadly comparable to the West of England sub-region, which comprises the local authorities of Bath & North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council, with the notable exception that the City of Bath lies outside the Bristol Water supply area (the supply area also includes parts of Sedgemoor, Mendip, Wiltshire, Cotswolds and Stroud local authority areas). The important relationship between the four principal local authority areas has been recognised through the creation of the West of England Local Enterprise Partnership (LEP) which replaced the former West of England Partnership.

Where possible, the spatial scope of the assessment coincides with the Bristol Water supply area (**Figure 1.2**). In these cases baseline information has been provided for areas/sites only found within the supply area, such as designated sites, or for Bristol Water resource use. However, given the nature of the available data this is not possible for all aspects of the baseline and the spatial scope of the assessment has been extended to areas outside the Bristol Water supply area. In these cases, information has been presented for the four local authorities that comprise the West or Southwest of England sub-region (as highlighted above) in order to build a baseline picture for Bristol Water, reflecting the fact that the areas are broadly similar.

3.3 Biodiversity, Fauna and Flora

Biodiversity is defined as the variety of plants (flora) and animals (fauna) in an area, and their associated habitats. The importance of preserving biodiversity is recognised from an international to a local level. Biodiversity is important in its own right and has value in terms of quality of life and amenity.

Baseline Characteristics

Statutory Designated Sites

There are a large number of sites within the Bristol Water supply area that are designated as internationally, nationally or locally important for biodiversity. These protected areas fall into three categories:

- ▶ protected areas that are established through global agreements (including Ramsar Sites, which are afforded the same degree of protection as European sites);
- ▶ protected areas that are established under European Union Directives or other European initiatives (including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs); and
- ▶ protected areas that are established under national legislation (including Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNR)).

The distribution of designated sites across the spatial scope area is shown in **Figures 3.1 to 3.4**. **Table 3.1** provides a breakdown.

Table 3.1 Land Designations within the Spatial Scope Area ¹⁵

Designated Site Classification	Area (hectares)	Description
Special Area of Conservation (SAC)	2,008	Including land in 6 SACs.
Site of Special Scientific Interest (SSSI)	7,725	Including land in 136 SSSIs.
Special Protection Areas (SPA)	2,671	Including land in 3 SPAs.
Ramsar	2,095	Including land in 2 Ramsar Sites.
National Nature Reserves (NNR) ¹⁶	621	Including land in 8 NNRs

Sites of European importance (SPAs and SACs) are designated to conserve natural habitats and species of wildlife which are rare, endangered or vulnerable in the European Community. In the UK, these form part of the 'Natura 2000' network of sites protected under the Habitats Directive (92/43/EEC) and the Birds Directive (09/147/EC). In the Bristol Water supply area, there are 11 Natura 2000 sites including 6 SACs, 3 SPAs and 2 Ramsar Sites.

As part of the Environment Agency's responsibilities under the Habitats Directive, it is required to conduct a Review of Consents (ROCs) of all existing permits and consents in order to ensure they do not have an adverse effect on SACs and SPAs. This review concluded in 2012. This is discussed within **Section 3.5**.

The Bristol Water supply area has 7,725 hectares (ha) of land designated as SSSIs. These include the Chew Valley Lake, Cheddar Reservoir and Blagdon Lake SSSIs. For example Blagdon Lake SSSI is designated on the basis of its nationally important bird populations and water plants such as the water starwort. At November 2016, 48% of the SSSIs were in 'favourable' condition and 40% were in 'unfavourable recovering' condition. 9% of SSSIs were classified as being in 'unfavourable no change'

¹⁵ Natural England information from Spatial Data Catalogue [available at <http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue>] (accessed February 2017)].

¹⁶ NNRs are protected under Sections 16 to 29 of the National Parks and Access to the Countryside Act, 1949 and the Wildlife and Countryside Act, 1981.

condition and 3% in 'unfavourable declining' condition¹⁷. There are 8 NNRs within the Bristol Water supply area, with a number of them supporting woodland habitats (Gordano Valley NNR, Leigh Woods NNR, R24Ra NNR and R24Ra NNR), peatland (Ham Wall NNR and Westhay Moor NNR), wetland habitat (Shapwick Heath NNR) and open water/low land grassland (Somerset Levels NNR).

¹⁷ Details of SSSIs condition searched at <https://designatedsites.naturalengland.org.uk/> (accessed February 2017)

Figure 3.1 SACs in the Bristol Water Supply Area

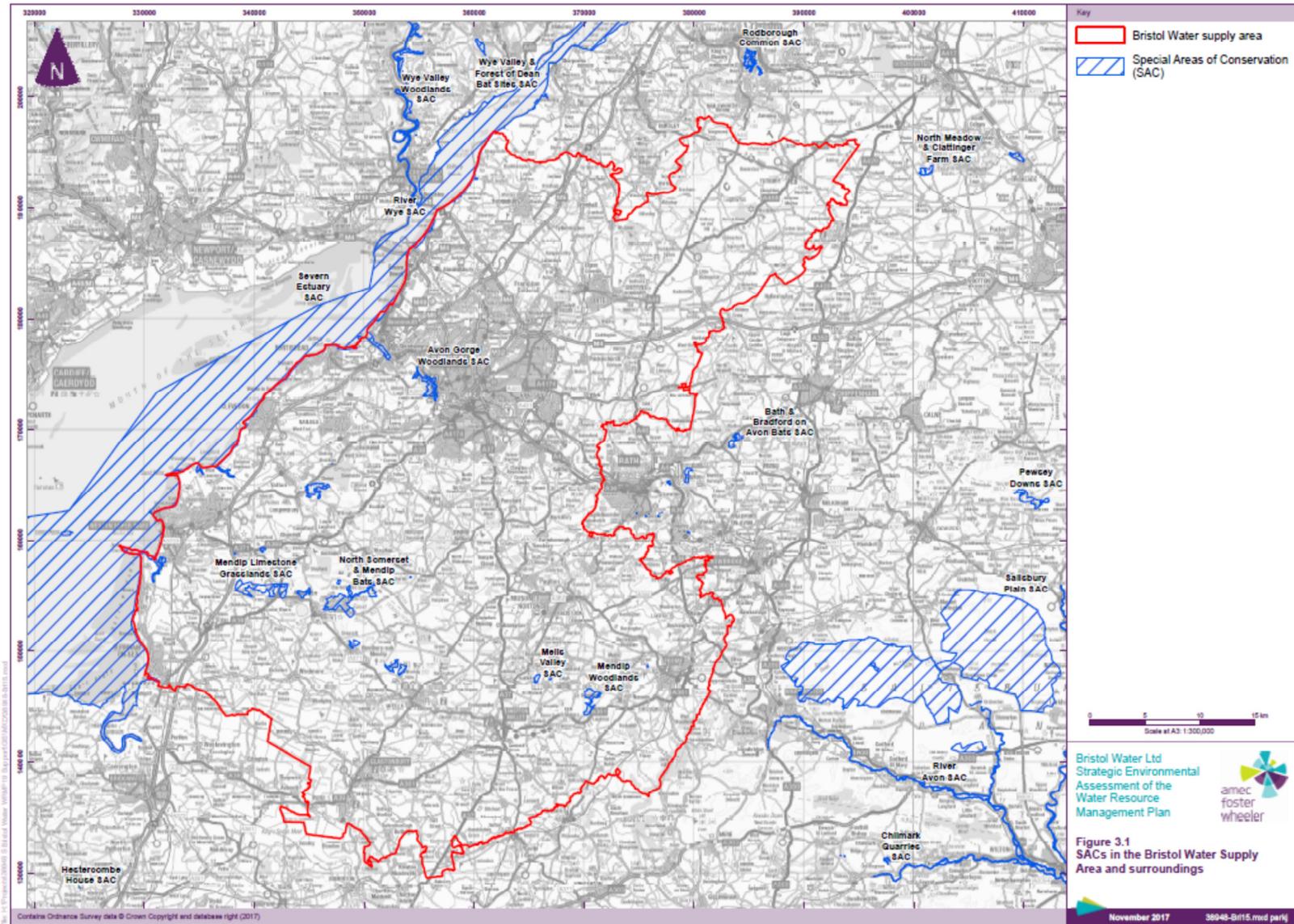


Figure 3.2 SPAs in the Bristol Water Supply Area

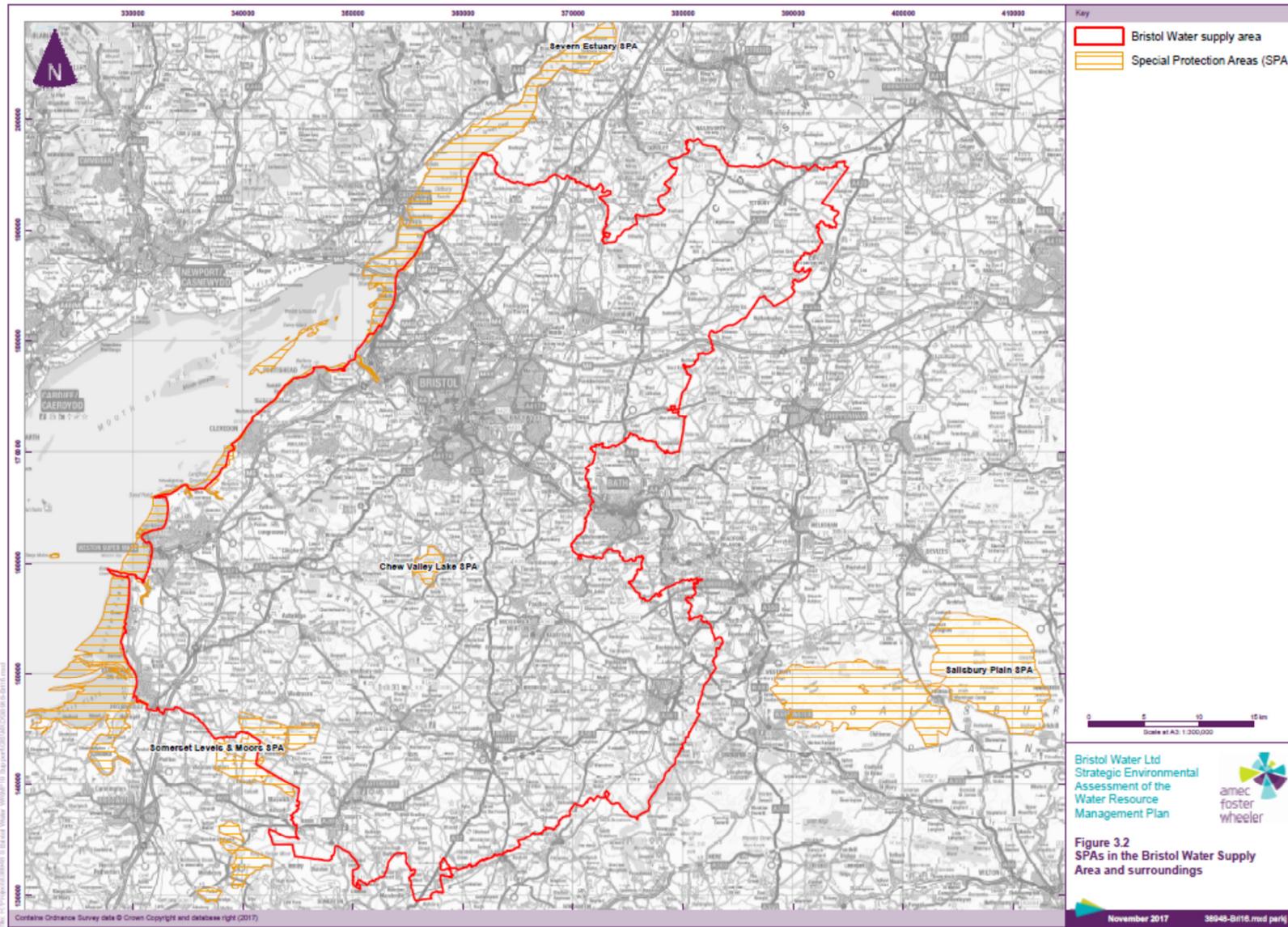


Figure 3.3 RAMSAR Sites in the Bristol Water Supply Area

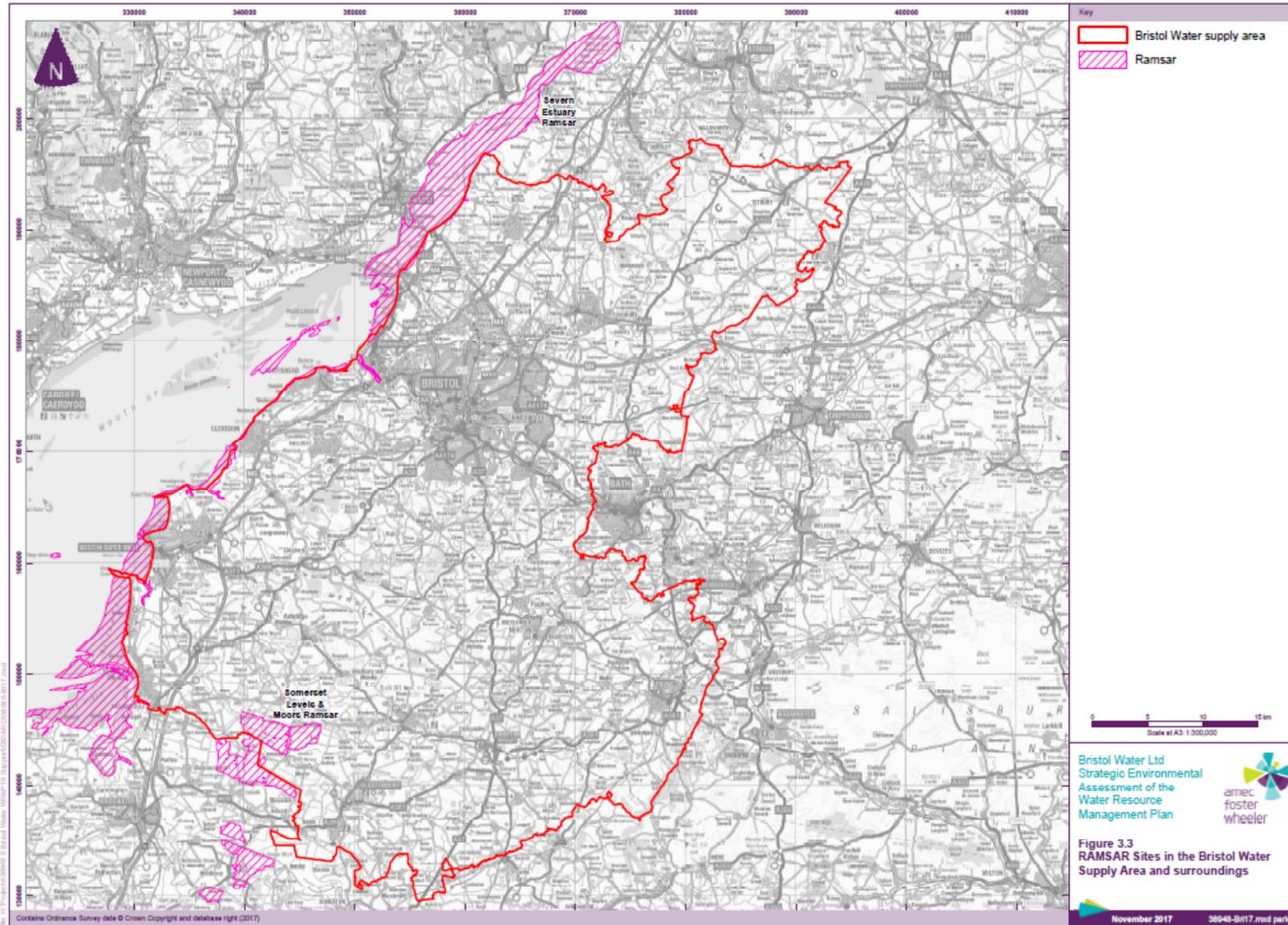
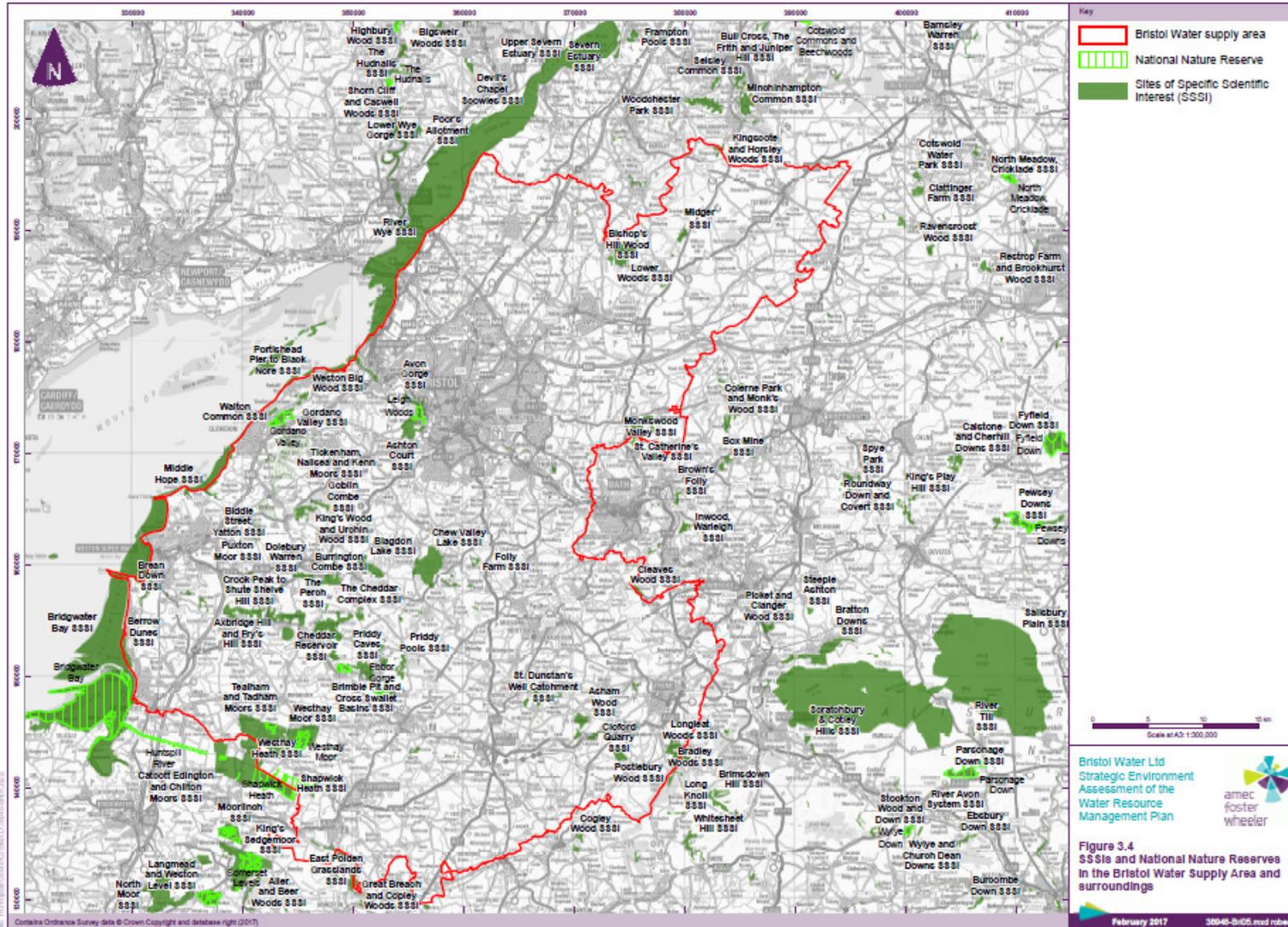


Figure 3.4 SSSIs and National Nature Reserves in the Bristol Water Supply Area



Non-statutory Protected Sites and Other Biodiversity

There are 29 Local Nature Reserves (LNR) within the Bristol Water supply area (**Figure 3.5**). These are areas with wildlife or geological features that are of special interest locally. Areas of ancient woodland within the Bristol Water supply area are also shown on **Figure 3.5**. Ancient woodlands are areas that have contained woodland continuously since at least 1600 AD. They tend to be more ecologically diverse and of a higher nature conservation value than those developed recently, or where cover on the site has been intermittent. They are important habitats and often also have cultural importance.

The Natural Environment and Rural Communities (NERC) Act 2006 Section 41 identifies species and habitats of principal importance for the conservation of biodiversity in England. There are 18 designated habitats¹⁸ within the Bristol Water supply area. These include rivers and streams, reed beds, fens and water meadows. Important water-related NERC species are listed below:

▶ Otter;	▶ Fine-lined Pea Mussel;
▶ Water vole;	▶ Freshwater Pea Mussel;
▶ Atlantic salmon;	▶ Depressed River Mussel;
▶ European eel;	▶ Greater Water Parsnip;
▶ Sea/Brown trout;	▶ Club-tailed Dragonfly;
▶ River lamprey;	▶ Tassel Stonewort;
▶ White clawed crayfish;	▶ Desmoulins Whorl Snail;
▶ Snakeshead Fritillary;	▶ Snipe;
▶ Loddon Lilly;	▶ Lapwing;
▶ Creeping Marshwort;	▶ Natterer's Bat;
▶ Narrow-leaved water-dropwort;	▶ Daubenton's Bat;
▶ River water-dropwort;	▶ Pipistrelle Bat.

The Avon Biodiversity Action Plan (BAP)¹⁹ has identified that the West of England sub-region (Bristol, Bath and North East Somerset, North Somerset and South Gloucestershire) contains 28 UK BAP priority habitats and 19 of the 27 broad habitat types found in the UK as defined in UK BAP²⁰. The West of England supports 47 UK BAP species including dormice, water voles, white-clawed crayfish, otters, barn owls, horseshoe bats and a significant number of butterfly species. Rare plant species include round-headed leek (Bristol onion), Bristol rock-cress, the endemic Bristol whitebeam and nationally notable plants such as lizard orchid, adder's-tongue spearwort and Bath asparagus. Otters are recovering across much of the region and pole cats are also making a recovery, spreading south from Gloucestershire.

The 2008 Avon priority species list²¹ identifies over 200 species either on the UK BAP list, in nationally or internationally concentrations or whose local declines meet the criteria used at the national level for inclusion on the national BAP list. A map showing the distribution of priority species and habitats in the Bristol Water Supply Area including those around the Blagdon Lake SSSI, Cheddar Lake SSSI and Chew Valley Lake SSSI is shown on **Figure 3.6**.

¹⁸ Species or habitats of principal importance for the conservation of biodiversity in England, identified in the Natural Environmental and Rural Communities (NERC) Act 2006 Section 41.

¹⁹ Avon Biodiversity Partnership (2004) *Biodiversity Action Plan* [available at <http://www.avonwildlifetrust.org.uk/my-wild-city/my-wild-life> (accessed February 2017)].

²⁰ UK BAP was published in 1994 and sets out a programme for conserving biodiversity in the UK. The UK Biodiversity Framework published in July 2012, succeeds the UK BAP.

²¹ Avon Biodiversity Partnership (2008) *Avon BAP List*, available via http://www.avonwildlifetrust.org.uk/ABAP/species_list.htm (accessed February 2017)

Figure 3.5 Ancient Woodland and Local Nature Reserves within the Bristol Water supply Area

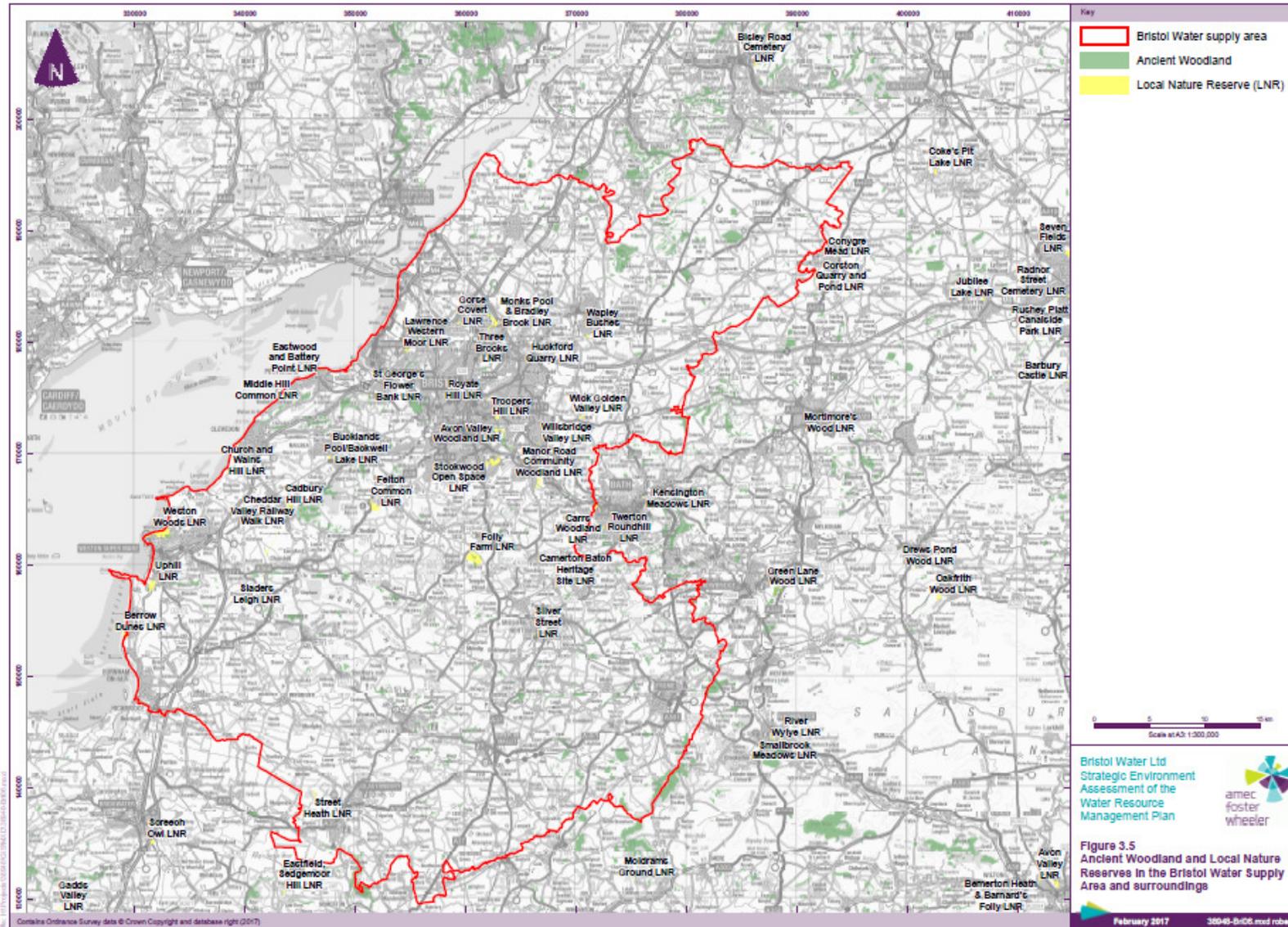
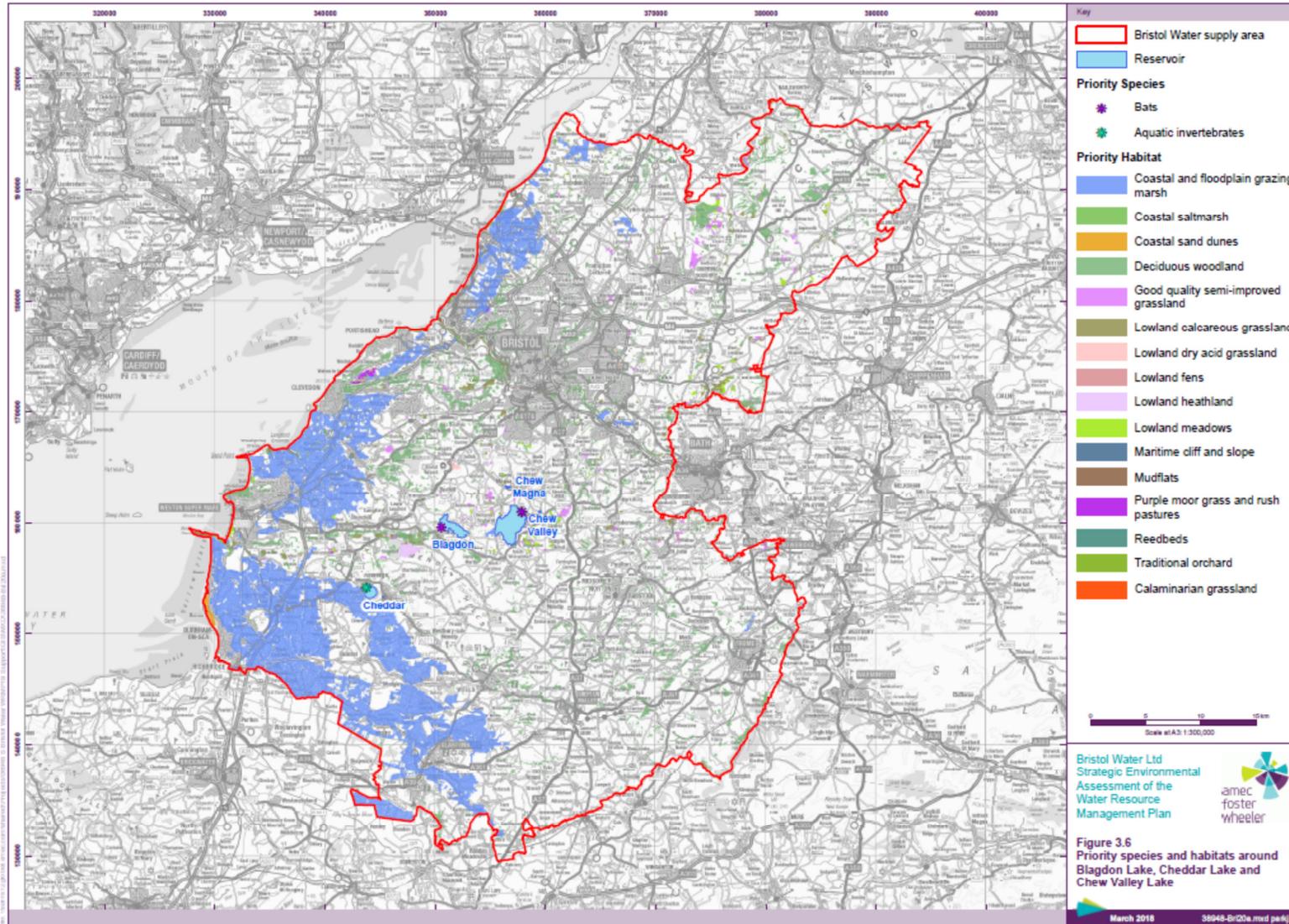


Figure 3.6 Priority Species and Habitats within the Bristol Water supply Area (including those around Blagdon Lake SSSI, Cheddar Lake SSSI and Chew Valley Lake SSSI)



Likely Evolution of the Baseline without the WRMP

- ▶ The Natural Environment White Paper²² identified the Government's aims to work to achieve more, bigger, better and less-fragmented areas for wildlife. It includes targets for no net loss of priority habitat, an increase of at least 200,000 hectares in the overall extent of priority habitats and for at least 50% of SSSIs to be in favourable condition, while maintaining at least 95% in favourable or recovering condition. Biodiversity 2020 builds on the Natural Environment White Paper and sets out the strategic direction for biodiversity policy for the next decade on land (including rivers and lakes) and at sea.
- ▶ Nearly half of the SSSIs within the Bristol Water supply area are in favourable condition with most of the sites in unfavourable condition showing signs of improvement (being in unfavourable recovering condition).
- ▶ The South West Biodiversity Action Plan²³ indicates that there have been significant declines in some habitats and species in the South West region and many are still declining. The key threats to biodiversity include:
 - ▶ land use changes, such as through agricultural intensification, decline in mixed farming, urban development and drainage/water level management;
 - ▶ environmental pollution;
 - ▶ climate change, which affects many habitats, especially soft coastal habitats (e.g. Bridgwater Bay saltmarshes), floodplain marshes (e.g. Somerset Levels and Moors), and chalk rivers (e.g. the River Avon). This will also affect sea defences, harbours, homes, businesses, infrastructure, archaeological sites and maritime heritage;
 - ▶ fragmentation and isolation of habitats;
 - ▶ damaging fishing methods in the marine environment; and
 - ▶ introduction of non-native species.
- ▶ Biodiversity targets for the maintenance, restoration and expansion of priority wildlife habitats within the South West region have been defined by Bristol Regional Environmental Records Centre (BRERC) on behalf of Biodiversity South West²⁴. These targets are based on the best available data for those priority habitats identified in the UKBAP, which occur in the south west. For example the upland heathland habitat has a maintenance target of 17,761 ha, restoration/expansion target of 4,091 ha by 2010, and restoration/expansion aspiration by of 12,273 ha by 2010 and 20,454 ha by 2030.
- ▶ Bristol Water has a number of statutory duties towards biodiversity that would help to ensure the conservation and enhancement of biodiversity without the WRMP. These include duties under the following legislation:
 - ▶ International sites: Regulation 9(5) of the Conservation of Habitats and Species Regulations 2017 ('Habitats Regulations') requires every competent authority, in the exercise of any of its functions, to have regard to the requirements of the Habitats Directive. As referred to in **Section 1.6** of this report, Bristol Water is the competent authority for HRA.
 - ▶ SSSI: Section 28G of the Wildlife and Countryside Act 1981, as inserted by Section 75 of and Schedule 9 to the Countryside and Rights of Way Act 2000, places a duty on public authorities, including water companies, to take reasonable steps consistent with the proper exercise of their functions to further the conservation and enhancement of SSSIs.

²³ http://www.biodiversitysouthwest.org.uk/hom_abo_bip.html (accessed January 2017)

²⁴ BREC (2006) Review of south west biodiversity targets - A report for the South West Regional Biodiversity Partnership. [available at http://www.biodiversitysouthwest.org.uk/hom_abo_hab.html (accessed February 2017)]

- ▶ Biodiversity and Protected Species: Under Section 40 of the Natural Environment and Rural Communities Act 2006 every public authority, including statutory undertakers, must in the exercise of its functions have regard so far as is consistent with the proper exercise of those functions to the purpose of conserving biodiversity. Conserving biodiversity in this context includes restoring or enhancing a population or habitat.

Key Sustainability Issues Relevant to the WRMP

The key sustainability issues relevant to the WRMP and the SEA arising from the analysis of the biodiversity baseline are:

- ▶ the need to protect and enhance sites designated for nature conservation;
- ▶ the need to protect and enhance non-designated sites;
- ▶ the need to take opportunities to improve connectivity between fragmented habitats to create functioning habitat corridors and to improve the resilience of habitats;
- ▶ the need to continue to increase and improve the condition of priority habitats and habitats of priority species, and restore populations of these species and other specially protected species;
- ▶ the need to avoid activities likely to cause irreversible damage to natural heritage;
- ▶ the need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services;
- ▶ the need to prevent the spread/introduction of invasive non-native species; and
- ▶ the need to recognise the importance of allowing wildlife to adapt to climate change.

3.4 Geology, Land Use and Soils

Baseline Characteristics

Geology²⁵

The Bristol Water supply area is geologically diverse and includes a number of Principal Aquifers such as the Chalk aquifer. Geological sites may be sensitive to changes in quality and levels, pollution and land use.

The Severn and Avon Vales to the west and north of Bristol is a low-lying, undulating flood plain of the Rivers Severn and the Warwickshire Avon and therefore contains alluvial soils. Much of the land adjacent to the rivers floods regularly in winter and there are relict wetland sites and features such as old pollards, wet pastures, ditches and tall hedges. Woodlands tend to be fairly small and are scattered throughout the area. The area is underlain by Triassic and Jurassic soft rocks, mostly consisting of Mercia Mudstones and Liassic Clays, which form heavy loam or clay soils. Several outliers of Cotswold Jurassic Limestone occur at Bredon Hill and near Gloucester.

The Bristol, Avon Valleys and Ridges toward the north and east of the Bristol Water supply area are underlain by Carboniferous and Jurassic Limestone with mudstones, clays and alluvium in the valleys. Land use is varied and includes the urban area of Bristol, the River Avon gorge and alternating ridges and broad valleys with some steep wooded slopes and open rolling farmland.

The Mendip Hills to the south are underlain by Carboniferous limestone and support species-rich grasslands and woodlands on thin soils. The Mendips are predominantly pastoral with much of the plateau traditionally

²⁵ Geological information has been sourced from Natural England's Natural Character Area (NCA) profiles 106 (Severn and Avon Vales), 118 (Bristol, Avon Valleys and Ridges), 141 (Mendip Hills) and 142 (Somerset Levels and Moors), available from <http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/southwest.aspx> (accessed February 2017)

being grazed by dairy cattle with beef or sheep on the escarpments. There has been significant horticultural use made of the lower slopes of the southern escarpment, particularly growing strawberries.

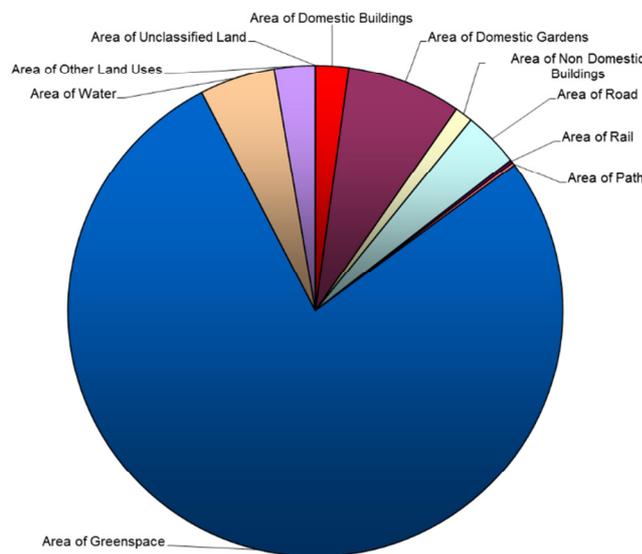
The Somerset Levels and Moors are located to the south of the Bristol Water supply area and are underlain by Triassic rocks, the most common of which is Mercia mudstone. It is the largest area of lowland wet grassland and associated wetland habitat remaining in Britain. The majority of the area is only a few metres above mean sea level and drains via a large network of ditches, rhynes and rivers. The area is mainly used for summer cattle grazing, often in conjunction with hay or silage production, although withy (willow) growing is also an important traditional activity.

Geological Conservation Review (GCR) Sites is the register of known nationally and internationally important Earth science (geological and geomorphological) sites in Great Britain²⁶. The GCR underpins designation of Earth science features in SSSIs. There are 88 GCRs within the Bristol Water supply area.

Land Use

The Generalised Land Use Database Statistics for England (2005) indicates that for both the South West and the UK, green space constitutes 90.7 % and 87.5 % respectively of total land area. The next largest area of land cover is domestic gardens (3.1 % of land cover in the South West and 4.3 % of land cover in the UK). **Figure 3.7** shows land use in the West of England sub-region and indicates that the two largest land uses are the same as those at the regional and national level although the proportion of green space (77.5% of the total land area) is lower than national and regional averages and domestic gardens (7.5%) is higher. Water equates to 4.9 % of the total area of land within the West of England sub-region compared to 2.6% nationally and 2.0% regionally with the Bristol City Council area having the largest proportion of land area within this land use typology (7.3%) and Bath & North East Somerset the lowest (1.9%).

Figure 3.7 Land Use in the West of England Sub-Region



Source: DCLG (2005) *Generalised Land Use Database Statistics for England*, available from <http://webarchive.nationalarchives.gov.uk/20120919132719/http://communities.gov.uk/publications/planningandbuilding/generalisedlanduse> (accessed February 2017)

Previously developed land (PDL) is defined as land that is or was occupied by a permanent structure (excluding agricultural or forestry buildings, landfills and parks) and associated fixed surface infrastructure. The proportion of new development built on PDL in the West of England varies across the four local authorities that comprise the sub-region. For example, between 2013 and 2016, 86% of new developments were constructed on PDL in the Bristol City Council area compared to 60% nationally which in part reflects

²⁶ <http://jncc.defra.gov.uk/page-2947> (accessed February 2017)

the urban nature of the area and limited opportunities for greenfield development. In contrast, only 37 to 42% of new dwellings in North Somerset, Bath & North East Somerset and South Gloucestershire were constructed on PDL over the same period²⁷.

In 2012, the South West had a total of 2,360 ha of vacant or derelict PDL that was unused or may be available for redevelopment, which was one of the lowest compared to other English regions (**Table 3.2**). Of this, about 23% had some form of planning permission or was allocated for development in a local plan. Two thirds (1,800 ha) of PDL in the South West region was considered to be suitable for housing, with capacity for 29,910 homes²⁸.

Table 3.2 Previously Developed Land Available for Redevelopment, 2012

Region	All Vacant and Derelict PDL (ha)	Total Area Suitable for Housing (ha)
North West	7,220	3,500
South East	2,670	3,800
Yorkshire & the Humber	3,900	1,850
East of England	3,240	3,750
East Midlands	2,840	1,600
South West	2,360	1,800
West Midlands	3,000	1,910
North East	2,600	1,830
London	1,240	2,650
<i>England</i>	<i>45,120</i>	<i>22,681</i>

Source: University of the West of England, for the Campaign to Protect Rural England (2014) *From Wasted Space to Living Spaces: The Availability of Brownfield Land for Housing Development in England*.

Adopted and emerging local plans of the local planning authorities that comprise the West of England seek to maximise development of brownfield sites in addition to greenfield land to meet housing and economic development needs.

Soils

The Agricultural Land Classification System (ALCS) developed by Defra provides a method for assessing the quality of farmland, principally for use in planning, by dividing the quality of land into five categories as well as non-agricultural and urban typologies. The 'best and most versatile land' is generally defined as the agricultural land which falls into Grades 1, 2 and 3a.

Figure 3.8 shows agricultural land quality across the Bristol Water supply area and **Table 3.3** highlights the percentage of land in the Bristol Water supply area in each category along with data for England. The 'best' agricultural land is Grade 1. In the Bristol Water supply area, significant areas of Grade 1 quality agricultural land are located in the area between Bristol and Radstock, and around Nailsea. Much of the poorer land is located in the Mendips and to the southeast of the Bristol Water supply area. In general, the majority of land in the Bristol Water supply area is classified as 'Good/Moderate' (Grade 3) and is proportionally greater than for England as a whole. Whilst the proportion of land classified as 'Poor' (Grade 4) or 'Very Poor' (Grade 5) is less relative to England, the percentage within Grade 1 ('Excellent') or Grade 2 ('Very Good') is also less.

²⁷ Department for Communities and Local Government (2016) Land Use Change Statistics [available at <https://www.gov.uk/government/statistical-data-sets/live-tables-on-land-use-change-statistics> (accessed February 2017)]

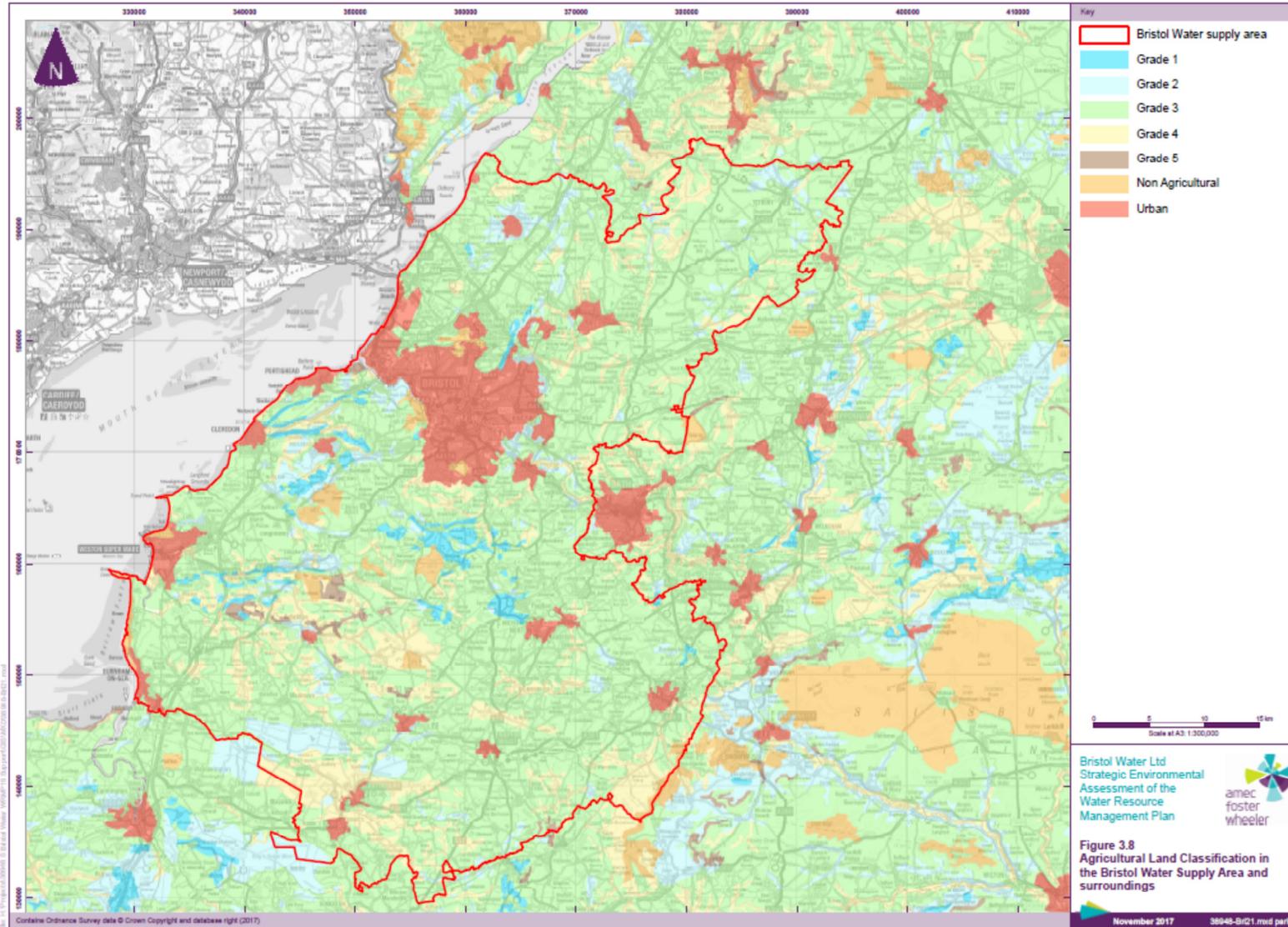
²⁸ University of the West of England, for the Campaign to Protect Rural England (2014) *From Wasted Space to Living Spaces: The Availability of Brownfield Land for Housing Development in England*.

Table 3.3 Agricultural Land Quality (as a percentage of land area)

Agricultural Land Grade	Bristol Water supply area	England
Grade 1 – Excellent	2.4	2.7
Grade 2 – Very Good	6.2	14.2
Grade 3 – Good / Moderate	67.1	48.2
Grade 4 – Poor	13.1	14.1
Grade 5 – Very Poor	0.7	8.4
Non agricultural	1.7	5.0
Urban	8.8	7.3

Source: Available from Natural England (accessed February 2017)

Figure 3.8 Agricultural Land Classification in the Bristol Water supply Area



Likely Evolution of the Baseline without the WRMP

- ▶ Key threats to soils include draining soils, intensive agriculture, changes in land management, climate change, construction, and pollution.
- ▶ Loss of nitrate from agricultural soils can lead to failure of drinking water standards and contribute to eutrophication in estuaries and the sea. Eutrophication can also be caused by excess phosphate entering water bodies, usually via soil erosion.
- ▶ Soils need to be safeguarded to protect their ability to support plants and animals, store carbon, and provide other important ecosystem services. The vision of Defra's Soils Strategy for England is for all England's soils to be managed sustainably and degradation threats tackled successfully by 2030. This will improve the quality of England's soils and safeguard their ability to provide essential services for future generations.
- ▶ The need for greenfield land to accommodate housing and economic development may lead to a loss of greenspace and soils.
- ▶ It is expected that there will be increased opportunities to protect soils and improve water quality as agricultural practices and farm management are influenced by sustainable land management schemes.
- ▶ New development could increase pressure on geological assets.
- ▶ One of the core planning principles of the NPPF is to encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.

Key Sustainability Issues Relevant to the WRMP

The key sustainability issues relevant to the WRMP and the SEA arising from the analysis of the geology, land use and soils baseline are:

- ▶ the need to maintain or improve the quality of soils/agricultural land;
- ▶ the need to protect and enhance sites designated for their geological interest;
- ▶ the need to maintain and enhance soil function and health;
- ▶ the need to make use of PDL, and to reduce the prevalence of derelict land; and
- ▶ the need to manage land more holistically at the catchment level, benefiting landowners and other stakeholders, the environment and sustainability of natural resources.

3.5 Water

Baseline Characteristics

Bristol Water provides water supplies to 1.1 million people and all the associated businesses in an area of 2,400 square kilometres centred on Bristol and the towns and villages within a 20-mile radius of the city. Water is distributed via a 6,000 km of mains, 164 pumping stations and 139 storage reservoirs. The Bristol Water supply area is operated as a single water resource zone comprising 68 water sources. About 88% of the water supply comprises surface waters while 12% comes from groundwater. The different source types comprise:

- ▶ **Rivers:** A major abstraction supplied by the River Severn and other local rivers. This single abstraction provides 46% of the water available to Bristol Water. In dry periods, use of this particular source is increased to conserve water stored in reservoirs;

- ▶ **Reservoirs:** Three surface water impounding reservoirs (Cheddar, Blagdon, Chew) collecting water from the Mendip Hills account for approximately 42% of the available licensed resource. Chew Reservoir is the largest and can store 20,460 million litres. There are also other smaller raw water reservoirs used operationally;
- ▶ **Groundwater:** 16 small groundwater sources such as springs, wells and boreholes which are used conjunctively and accounts for approximately 12% of available licensed resource.

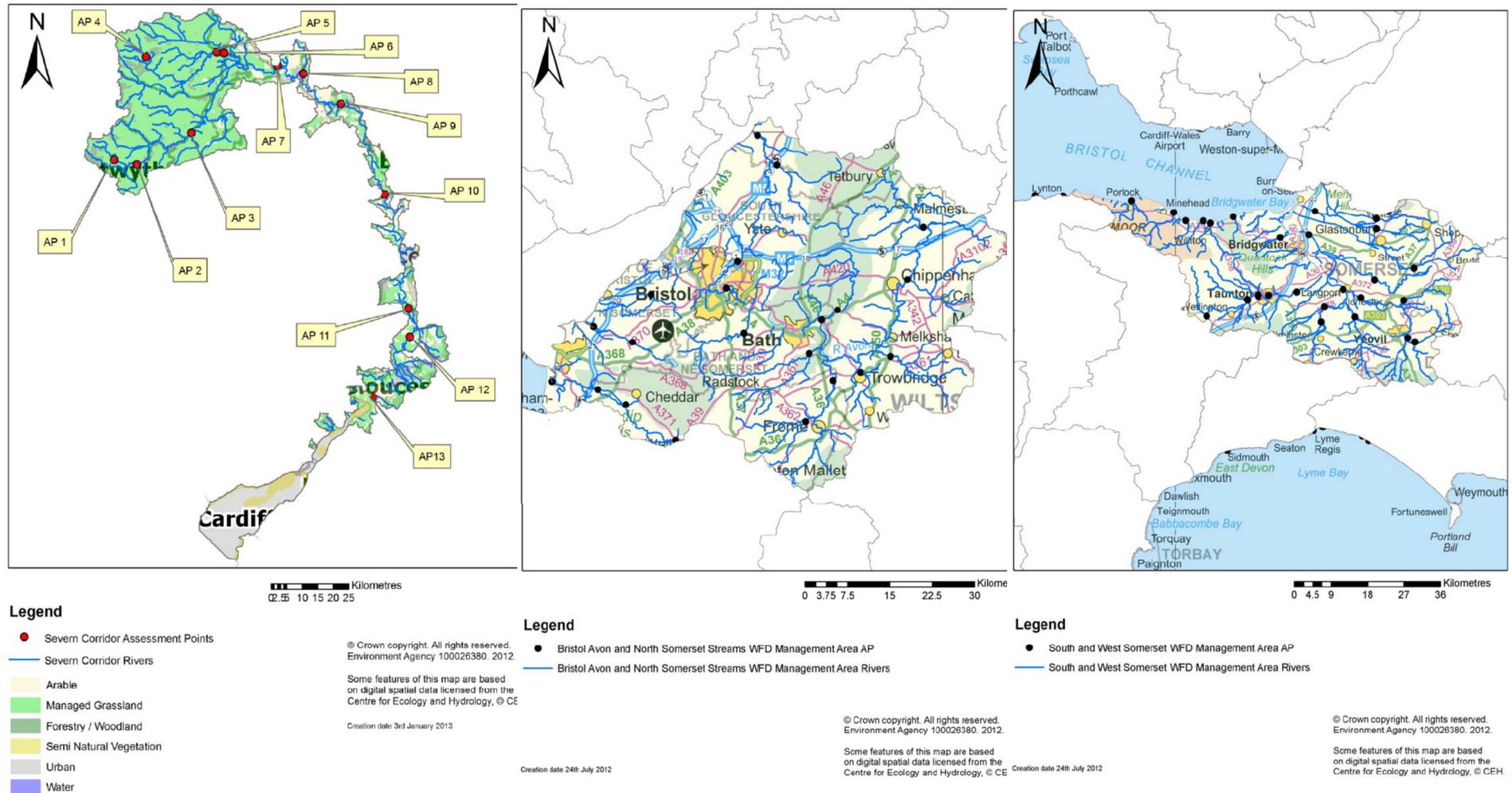
Water Availability

The Environment Agency has produced a series of Catchment Abstraction Management Strategies (CAMS) which set out how water resources will be managed in each catchment and provide information on how existing abstraction licenses are managed and the availability of water for further abstraction. Within each CAMS, river flows and groundwater levels are monitored at Assessment Points (significant points on rivers) and assessed alongside the amount of water which has been abstracted on average over the previous six years and the situation if all abstraction licences were used to full capacity. This data is used to determine the water availability for each water body. Water availability falls into the following categories:

- ▶ **Water available for licensing:** There is more water than required to meet the needs of the environment. New licences can be considered depending on local and downstream impacts.
- ▶ **Restricted water available for licensing:** If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted and restrictions may be in place. Trading from an existing licence holder can occur.
- ▶ **Water not available for licensing:** Water body flows are below the indicative flow requirement to help support Good Ecological Status (as required by the Water Framework Directive). No further consumptive licences will be granted. Trading from an existing licence holder can occur.

The Bristol Water supply area includes the southern tip of the Severn Corridor CAMS, the western half of the Bristol Avon, Little Avon, Axe and North Somerset Streams CAMS area, and the Parrett, Brue and West Somerset Streams CAMS area. **Figure 3.9** shows the catchment areas.

Figure 3.9 Severn Corridor CAMS, Bristol Avon, Little Avon, Axe and North Somerset Streams CAMS and Parrett, Brue and West Somerset Streams CAMS Areas



The water availability assessments for the CAMS particularly relevant to the WRMP are summarised in **Table 3.4** below. In addition, assessing water availability in the Somerset Levels and Moors SPA/Ramsar should consider, like all catchments that the national process of assessing and licensing currently exempts water transfers. It is understood that this is currently under discussion between the EA, Natural England and the Somerset IDB.

Table 3.4 Summary of CAMS Water Availability Assessments

Catchment Abstraction Management Strategy	Water Available at AP	Restricted Water Available at AP	Water Not Available at AP	Total Number of APs
Severn Corridor	0	13	0	13
Bristol Avon, Little Avon, Axe and North Somerset Streams	8	10	3	21
Parrett, Brue and West Somerset Streams	12	15	2	29

AP- Assessment Point

Source: Environment Agency (2013) *Severn Corridor Abstraction Licensing Strategy*; Environment Agency (2012) *Bristol Avon and North Somerset Streams WFD Management Area Abstraction Licensing Strategy*

Sustainability Reductions - Review of Consents

Under the Habitats Directive, the Environment Agency reviewed all the consents (the RoC) that it regulated to ensure that there are no detrimental impacts on the conservation interests of designated sites including SPAs and SACs. This review concluded in 2012. Discharge consents and water abstraction licences were included within this review. Where the Environment Agency was unable to demonstrate that abstraction licences and discharge consents were not having an adverse impact on the designated sites, it sought and where necessary enforced consent amendments.

Bristol Water together with Wessex Water volunteered to reduce abstraction from the Malmesbury sources north of Bath in order to improve low flows in the Malmesbury Avon. Since 1998, Bristol Water has operated a 10.1 Ml/d reduction in abstraction from the Shipton Moyne and Long Newton sources to improve flow in the Tetbury Avon. Bristol Water has worked with the Environment Agency and Wessex Water to achieve additional reductions in abstraction of 1.5 Ml/d in the Malmesbury area for sustainability reasons²⁹.

Water Quality

The Bristol Water supply area lies within the geographical scope of the Severn River Basin District and North Somerset Streams River Basin District. There are 220 surface water bodies in the two catchments of which only 11% are currently classed as achieving 'good' WFD overall status. However, by 2021 it is predicted that a further 24% of the waterbodies will achieve this standard. The groundwater body status underlying the Bristol Water supply area is generally good, except for the Bristol Triassic aquifer which is of poor chemical status despite having a good quantitative status. The WFD key water status statistics are presented in **Table 3.5**.

Table 3.5 Key Status Statistics for Surface and Groundwater Bodies in the Bristol Avon and North Somerset Management Catchment and South and West Somerset Management Catchment³⁰

River and Lake Water Bodies	2015	2021	Improvement Actions
% at good ecological status or good potential	11%	35%	Reduce abstraction rate (daily or hourly)

²⁹ Bristol Water (2014). Final Water Resource Management Plan

³⁰ <http://environment.data.gov.uk/catchment-planning/ManagementCatchment/3005/Summary> and <http://environment.data.gov.uk/catchment-planning/ManagementCatchment/3080/Summary> [accessed February 2017]

River and Lake Water Bodies	2015	2021	Improvement Actions
% at good or high biological status	30%	50%	Additional treatment to reduce concentrations of phosphate
% at good chemical status	94%	94%	
% at good status overall	11%	35%	
Groundwater Bodies	2015	2021	Improvement Actions
Wells	good	good	N/A
Bristol Triassic	poor	poor	
Mendips	good	good	

The Chew Valley Lake SSSI, Cheddar Lake SSSI and Blagdon Lake SSSI are the largest surface water impounding reservoirs within the Bristol Water supply area. Chew Valley Lake and Blagdon Lake are designated as polluted waters (eutrophic)³¹ due to the elevated nitrogen concentrations (>1 mg N/l) and frequent algal blooms.

The biota of the littoral zone (generally defined as the shallow water around the shoreline of the lake to the maximum depth at which light still reaches the bottom sediments to allow macrophytic growth) have evolved adaptations to the natural regime of lake water level fluctuations, however they can be adversely impacted by excessive water level fluctuations. The impacts on aquatic vegetation (e.g. Stonewort) of water level drawdown associated with Blagdon Lake SSSI are currently under investigation. Data collected to date³² show evidence of a transition from aquatic to terrestrial species as the water levels decreased in the lake and the quadrats were exposed.

The key pressures in the catchments, particularly affecting ecological and biological status are:

- ▶ discharges from sewage treatment works releasing ammonia, phosphates, and other pollutants into the water environment. The major discharges in the catchment are from sewage treatment works and these can lead to signs of nutrient enrichment at times of low flows, for example in the Axe and North Somerset Streams³³;
- ▶ intermittent urban discharges (pollution incidents);
- ▶ diffuse runoff from agricultural land into water courses (increasing nitrates and to a lesser extent pesticides);
- ▶ impact of historical release of nitrates into groundwater (nitrates continue to accumulate in water many years after the sources of nitrates are removed);
- ▶ surface water abstraction (public water supply and other abstractions impacting on low flows in the catchment);
- ▶ hyper-eutrophication of the Blagdon Lake SSSI and Chew Valley Lake SSSI which may have an impact on the favourable status of these SSSIs; and
- ▶ hyper-eutrophication of the rivers feeding the Somerset Levels and Moors SPA/Ramsar.

Bathing waters are designated waters and beaches that large numbers of bathers use. The quality of the environment should be preserved, protected and improved and human health should be protected by meeting the 'sufficient' water quality standards of the Bathing Waters Directive and to take such realistic and

³¹ Environment Agency (2016). Nitrate Vulnerable Zone (NVZ) designation, 2017 Eutrophication (lakes): Blagdon Lake and Environment Agency (2016). Nitrate Vulnerable Zone (NVZ) designation, 2017 Eutrophication (lakes): Chew Valley Lake.

³² Bywater (2016). Blagdon Lake 2016 Macophyte Survey Report

³³ Environment Agency (2015). River Basin Management Plan Severn River Basin District

proportionate measures considered appropriate with a view to increasing the number of bathing waters classified as 'excellent' or 'good'.

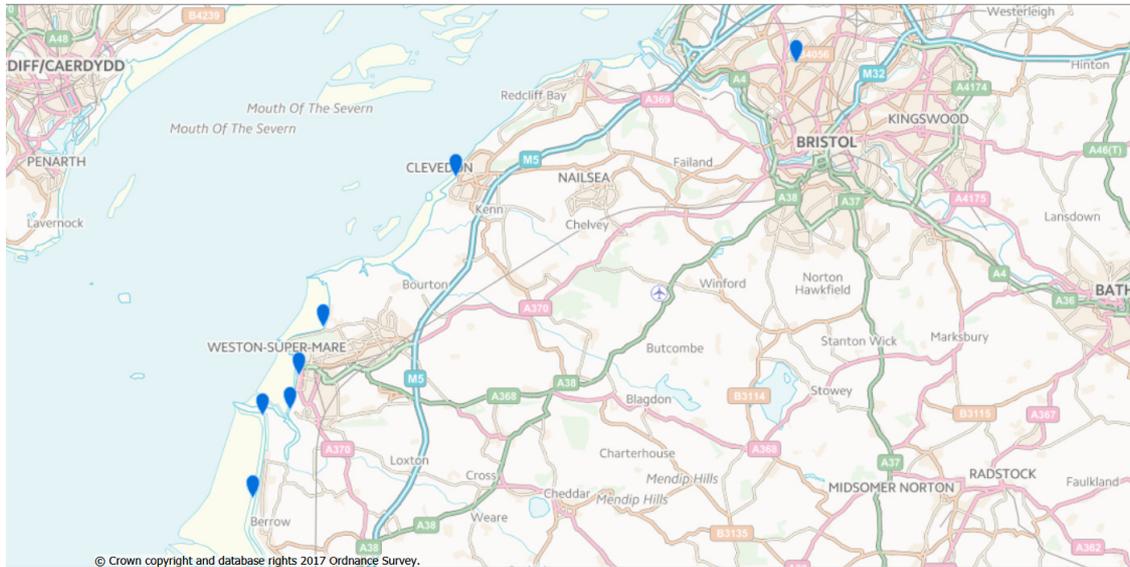
There are seven bathing water monitoring sites in the Bristol Water supply area. **Figure 3.10** shows the locations of these sites and **Table 3.6** shows the 2015-2016 water quality sampling results. In 2015-2016 sampling results classified one of these sites as 'excellent', four as 'good' (reducing to three in 2016) and one as 'sufficient' (increasing to two in 2016).

Table 3.6 Bathing Water Quality Results within the Bristol Water supply Area (2015-2016)

Bathing Water Site	Description of Site	2015 and 2016 Classification
Berrow North of Unity Farm	The River Brue and River Parrett flow into Bridgwater Bay south of the bathing water. Sources of reduced water quality in these rivers include agricultural runoff, surface water drains and private sewerage systems. These rivers can affect the water quality especially in times of high rainfall.	Good (2015 & 2016)
Brean	No description provided.	Excellent (2015 & 2016)
Weston-super-Mare Uphill Slipway	The River Axe flows into the sea at the southern end of the beach. During periods of heavy rainfall, the runoff to these rivers can affect the water quality. A storm overflow discharges to the sea at this beach, heavy rainfall may cause operation of this which can affect water quality.	Sufficient (2015 & 2016)
Weston Main	Runoff to the River Axe and the Uphill Great Rhyne can affect the water quality during periods of heavy rainfall. Storm overflows discharge to the sea close to this beach, heavy rainfall may cause operation of these which can affect water quality.	Good (2015) Sufficient (2016)
Weston-super-Mare Sand Bay	Typically achieves a high water quality standard.	Good (2015 & 2016)
Clevedon Beach	Typically achieves a high water quality standard. There are two storm overflows that discharge to the sea near this site, heavy rainfall may cause operation of these which can affect water quality.	Good (2015 & 2016)
Henleaze Lake	Not directly connected to any streams or rivers, although it is possible a groundwater connection exists with the River Trym to the north west and the Hen stream to the south west.	Good (2015 & 2016)

Source: Environment Agency (2016) *Bathing Water Profiles* [available at: <http://environment.data.gov.uk/bwq/profiles/> (accessed February 2017)]

Figure 3.10 Location of Bathing Waters Monitoring Locations within the Bristol Water supply Area



Source: Environment Agency (2016) *Bathing Water Profiles* [available at: <http://environment.data.gov.uk/bwq/profiles/> (accessed February 2017)].

Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are designated where nitrate concentrations in water bodies are high or increasing, or water bodies are, or may become, eutrophic due to agricultural nitrate pollution. They include about 58% of land in England.

Table 3.7 identifies the number and area of NVZs within the Severn and South West River Basin Districts which include the Bristol Water supply area. The proportion of NVZs designated for high nitrate in groundwater is similar in both districts, covering about one third of each district. In contrast, NVZs designated for high nitrate in surface water cover about half of the Severn River Basin District but only 5% of the South West River Basin District. NVZs designated for eutrophication cover less than 1% of the Severn District compared to 14% of the South West District.

Table 3.7 Nitrate Vulnerable Zones within Severn and South West River Basin Districts

Reason for Designation	Number of NVZs		% of River Basin Area covered by NVZ	
	Severn	South West	Severn	South West
High nitrate in surface water	66	27	51	5
High nitrate in groundwater	19	14	23	21
Eutrophication in lakes and reservoirs	6	5	<1	<1
Eutrophication in estuaries or coastal waters	0	4	0	14

Source: Environment Agency (2015) River Basin Management Plans – Severn River Basin District and South West River Basin District

Flood Risk

Flood Zones are terms used to describe a series of fluvial and coastal flood extent datasets produced by the Environment Agency. Flood Zone 1 represents areas least at risk of flooding (assessed as having a less than 1 in 1,000 annual probability of river flooding in any year). Flood Zone 2 shows the additional extent of an extreme flood from rivers or the sea, with up to a 0.1% (1 in 1,000) chance of occurring each year. Flood Zone 3, meanwhile, represents areas with a high probability of flooding, which could be flooded either from

rivers or the sea if there were no flood defences. These areas could be affected by flooding from the sea that has a 0.5% (1 in 200) or greater chance of occurring each year, or flooding from rivers that has a 1% (1 in 100) or greater chance of occurring each year.

The Environment Agency flood map (rivers and sea) for the Bristol Water supply area (**Figure 3.11**) shows that there are two defined high flood risk areas within the Bristol Water supply area; coastal areas along Bridgwater Bay (including areas near Cleveland) and the Mendip Hills area. These are areas where there is a significant risk of flooding from local sources, such as surface water, groundwater and ordinary watercourses, combined with a significant population at risk of the effects of flooding. The coastal areas are not very populated and flood risk is mitigated by flood defences where urban areas are present (i.e. Weston-Super-Mare).

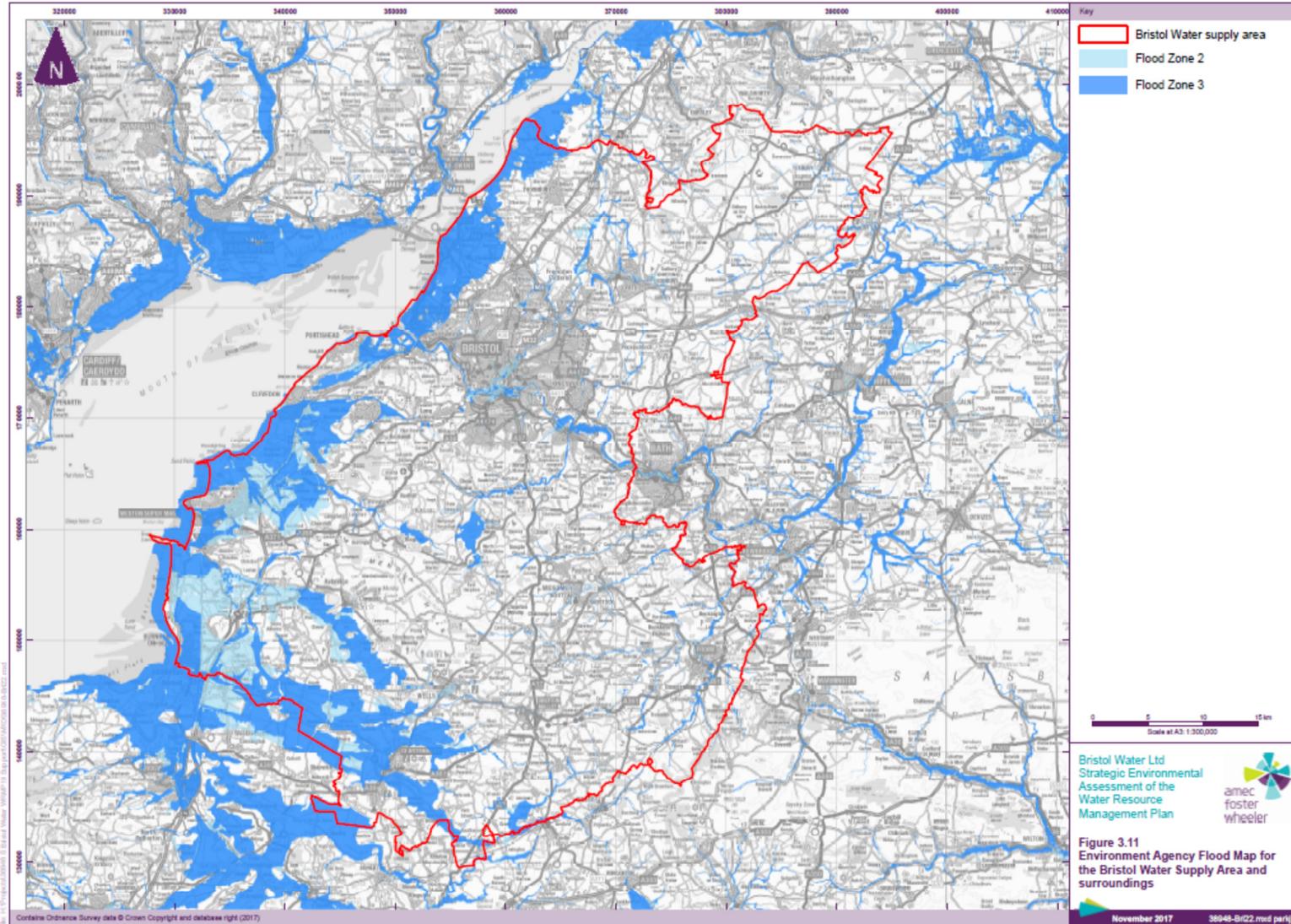
Numerous engineering schemes have been implemented to reduce flood risk in the Bristol Avon catchment including: widening and deepening of rivers and removal of obstructions; building flood bypass tunnels; and constructing reservoirs. There are a number of flood storage reservoirs across the area such as the reservoir at Iron Acton which reduces flood risk downstream on the Bristol Frome through Frampton Cotterell to Eastville. Reservoirs at Bassett and Emerson's Green have similar impacts on the Hancock's Water and Folly Brook respectively³⁴.

Bristol Water's operational area is subject to flooding in certain locations. The company has undertaken flood risk assessments for its key assets e.g. at Purton treatment works (located on low lying land adjacent to the Severn Estuary/Gloucester and Sharpness Canal), Littleton treatment works (smaller treatment works supporting Purton), and Oldford treatment works.

Climate change may have a significant effect upon future flood risk in the region. This is discussed further below and in **Section 3.5**.

³⁴ Environment Agency (2012). Bristol Avon Catchment Flood Management Plan. Summary Report.

Figure 3.11 Environment Agency Flood Map for the Bristol Water supply Area



Likely Evolution of the Baseline without the WRMP

- ▶ Under the WFD, rivers in England and Wales are required to achieve 'good ecological status' by 2015. Where this was not possible, and subject to criteria set out in the Directive, the aim is to achieve good status by 2021 or 2027. Of the 220 surface water bodies in the Severn River Basin District and North Somerset Streams River Basin District which cover the Bristol Water supply area 11% have achieved good ecological status or good potential in 2015 (see Table 3.5).
- ▶ Pressure to meet demand for public water supply in the area will increase as the population increases, despite efforts to manage demand through water efficiency and leakage reduction. Acute problems arising from abstraction are present in the Malmesbury Avon and Bristol Water already maintains a voluntary reduction on its sources at Long Newton and Shipton Moyne (abstractions by Wessex Water are also significant in this area).
- ▶ The NPPF³⁵ states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. The NPPF requires that, where development is necessary, it should be made safe without increasing flood risk elsewhere, as defined in the Technical Guidance to the NPPF³⁶.
- ▶ The UK Climate Change Risk Assessment (CCRA) 2017 Evidence Report³⁷ draws together and interprets the evidence gathered by CCRA regarding current and future threats and opportunities for the UK posed by the impacts of climate change up until 2100. Findings of the assessment include:
 - ▶ increasing pressure on the UK's water resources due to changes in hydrological conditions and regulatory requirements to maintain good ecological status;
 - ▶ increases in water demand for irrigation of crops;
 - ▶ lower summer rivers flows across the UK due to warming and drying conditions;
 - ▶ an increase in precipitation in winter months due to a combination of greater depths and more frequent heavy rainfall events - suggesting larger volumes of runoff with potential negative impacts on flood risk and sewer overflows in urban environments;
 - ▶ flash-flooding associated releases from combined sewer overflows (CSO) could in turn increase associated illnesses at the coast due to the varying occurrence of microbial pathogens in the marine environment.

Key Sustainability Issues Relevant to the WRMP

The key sustainability issues relevant to the WRMP and SEA arising from the baseline assessment for water are:

- ▶ the need to further improve the quality of the region's river, estuarine and coastal waters taking into account WFD objectives;
- ▶ the need to maintain the quantity and quality of groundwater resources taking into account WFD objectives;
- ▶ the need to ensure the risk of flooding is not increased, and options for flood avoidance and resilience are investigated;
- ▶ the need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters;

³⁵ Department for Communities and local Government (2012) National Planning Policy Framework: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

³⁶ Communities and Local Government (2012) Technical guidance to the National Policy Planning Framework

³⁷ Defra (2016) The UK Climate Change Risk Assessment 2017 Evidence Report

- ▶ the need to ensure sustainable abstraction to protect the water environment and meet society's needs for a resilient water supply; and
- ▶ the need to ensure that people understand the value of water.

3.6 Air Quality and Climate

Baseline Characteristics

Air Quality

The emission of pollutants to air can pose a hazard to human health (e.g. respiratory illnesses and lung conditions) and can also have a negative impact on the environment (e.g. changes to ecosystems and damage to vegetation when present within the atmosphere in excess of certain concentrations). Concentration thresholds are set through legislation and include pollutants such as nitrogen dioxide (NO₂), sulphur dioxide (SO₂), volatile organic compounds (VOCs) and fine particles (known as 'particulates').

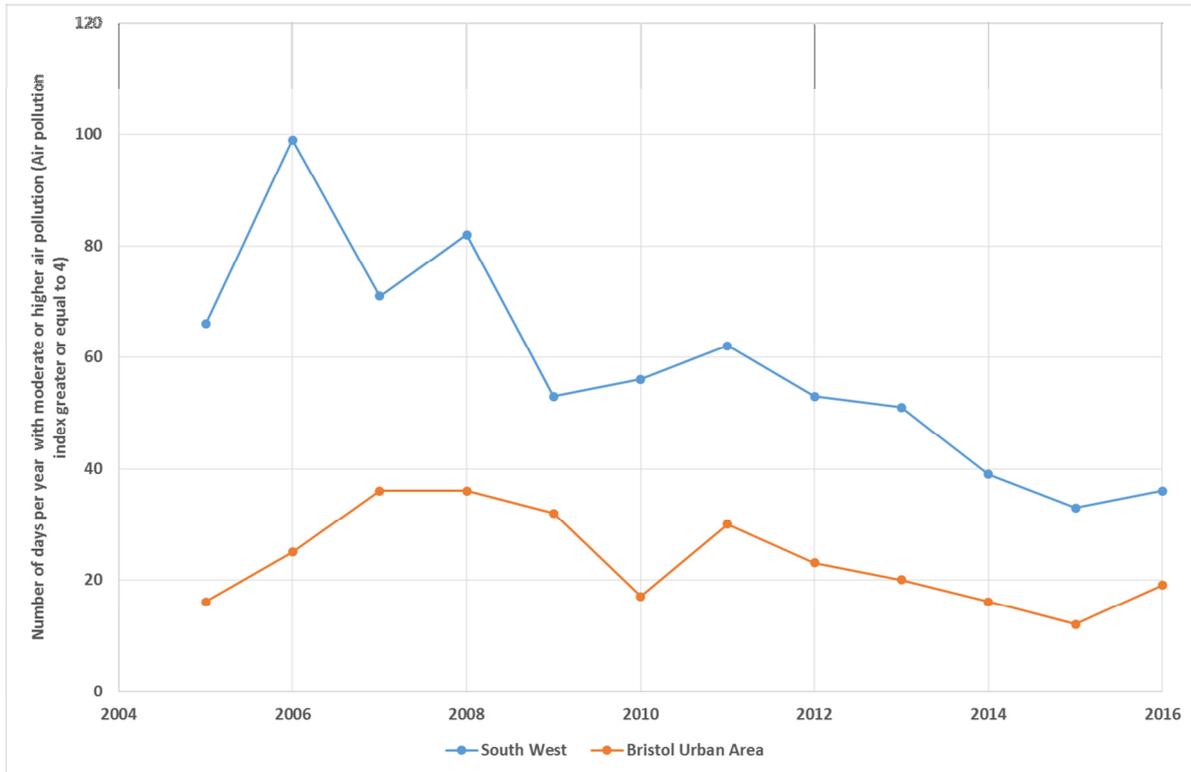
Air quality monitoring takes place across the UK to determine compliance with EU Council Directive on ambient air quality and cleaner air for Europe (2008/50/EC) and the Fourth Daughter Directive (2004/107/EC) under the Air Quality Framework Directive (1996/62/EC). For the purposes of air quality monitoring, the UK is divided into 43 zones. Overall, the UK data for 2015 show an improving picture compared to the previous year's data³⁸. **Figure 3.12** shows air pollution in the South West and Bristol urban area zones between 2005 and 2016. Air pollution is defined by a daily air quality index (DAQI) which is determined by the highest concentration of five air pollutants (nitrogen dioxide, sulphur dioxide, ozone, particles < 2.5µm (PM_{2.5}) and particles < 10µm (PM₁₀)). The data for the South West zone show a reduction in the number of days with moderate to higher air pollution (DAQI greater or equal to 4) from the 2006 elevated peak which was related to hot summer and other pollution episodes. In contrast air pollution in the Bristol urban area zone has remained fairly stable.

Air Quality Management Areas (AQMAs) are declared in specific locations where atmospheric concentrations of one or more pollutants are either close to or exceeding statutory objectives set out within the *Air Quality Strategy for England, Scotland, Wales and Northern Ireland*.³⁹ There are six AQMAs in total within the Bristol Water supply area declared by Bath & North East Somerset Council, Bristol City Council and South Gloucestershire Council. The majority of the AQMAs have been declared because of emissions from road transport.

³⁸ Defra (2015) *Air Pollution in the UK 2015* [available at: <https://uk-air.defra.gov.uk/library/annualreport/index> (accessed February 2017)].

³⁹ Defra (2007) *Air Quality Strategy for England, Scotland, Wales and Northern Ireland* [available at: <https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-2> (accessed February 2017)].

Figure 3.12 Days with Moderate or Higher Air Pollution in the South West and Bristol Urban Area



Source: Defra- daily air quality index (DAQI) regional data (available at <https://uk-air.defra.gov.uk/data/DAQI-regional-data> [accessed in February 2017])

Air quality compliance data in 2015 for the South West and Bristol urban area zones is summarised below:

- ▶ The limit value for hourly mean nitrogen dioxide (NO₂) was met but the limit value for annual mean NO₂ was exceeded (along with six other UK zones).
- ▶ The target values for ozone based on the maximum daily eight-hour mean, based on the AOT40⁴⁰ statistic were met.
- ▶ The long-term objective for ozone, set for the protection of human health (maximum daily eight-hour mean) was exceeded (along with all other UK zones);
- ▶ The limit value for annual mean concentration of PM₁₀ particulate matter was met.
- ▶ The target value for annual mean concentration of PM_{2.5} particulate matter, the Stage 1 limit value (which came into force on 1 January 2015), and the Stage 2 limit value (which must be met by 2020) were met.
- ▶ The limit values for nickel, benzo[a]pyrene, sulphur dioxide, carbon monoxide, lead and benzene were met.

In recent years, several key air pollutants have shown major decreases in atmospheric concentrations across the UK, while others have remained constant:

- ▶ Atmospheric concentrations of SO₂ decreased across the UK due to reductions in the use of coal, gas and oil and reductions in the sulphur content of fuels.

⁴⁰ AOT40 is defined as the sum of the hourly O₃ concentration exceeding the threshold of 40 ppb over the period 1 April - 30 September

- ▶ While overall emissions of NO_x have decreased over the last 20 years, the monitored atmospheric concentrations did not show such a notable decrease, potentially due to continued high levels of NO_x emission from older vehicles.
- ▶ Atmospheric concentrations of particulate matter (PM₁₀) have broadly been reduced, while PM_{2.5} remained at constant levels.
- ▶ Carbon monoxide (CO) concentrations were reduced as a result of reductions in emissions from road transport, iron and steel production and the domestic sector.
- ▶ Levels of ozone have remained relatively constant since the mid-1990s, with a possible increase observed within significant annual variation³⁸.

Bristol Water's activities and operations related to the delivery of the current WRMP have not been associated with any significant emissions of NO₂, SO₂ VOCs and particulates in the Bristol Water supply area, although there may be some minor and localised emissions associated with vehicle movements and development activities.

Climate Change

Greenhouse gases including carbon dioxide (CO₂) emitted from human actions are a major contributor to climate change. The South West emitted 8% of the UK's greenhouse gas emissions in 2014⁴¹. The amount of CO₂ emitted in the South West of England sub-region between 2010 and 2014 is shown in **Table 3.8** and highlights that emissions have reduced since 2010 by 14% to 31.6 MtCO₂ in 2014, principally because of declines in emissions from the industry and commercial and domestic sectors. Industry and commercial and transport sectors remained the largest source of CO₂ emissions in the region.

On a local authority basis within South West England, Poole has the largest decrease in emissions across the UK, with a 22% reduction in emissions in 2014 compared to 2010. This is primarily associated with changes in emissions from industry and commercial and domestic sectors. In contrast, West Somerset had an increase in greenhouse gas emissions from 2010 to 2014 by 2% due to increased production from the industry and commercial sector.

On a per capita basis, South West England emitted 5.8 tCO₂ per person in 2014 which is comparable to 6.0 tCO₂ per person in England.

Table 3.8 End User Estimates of Carbon Emissions (MtCO₂), South West England 2010-2014

End User	2010	2011	2012	2013	2014
Industrial and Commercial	12.9	11.7	12.5	12.1	11.0
Domestic	11.9	10.3	11.1	10.8	9.1
Transport	11.7	11.5	11.3	11.2	11.3
LULUCF	0.4	0.3	0.3	0.3	0.2
Total	36.8	33.8	35.2	34.4	31.6
<i>Per Capita Emissions (t)</i>	<i>7.0</i>	<i>6.4</i>	<i>6.6</i>	<i>6.4</i>	<i>5.8</i>

NB: due to rounding totals may not sum exactly.

Source: BEIS (formerly DECC) *UK local authority and regional carbon dioxide emissions national statistics: 2005-2014*.

Increasing the amount of renewable energy generation is one response to the need to reduce CO₂ emissions, and the South West region has shown a steady year-on-year increase in generation from 2003 to 2015. The most recent data from the Department for Business, Energy & Industrial Strategy (BEIS) shows

⁴¹ BEIS (formerly DECC) (2016) *UK Local Authority and Regional Carbon Dioxide Emissions National Statistics: 2005-2014* [available at: <https://www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics> (Accessed February 2017)].

that in 2016, the South West had an installed capacity of 3,387 MW from sites generating electricity from renewable sources. The South West had the fourth highest regional capacity at about 15% of the total capacity in England and accounts for 24 per cent of the total UK solar capacity (24 per cent of the generation)⁴².

Bristol Water is a large user of energy due to the energy needed to treat and pump water. Bristol Water's total carbon emissions were 38.5 kg CO₂e/person in 2014/15 and 32 kg CO₂e/person in 2016/2017, with plans to reduce emissions to 20 kg CO₂e/person by 2020⁴³.

Bristol Water takes part in the Carbon Reduction Commitment, a UK initiative for large energy users to cut their carbon footprint. The company's carbon footprint has decreased between 2006/2007 (47,643 tonnes) and 2014/2015 (41,931 tonnes)^{44,45} although emissions have risen marginally between 2012/2013 (41,950 tonnes) and 2013/2014 (41,995 tonnes), primarily as a result of drier weather conditions and the subsequent increased use of water from sources that require more energy to treat and supply.

Likely Evolution of the Baseline without the WRMP

Air Quality

- ▶ With increasingly strong air quality legislation and de-industrialisation, levels of the majority of air pollutants will continue to decline.
- ▶ Pollutants associated with road transport such as ozone will be harder to reduce particularly in hotspot areas of traffic congestion.

Climate Change

Climate change could cause significant environmental effects within the Bristol Water supply area. A report by Climate UK⁴⁶ highlights that climate change in South West England could increase the number of flooding events, increase the frequency of summer water shortages, increase the variability in precipitation and drought patterns, reduce summer river flows by as much as 17% by 2050 (with the potential of some headwaters drying up completely in the summer months), result in the loss of habitats and species (e.g. salmon), and increase the risk of wildfires (particularly within the Parks such as Exmoor and Dartmoor), and decrease the distribution of blanket peat, significantly impacting on ecosystem biodiversity and other services this habitat provides.

The UK Climate Programme 2009 (UKCP09)⁴⁷ provides climate information for different emissions scenarios (high, medium, low) and differing levels of uncertainty. For the South West (under medium emissions), by the 2080s the UKCP09 central estimate (50 per cent probability) indicates that there will be:

- ▶ an increase in winter mean temperature of 2.8°C; it is very unlikely to be less than 1.6°C and is very unlikely to be more than 4.3°C;
- ▶ an increase in summer mean temperature of 3.9°C; it is very unlikely to be less than 2.1°C and is very unlikely to be more than 6.4°C;
- ▶ a change in annual mean precipitation of 1 per cent; it is very unlikely to be less than –5 per cent and is very unlikely to be more than 7 per cent;

⁴² BEIS (formerly DECC) (2017) *Renewable Electricity in Scotland, Wales, Northern Ireland and the Regions of England in 2016* [available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/647344/Regional_renewable_electricity_2016.pdf and excel data spreadsheets available at <https://www.gov.uk/government/statistics/regional-renewable-statistics> [accessed October 2017]].

⁴³ Bristol Water (2017) *Annual Performance Report*, available from <https://www.bristolwater.co.uk/wp/wp-content/uploads/2016/01/BW-APR-2017-1.pdf>

⁴⁴ Bristol Water (2010) *Environment & Sustainability Report 2010*, (available from <http://www.bristolwater.co.uk/pdf/environment/environmentAndSustainabilityReport2010.pdf> [accessed July 2012])

⁴⁵ Bristol Water (2015) *Annual Report for 2015* (available at <http://dev.bristolwater.co.uk/wp/wp-content/uploads/2015/07/Annual-report-14-15-Final-Version.pdf.pdf>)

⁴⁶ Climate UK (2012) *A Summary of Climate Change Risks for South West England* (available at: <http://climateuk.net/sites/default/files/SouthWest-NewText-1-A4.pdf> [accessed February 2017]).

⁴⁷ UKCP09 *Key Findings* (available at <http://ukclimateprojections.defra.gov.uk/content/view/2274/499/> [accessed February 2017]).

- ▶ a change in winter mean precipitation of 23 per cent; it is very unlikely to be less than 6 per cent and is very unlikely to be more than 54 per cent; and
- ▶ a change in summer mean precipitation of –24 per cent; it is very unlikely to be less than –50 per cent and is very unlikely to be more than 6 per cent;

The UK Climate Change Risk Assessment (CCRA) 2017 Evidence Report⁴⁸ draws together and interprets the evidence gathered by CCRA regarding current and future threats and opportunities for the UK posed by the impacts of climate change up until 2100. Overall, the findings of the CCRA indicate that the greatest need for early adaptation action (i.e. within the next 5 years) is in the following areas:

- ▶ flood and coastal erosion risk management;
- ▶ specific aspects of natural ecosystems, including managing productivity and biodiversity (the management of forest pests and diseases, low summer river flows and the movement of plants and animal species are all highlighted as high priorities for action)
- ▶ managing water resources, particularly in areas with increasing water scarcity;
- ▶ overheating of buildings and infrastructure in the urban environment;
- ▶ health risks associated with heatwaves and other risks that may affect the NHS;
- ▶ opportunities for the UK economy, particularly to develop climate adaptation products and services.

The Kyoto Protocol's first commitment period ended in 2012, which had set a legally binding target for the UK to reduce its greenhouse gas emissions by 12.5% (compared to the 1990 base year) across 2008 to 2012. Recently, the 2015 United Nations Climate Change Conference (COP 21) negotiated the Paris Agreement, a global agreement to (inter-alia) hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development.

The UK Climate Change Act 2008 set legally binding targets for the UK to reduce greenhouse gas emissions by at least 80% by 2050, and CO₂ emissions by at least 26% by 2020, both set against a 1990 baseline. Under the requirements of the Act, the Government has set five year carbon budgets to set out a trajectory for emissions reductions to 2050. Budgets have been set covering the periods 2008-12, 2013-17, 2018-22, 2023-27 and 2028-32, equivalent to 22%, 28%, 34%, 50% and 57% reductions in carbon emissions compared to 1990 levels respectively.

The UK Government has agreed to an EU-wide target of 20 per cent renewable energy by 2020 – including a binding 10% target for the transport sector. The European Commission has proposed that the UK share of this target would be to achieve 15 per cent of the UK's energy from renewables by 2020.

Bristol Water is committed to significantly increase renewable generation using floating solar panels on water storage reservoirs, wind turbines and solar panels⁴⁹.

Key Sustainability Issues Relevant to the WRMP

The key sustainability issues relevant to the WRMP and the SEA, arising from the analysis of the air quality and climate baseline are:

- ▶ the need to minimise emissions of pollutant gases and particulates and enhance air quality;
- ▶ the need to reduce the need to travel and promote sustainable modes of transport;
- ▶ the need to reduce greenhouse gas emissions arising from implementation of the WRMP;
- ▶ the need to take into account, and where possible adapt to, the potential effects of climate change; and

⁴⁸ Committee on Climate Change (2016) The UK Climate Change Risk Assessment 2017 Evidence Report

⁴⁹ Bristol Water (2017) *Energy & Renewables* [available at: <https://www.bristolwater.co.uk/article/floating-solar-panels-on-reservoirs/> (accessed February 2017)].

- ▶ the need to increase environmental resilience to the effects of climate change.

3.7 Human Environment

Baseline Characteristics

Community

There is a resident population in the Bristol Water supply region of just over 1.1 million⁵⁰. The greater South West region is mainly rural, with a population of 5.4 million. The annual average percentage growth rate for the South West over the 10 year period 2004-2014 was 0.7%⁵¹. Water is supplied by Bristol Water to around 520,000 households.

As at the 2011 Census, it is estimated that 68% of the population of the South West lived in urban areas⁵². Within the Bristol Water region, population density is highest within the City of Bristol area at 4,095 people per sq. km⁵³. **Table 3.9** Population Change (2011-2015) illustrates the population density across the region and relative changes in population between 2011 and 2015.

Table 3.9 Population Change (2011-2015)⁵⁴

Name	Estimated Population mid-2011	Estimated Population mid-2015	Total Change	% Change
England	63,285,145	65,110,034	1,824,889	2.88
South West	5,300,800	5,471,180	170,380	3.21
Bath and North East Somerset Council	175,538	184,874	9,336	5.32
Bristol City Council	428,074	449,328	21,254	4.97
North Somerset Council	203,091	209,944	6,853	3.37
South Gloucestershire Council	263,417	274,661	11,244	4.27

Considering the respective purposes of Water Resources Management Plans (WRMP), it is considered that the longer term issues relating to population growth represent key issues for the strategic nature of the WRMP. In the shorter term, an awareness of the population in the region is required for tactical approaches to drought conditions and the avoidance of emergency drought measures.

Health

Life expectancy is used as a broad measure of the health of an area and where a person is born largely influences how long they will live. Health-related sustainability indicators are reported in the annual ONS Sustainable Development Indicators report⁵⁵. In general, the health of the population is good for the UK with the healthy life expectancy for both men and women increasing during the period of 2009 to 2011, reaching

⁵⁰ Bristol Water (2016) *Annual Report*, available from http://www.bristolwater.co.uk/wp/wp-content/uploads/2016/03/BW_AnnualReport2016_SPREADS.pdf (accessed February 2017)

⁵¹ ONS (2015) Overview of UK population, 25 June 2015: <http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk-england-and-wales--scotland-and-northern-ireland/mid-2014/sty--overview-of-the-uk-population.html>

⁵² Nomis (2011) *Population Density* [available at: <https://www.nomisweb.co.uk/census/2011/qs102ew> (accessed February 2017)].

⁵³ https://en.wikipedia.org/wiki/List_of_English_districts_by_population_density (accessed February 2017)].

⁵⁴ Population Estimates for UK, England and Wales, Scotland and Northern Ireland, Mid-2015. Office for National Statistics. 23 June 2016 (accessed February 2017).

⁵⁵ ONS (2015). Sustainable Development Indicators: July 2015. Available from: <https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/wellbeing/datasets/sustainabledevelopmentindicators/july2015/sdisjuly2015datasheet28716.xls>

64.2 years for men and 66.1 year for women. Water is considered a vital resource that is managed carefully to ensure both that people have access to affordable and safe drinking water and sanitation.

In the South West, the average life expectancy at birth for the period 2012-14 was 80.2 years for men and 83.9 years for women, compared to 79.5 and 83.2 years respectively for all of England. The region has one of the highest life expectancies across all the English regions and one of the highest proportions of life spent with a persistent illness or disability.

The health of people in the area covered by Bristol Water is very varied and summarised within the 2017 health profiles⁵⁶. Compared with the rest of England, men and women in the South West can expect to live 0.7 years more on average⁵⁷. According to the 2011 Census, 18.5% of the South West's population was classified as having an activity limiting health problem or disability, 0.9 percentage points above the average for England of 17.6%⁵⁸.

Economy

The South West was responsible for 7.7% of the UK's gross value added (GVA) in 2011 at £101.1 billion. More than half of this was produced by the Gloucestershire, Wiltshire and Bristol/Bath area, which includes Swindon. At 23,829 square kilometres, the South West region covers nearly ten per cent of the UK's land mass with almost three quarters of its entire area (1.8 million hectares) devoted to agriculture. There are just over 25,000 commercial 'agricultural holdings' of all shapes and sizes ranging from small family farms to highly sophisticated, multiple thousand acre estates and agri-enterprises.

The proportion of economically active people within the South West region during the period October 2015 to September 2016 was at 80.8%, similar to that of the West of England (Table 3.9)⁵⁹, but marginally higher than the City of Bristol area (79.4%) and Great Britain as a whole (77.8%). Economically active in this context is defined as those persons of working age who are employed or looking to be employed⁶⁰.

⁵⁶ Public Health England (2017) http://fingertips.phe.org.uk/profile/health-profiles/area-search-results/E12000009?search_type=list-child-areas&place_name=South%20West

⁵⁷ Office for National Statistics (2016) *Disability-Free Life Expectancy (DFLE) and Life Expectancy (LE) at birth by Region, England* [available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/datasets/disabilityfreelifeexpectancydfleandlifeexpectancyatbirthbyregionengland> (accessed February 2017)].

⁵⁸ Office for National Statistics (2013) *Disability in England and Wales: 2011 and Comparison with 2001* [available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/disability/articles/disabilityinenglandandwales/2013-01-30> (accessed February 2017)].

⁵⁹ NOMIS (2017) Labour Market Profile - South West <https://www.nomisweb.co.uk/reports/lmp/gor/2013265929/report.aspx>

⁶⁰ Source: NOMIS (2012) *Labour Market Profiles*, available from <https://www.nomisweb.co.uk/reports/lmp/la/contents.aspx> (accessed February 2017)

Table 3.10 Employment and unemployment (Oct 2015 – Sept 2016)

	West of England (numbers)	West of England (%)	South West (%)	Great Britain (%)
Economically active†	596,100	80	80.8	77.8
In employment†	574,400	77	77.3	73.9
Employees†	484,000	65.8	65	63.1
Self-employed†	86,800	10.8	11.9	10.4
Unemployed§	21,700	3.6	4.1	4.9

Source: ONS annual population survey: † - numbers are for those aged 16 and over, % are for those aged 16-64; § - numbers and % are for those aged 16 and over. % is a proportion of economically active

Table 3.11 shows the employee jobs for the West of England by industry. These are generally comparable to percentages for the South West and Great Britain as a whole, although the “Accommodation and food service” percentages are reduced. This may place an additional seasonal burden on water resources during the tourist season.

Table 3.11 Employee jobs (2015)⁶¹

Employee jobs by industry	West of England (employee jobs)	West of England (%)	South West (%)	Great Britain (%)
Mining and quarrying	200	0.0	0.1	0.2
Manufacturing	35,000	6.3	8.9	8.3
Electricity, gas, steam and air conditioning supply	1,750	0.3	0.3	0.4
Water supply; sewerage, waste management and remediation activities	4,500	0.8	0.7	0.7
Construction	26,000	4.7	5.0	4.6
Wholesale and retail trade; repair of motor vehicles and motorcycles	86,000	15.5	17.1	15.8
Transportation and storage	28,000	5.0	4.4	4.7
Accommodation and food service activities	36,000	6.5	8.3	7.2
Information and communication	23,000	4.1	2.9	4.2
Financial and insurance activities	27,000	4.9	3.4	3.6
Real estate activities	8,000	1.4	1.6	1.7
Scientific and technical activities	55,000	9.9	7.9	8.4
Administrative and support service activities	50,000	9.0	7.1	8.9
Public administration and defence; compulsory social security	22,000	4.0	4.1	4.4
Education	52,000	9.4	9.0	9.2

⁶¹ <https://www.nomisweb.co.uk/reports/lmp/lep/1925185566/report.aspx>

Employee jobs by industry	West of England (employee jobs)	West of England (%)	South West (%)	Great Britain (%)
Human health and social work activities	79,000	14.2	14.7	13.3
Arts, entertainment and recreation	11,000	2.0	2.2	2.4
Other service activities	10,000	1.8	1.9	2.0

Notes: % is a proportion of total employee jobs excluding farm-based agriculture
Employee jobs excludes self-employed, government-supported trainees and HM Forces
Data excludes farm-based agriculture

Deprivation

The English Index of Deprivation measures relative levels of deprivation in small areas of England called Lower Layer Super Output Areas (LSOA). The Indices of Deprivation is based on seven different domains⁶² of deprivation:

- ▶ Income Deprivation;
- ▶ Employment Deprivation;
- ▶ Education, Skills and Training Deprivation;
- ▶ Health Deprivation and Disability;
- ▶ Crime;
- ▶ Barriers to Housing and Services; and
- ▶ Living Environment Deprivation.

A map ranking each of the LSOAs within the Bristol Water supply area is shown in **Figure 3.13**. This serves to highlight that there are some significant pockets of deprivation in the West of England, particularly within parts of Bristol (Whitchurch Park ward is within England's most deprived 1 per cent SOAs) and Weston-super-Mare.

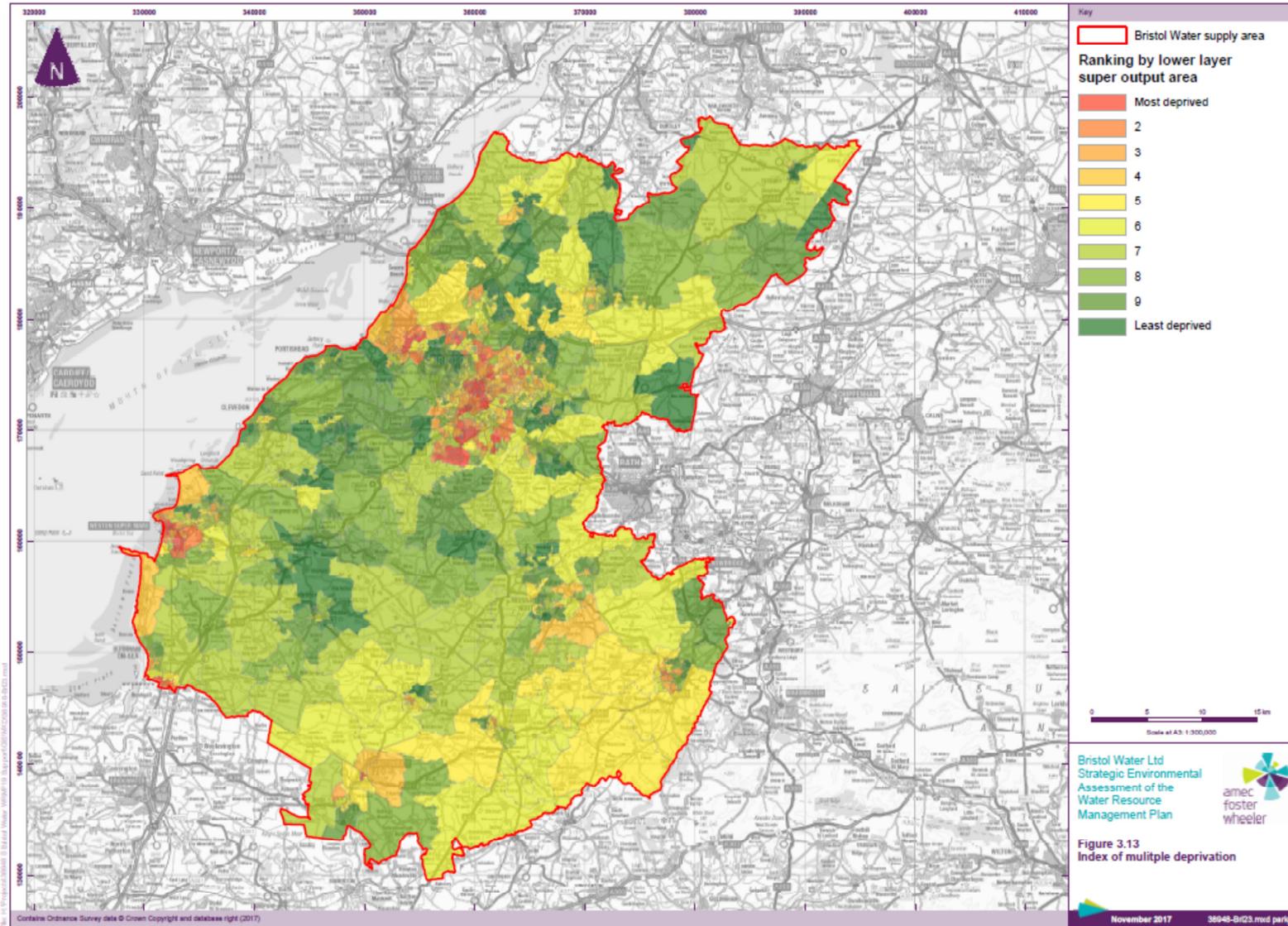
It is estimated that 7.7% (52 out of 678) of all LSOAs in the Bristol Water supply area (Bath and North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council) are in the 10% most deprived LSOAs nationally. The majority of these are within the Bristol City LSOAs⁶³. Severe deprivation is evident in most of the districts that comprise the Bristol Water supply area. Concentrations of LSOAs showing deprivation in the most deprived decile are found in the urban areas in Bristol.

Levels of deprivation, particularly income deprivation, affect the ability of customers to pay for water and may also impact on total water usage.

⁶² Each domain is based on a basket of indicators. As far as is possible, each indicator is based on data from the most recent time point available; in practice most indicators in the Indices of Deprivation 2015 relate to the tax year 2012/13. Combining information from the seven domains produces an overall relative measure of deprivation, the Index of Multiple Deprivation.

⁶³ DCLG (2015) *English indices of deprivation 2015: File 1: index of multiple deprivation* [available at: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015> (accessed February 2017)].

Figure 3.13 Index of Deprivation (2015)



Housing

In 2015, water was supplied by Bristol Water to around 520,000 households. As of the 2011 Census, 67% of the housing stock in the South West was owner (or shared ownership) occupied (very similar to the overall English proportion, 64%), 13% was rented from a social landlord, and 17% was privately rented⁶⁴.

There is expected to be a significant increase in the number of dwellings across the West of England sub-region over the next twenty years. **Table 3.12** provides an overview of annual average and total housing targets based on the provisions contained within emerging and adopted local planning authority Core Strategies. This indicates that nearly 5,000 dwellings are to be provided per annum in the sub-region to 2029, equating to a total of 93,000 units with Bristol expected to accommodate the largest proportion of the sub-region's growth (32.9 per cent) followed by South Gloucestershire (30.6 per cent).

Table 3.12 New Housing Provision across the West of England Sub-Region (2006-2009)

Local Authority	Annual Average Provision of Dwellings	Total Provision of Dwellings*
Bath & North East Somerset	Varies between 463 and 850, av. 650	13,000
Bristol City Council	1,530	30,600
North Somerset	1,050	20,985
South Gloucestershire	1,610	28,550
West of England Total	4,840	93,135

Source: Local Planning Authority (various) Core Strategies (emerging and adopted)

* Period covered by plans is 20 years; however, time over which this period applies varies.

Transport

The South West is easily accessible from the north and the south via the M5 and from the east and from the west via the M4 (the M32 serving the city of Bristol), and the Great Western mainline railway between Paddington to Bristol and South Wales. There is one major regional airport in the region just to the south of Bristol; handled 23 million passengers⁶⁵. Bristol Airport has experienced significant growth with a 3% rise in people passing through the terminal in 2012. The region also has a major seaport, Bristol port, which has a proximity (within 250km) to markets of 67% of the UK population (43 million people)⁶⁶, which handled 8.9 million tonnes of sea freight in 2015⁶⁷.

In the South West, over 7,817 miles (per person per year) were undertaken by all modes of transport (2014/15), which equates to 13% of the total within England and the greatest for all of the regions^{68, 69}.

Although there were 14,894 road casualties in 2015, the South West's roads are safer than the average for England and continue to show a downward trend. Relative to the volume of traffic, the reported casualty rate

⁶⁴ NOMIS (2011) *Tenure* [available at: <https://www.nomisweb.co.uk/census/2011/ks402ew> (accessed February 2017)].

⁶⁵ Department for Transport (2015) *Air traffic by type of service, operator and airport: United Kingdom, 2005-2015 (Table AVI0102b)* [available at: <https://www.gov.uk/government/statistical-data-sets/avi01-traffic-passenger-numbers-mode-of-travel-to-airport> (accessed February 2017)].

⁶⁶ Bristol port website - <https://www.bristolport.co.uk/about-us/bristol-port-company-today>

⁶⁷ Department for Transport (2015) *UK major and minor ports, all freight traffic, by port and direction, annually: 1965 - 2014 (Table PORT0101)* [available at: <https://www.gov.uk/government/statistical-data-sets/tsqb05-maritime> (accessed February 2017)].

⁶⁸ Department for Transport (2016) *Average number of trips (trip rates) by main mode, region and Rural-Urban Classification: England, 2013/14 (Table NTS9903) and Average distance travelled by mode, region and Rural-Urban Classification: England, 2013/14 (Table NTS9904)* [available at: <https://www.gov.uk/government/statistical-data-sets/nts99-travel-by-region-and-area-type-of-residence> (accessed February 2017)].

⁶⁹ Department for Transport (2016) *Proportion of how often and how long adults walk for (at least 10 minutes) by local authority, 2014/15 (Table CW0105) and Proportion of how often and how long adults cycle for by local authority, 2014/15 (Table CW0104)* [available at: <https://www.gov.uk/government/statistical-data-sets/how-often-and-time-spent-walking-and-cycling-at-local-authority-level-cw010> (accessed February 2017)].

was 389 per billion vehicle kilometres, compared with the average of 380 casualties per billion vehicle kilometres across England⁷⁰.

Recreation and Tourism

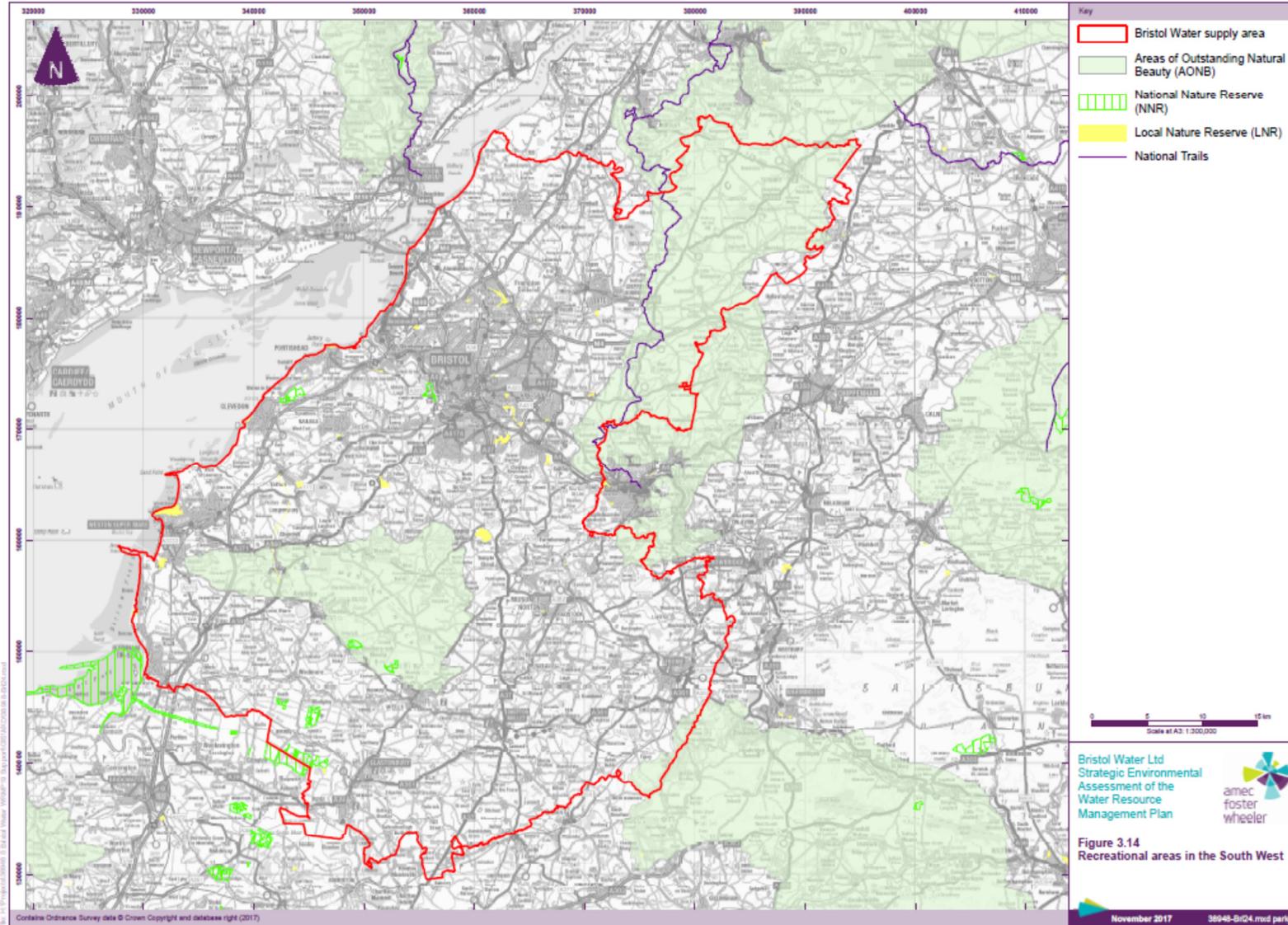
In 2015, 19.7 million UK domestic overnight trips were made to the South West, accounting for 33% of overnight trips in England and generating a total spend of £4.4 billion⁷¹. With specific regard to water resources, large seasonal fluxes in tourist numbers create additional demand on water resources in summer months when demand is already at its highest. Bristol Water owns land and reservoirs in scenic areas of South West England which are publicly accessible for recreational activities.

Figure 3.14 shows some of the areas that may be used for recreation within the area. This includes National Trails, Areas of Outstanding Natural Beauty (AONB) (see Landscape and Visual Amenity topic), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs). Bristol Water's surface water reservoirs are accessible to the public and provide a range of recreation facilities, including bird-watching, walking, sailing or fishing. Some sections of rivers and canals in the area are of particular importance with respect to navigation (e.g. the Kennet and Avon Canal) and angling (e.g. Bristol Harbour).

⁷⁰ Department for Transport (2015) *Reported casualties by region and local authority, England, 2010 - 2014 and 2005-09 average (RAS30038) and Reported casualty rate per billion vehicle kilometres by local authority, England, 2010 - 2014 and 2005-09 average (RAS30040)* [available at: <https://www.gov.uk/government/statistical-data-sets/ras30-reported-casualties-in-road-accidents> (accessed February 2017)].

⁷¹ Visit Britain (2016) *England - All Trip Purposes 2015* [available at: <https://www.visitbritain.org/gb-tourism-survey-2015-overview> (accessed February 2017)].

Figure 3.14 Recreational Areas in the South West



Likely Evolution of the Baseline without the WRMP

- ▶ The population within the Bristol Water supply Area is projected to rise from 5.34 million in 2014 to 5.81 million by 2024 (7 % increase)⁷².
- ▶ There will be a continued and substantial growth in the demand for housing, the number of dwellings completed and the number of households formed.
- ▶ Ofwat has explored the many factors influencing water affordability in two recent reports^{73 74}. Several initiatives are underway to improve the incentives for companies to better meet customers' need in the future.
- ▶ In response to recent studies, access to the recreational resources, green spaces and the historic environment will have greater importance in future planning⁷⁵. For example, the National Ecosystem Assessment and the Marmot Review, *Fair Society, Healthy Lives*, demonstrate the positive impact that nature has on mental and physical health and as a result the Government intends to promote Green Infrastructure Partnerships⁷⁶ with civil society to support the development of green infrastructure in England. Improvements to the quality of the water environment and certain potential climate change impacts will present opportunities for an expanding tourist industry in the region⁷⁷.

Key Sustainability Issues Relevant to the WRMP

The key sustainability issues relevant to the WRMP and the SEA, arising from the analysis of the human environment baseline are:

- ▶ the need to ensure water supplies remain affordable especially for deprived or vulnerable communities, reflecting the importance of water for health and wellbeing;
- ▶ the need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas;
- ▶ the need maintain resilient, reliable public water supplies;
- ▶ the need to ensure water quantity and quality is maintained for a range of uses including tourism, recreation, navigation and other uses such as agriculture;
- ▶ the need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists for access to green infrastructure and the natural and historic environment, as well as protecting and enhancing recreational resources;
- ▶ the need to accommodate an increasing population and local housing growth through provision of essential services including water supply; and
- ▶ sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and wellbeing and the economy.

⁷² ONS (2016) Subnational population projections for England: 2014-based - <http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/subnationalpopulationprojectionsforengland/2014-05-29>

⁷³ Ofwat (2011) Water today, water tomorrow: Affordable for all. How can we help those who struggle to pay their water bills?

⁷⁴ Ofwat (2015) Affordability and debt – 2014-15.

⁷⁵ Defra (2011) The Natural Choice: securing the value of nature, The Natural Environment White Paper

⁷⁶ Green infrastructure is a term used to refer to the living network of green spaces, water and other environmental features in both urban and rural areas.

⁷⁷ Defra (2012) The UK Climate Change Risk Assessment 2012 Evidence Report.

3.8 Material Assets and Resource Use

Baseline Characteristics

Water Demand

Bristol Water supplies nearly 264 million litres of drinking water each day from its 16 water treatment works through over 6,700 kilometres of water mains to customers' taps. Currently, only 46.6% of households are metered although Bristol Water plans to reach a metered household rate of 95% by 2040. It is expected that between 2015 and 2040, average daily water use will decrease from 146 litres per person to 130 litres per person. Consumption is still between the 2015 WRMP forecasts for normal and dry years and is lower than the national average of approximately 150 litres per person per day.⁷⁸

Leakage

Bristol Water has one of the lowest leakage levels in the industry in the UK. Between 2015 and 2040, Bristol Water proposes to reduce water leakage from 18% of the total water supplied to the network to less than 10%. Leakage has been reduced from 45.1 MI/day in 2014/15 to 44.2 MI/day in 2015/16⁷⁹. Reported leakage for the 2016/17 year was 46.4 MI/day following adjustments to the underlying assumptions used to calculate leakage⁸⁰.

Bristol Water is actively pursuing measures to encourage its customers to reduce their water use and use water wisely, particularly in dry conditions. These measures of water efficiency activities help to safeguard essential water supplies.

Water Efficiency

In 2015, Bristol Water generated an estimated 0.50 MI/d in water efficiency savings, by giving out 30,000 free water saving devices. They also help local schools to save water and money through our Eco School Challenge, during which a water audit for the school is carried out, water workshops for the children take place and water-saving devices for teachers and pupils are distributed for them to take home. In 2015/16 five primary schools took part and saved an estimated 18 million litres of water⁸¹.

Energy Use

Bristol Water is a large user of energy due to the energy needed to treat and pump water. Use amounts to almost 80,000 Megawatt hours of electrical energy to treat and distribute water and this accounts for almost 90% of total carbon footprint⁸². The predominant greenhouse gas of interest is carbon dioxide (CO₂). Between April 2015 and March 2016, 42 kilotonnes of CO₂ were produced by Bristol Water, with around 1.4% of its total energy use derived from renewable sources. Bristol Water's carbon emissions figure per megalitre of water supplied was 489 kg/CO₂e/MI in 2012, with plans to reduce emissions to 200kgCO₂e/MI by 2040.

The South West is a relatively high producer and consumer of energy. Total energy consumption in the region was 112.2 terawatt hours in 2014 (Total All Fuels), about 7.6% of the total UK figure. This represents a decrease of 13.5% since 2005, from 129.7 terrawatt hours⁸³.

⁷⁸ Ofwat (2015) *Conserving Water* [available at: <http://www.ofwat.gov.uk/households/conservingwater/> (accessed February 2017)].

⁷⁹ Bristol Water (2016) *Annual Report*, available from http://www.bristolwater.co.uk/wp/wp-content/uploads/2016/03/BW_AnnualReport2016_SPREADS.pdf (accessed February 2017)

⁸⁰ Bristol Water (2017) Annual Performance Report <https://www.bristolwater.co.uk/wp/wp-content/uploads/2016/01/BW-APR-2017-1.pdf>

⁸¹ Source: Bristol Water Annual Report (2016), available from http://www.bristolwater.co.uk/wp/wp-content/uploads/2016/03/BW_AnnualReport2016_SPREADS.pdf (accessed February 2017)

⁸² Bristol Water (2016) *Annual Report*, available from http://www.bristolwater.co.uk/wp/wp-content/uploads/2016/03/BW_AnnualReport2016_SPREADS.pdf (accessed February 2017)

⁸³ Source: BEIS (formerly DECC) (2015) *Sub-National Total Final Energy Consumption Statistics: 2005-2013* [available at: <https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level-2005-to-2010> (accessed February 2017)].

Material Use and Waste Generation

There is an ongoing need for society to reduce the amount of waste it generates by using materials more efficiently and improving the management of waste that is produced. Waste in England going to landfill has more than halved over the period 2004/5 to 2014/15 (19,822 thousand tonnes to 6,361 thousand tonnes); household recycling rates have climbed to nearly 44% (2014/15)⁸⁴; waste generated by businesses declined by 29% in the six years to 2009 and business recycling rates are above 50%⁸⁵. In line with the widely adopted 'waste hierarchy', best practice for waste management is to reduce, re-use, recycle and recover, and only then should disposal (or storage) in landfill be considered.

Data on waste arisings are collected in a range of categories. The activities of the water industry contribute to construction, demolition and excavation waste (CDEW), through construction of new infrastructure. The water industry also contributes to several waste streams through the operation of its treatment facilities. Waste streams include commercial and industrial waste (statistics include waste arisings from the power and utilities sector, which includes water supply and sewage removal), and also hazardous wastes. **Table 3.13** shows waste data according to economic activity in England in 2012.

Table 3.13 Waste generation split by NACE⁸⁶ economic activity in England ('000 tonnes)⁸⁷

Waste Figures ('000 tonnes)	2012	Recycle rate	2014	Recycle rate
Commercial and Industrial ('000 tonnes)	24,240	-	19,849	-
Construction ('000 tonnes)	45,000	91.1 %	49,109	91.4 %
Household ('000 tonnes)	21,956	44.1%	22,355	44.8%
Other (municipal waste)	16,187	-	13,714	-

Currently, 97% of the waste disposed by Bristol Water complies with Environmental Permitting Regulations; a 99% compliance rate is expected by 2040.

Likely Evolution of the Baseline without the WRMP

Bristol Water aims to reduce leakage from its water distribution network over the next 25 years with several schemes planned to support the reduction. Bristol Water's aim is to manage water resources more efficiently in order to improve the reliability of water provision to its customers. To this effect, Bristol Water has set a target to reduce the frequency of restrictions on customer's water use, such as Temporary Use Bans, from 1 in 15 years to 1 in 25 years by 2040.

The Government's national aspiration is to reduce water usage to an average of 130 l/h/day by 2030. Bristol Water aims to achieve such a reduction while increasing household metering to 95% by 2040.

There is the potential for increase in operational waste from the water sector as regional population increases and standards of treatment are increased through regulatory requirements.

With the Waste Strategy for England, diminishing landfill capacity and a fast-growing waste recycling and recovery industry, the proportion of waste sent to recovery rather than landfill is set to continue to increase in

⁸⁴ Defra (2015) Local authority collected waste statistics – local authority data.

www.gov.uk/government/uploads/system/uploads/attachment_data/file/481060/LA_and_Regional_spreadsheet_2014-15_publication ods

⁸⁵ Defra (2011), Government Review of Waste Policy in England 2011

⁸⁶ Statistical classification of economic activities developed by the European Community –Nomenclature of Economic Activities (NACE)

⁸⁷ Defra (2015) UK Statistics on Waste: <https://www.gov.uk/government/statistical-data-sets/env23-uk-waste-data-and-management>

the future. One of the Waste Framework Directive targets is for at least 70% of construction and demolition waste to go to recovery by 2020.

The Government's first National Infrastructure Plan⁸⁸ (NIP) (2010) included a vision to manage natural capital sustainably; treat water and waste in ways that sustain the environment and enable the economy to prosper; ensure a supply of water that meets the needs of households, businesses and the environment now and in the future and deals with waste in accordance with the waste hierarchy. The plan was updated in 2014, setting out progress to date whilst including detailed delivery plans to 2020 in key economic sectors⁸⁹. This was then revised further in the National Infrastructure Delivery Plan⁹⁰, published in 2016, which brought together the government's plans for economic infrastructure over the next 5 years with those to support delivery of housing and social infrastructure. It included information for the water sector.

Key Sustainability Issues Relevant to the WRMP

- ▶ the need to minimise the consumption of resources, including water and energy;
- ▶ the need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill;
- ▶ the need to continue to reduce leakage from the water supply system to help reduce demand for water; and
- ▶ the need to continue to encourage more efficient water use by consumers.

3.9 Cultural Heritage

Baseline Characteristics

Archaeological remains are sensitive to changes in water quality, water levels (for example waterlogged deposits), pollution and land-use practices. Heritage designations for the assessment area are shown in **Figure 3.15**. Nationally important archaeological sites are statutorily protected as Scheduled Monuments (SMs)⁹¹. There are currently around 19,850 entries in the Schedule for the UK⁹². There are approximately 470 SMs located within the assessment area. Registered Parks and Gardens also make up part of the UK's cultural heritage of national importance (49 in the assessment area). An overview of all cultural heritage sites in the study area is provided in **Table 3.14**. Important cultural heritage assets include the Clifton Suspension Bridge, Temple Meads Railway Station and Vanbrugh's Kings Weston House, Westonbirt Arboretum Registered Park and Garden and Battle of Lansdown Hill Registered Battlefield. There are no World Heritage Sites or Protected Wreck Sites within the Bristol Water supply area.

Table 3.14 Heritage assets in the assessment area

Asset	Assessment Area
Scheduled Monuments	470
Listed Buildings	10,276
Registered Historic Parks and Gardens	49
Registered Historic Battlefields	1

⁸⁸ HM Treasury Infrastructure UK (2010) National Infrastructure Plan

⁸⁹ HM Treasury (2014) National Infrastructure Plan 2014:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/381884/2902895_NationalInfrastructurePlan2014_acc.pdf

⁹⁰ Infrastructure and Projects Delivery Agency (2016), National Infrastructure Delivery Plan

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/520086/2904569_nidp_deliveryplan.pdf

⁹¹ Nationally important archaeological sites designated under the Ancient Monuments and Archaeological Areas Act, 1979,

www.culture.gov.uk/historic_environment/scheduled_ancient_monuments/

⁹² Historic England (2015) Heritage counts 2015

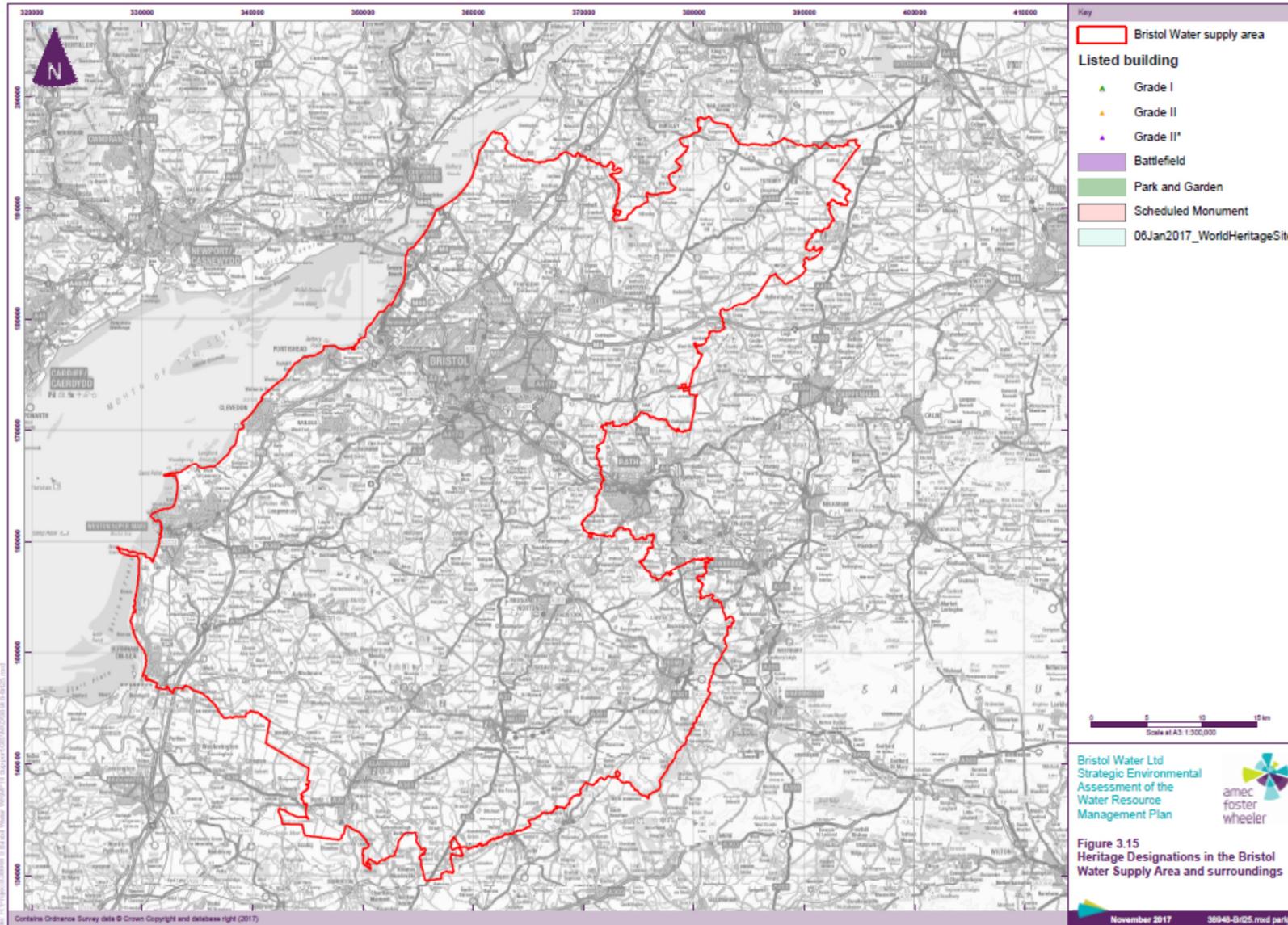
Historic England collects data on buildings at risk. There were 5,534 designated assets on the Heritage at Risk (HAR) register in 2015. 604 were removed from the Register since 2014, and 327 added. One third of sites on the 2010 Register have now been removed from the Register⁹³.

For other types of heritage assets, the long-term trends are not yet firmly established but a very small reduction in the number of sites on the Register between 2009 and 2010 has been reported. The source of risk to Scheduled Monuments resulting from water abstraction or dewatering is 1.71% nationally. However, other assets, such as those composed of organic material and preserved in waterlogged or anaerobic conditions, are proportionately more at risk (e.g. palaeo-environmental deposits).

In relation to unknown assets, waterlogged conditions (e.g. rain or groundwater fed) preserve waterlogged archaeology, such as wooden artefacts and structures such as trackways. In consequence, abstraction levels can be a critical factor in maintaining conditions in which preservation of the assets is viable. In addition, there are waterlogged deposits that are specifically associated with chalk, such as springs and their associated wetlands which again can contain important archaeological information, especially palaeo-environmental evidence. Such water-dependent heritage assets will be considered when assessing potential WRMP options.

⁹³ Source: Historic England (2016) *Heritage At Risk Register*, available from <https://historicengland.org.uk/advice/heritage-at-risk/> (accessed February 2017)

Figure 3.15 Heritage Designations in the Bristol Water supply Area



Likely Evolution of the Baseline without the WRMP

Recent and ongoing national economic difficulties may have a negative effect on removing heritage assets from the heritage at risk register. Climate change could have variable impacts on heritage assets in the future. Some types of assets and landscapes have already experienced and survived significant climatic changes in the past and may demonstrate considerable resilience in the face of future climate change. However, many more historic assets are potentially at risk from the direct impacts of future climate change⁹⁴.

Key Sustainability Issues Relevant to the WRMP

- ▶ the need to conserve or enhance sites of archaeological importance and cultural heritage interest, and their setting, particularly those which are sensitive to the water environment; and
- ▶ the need to protect water-dependent heritage sites during drought conditions.

3.10 Landscape

Baseline Characteristics

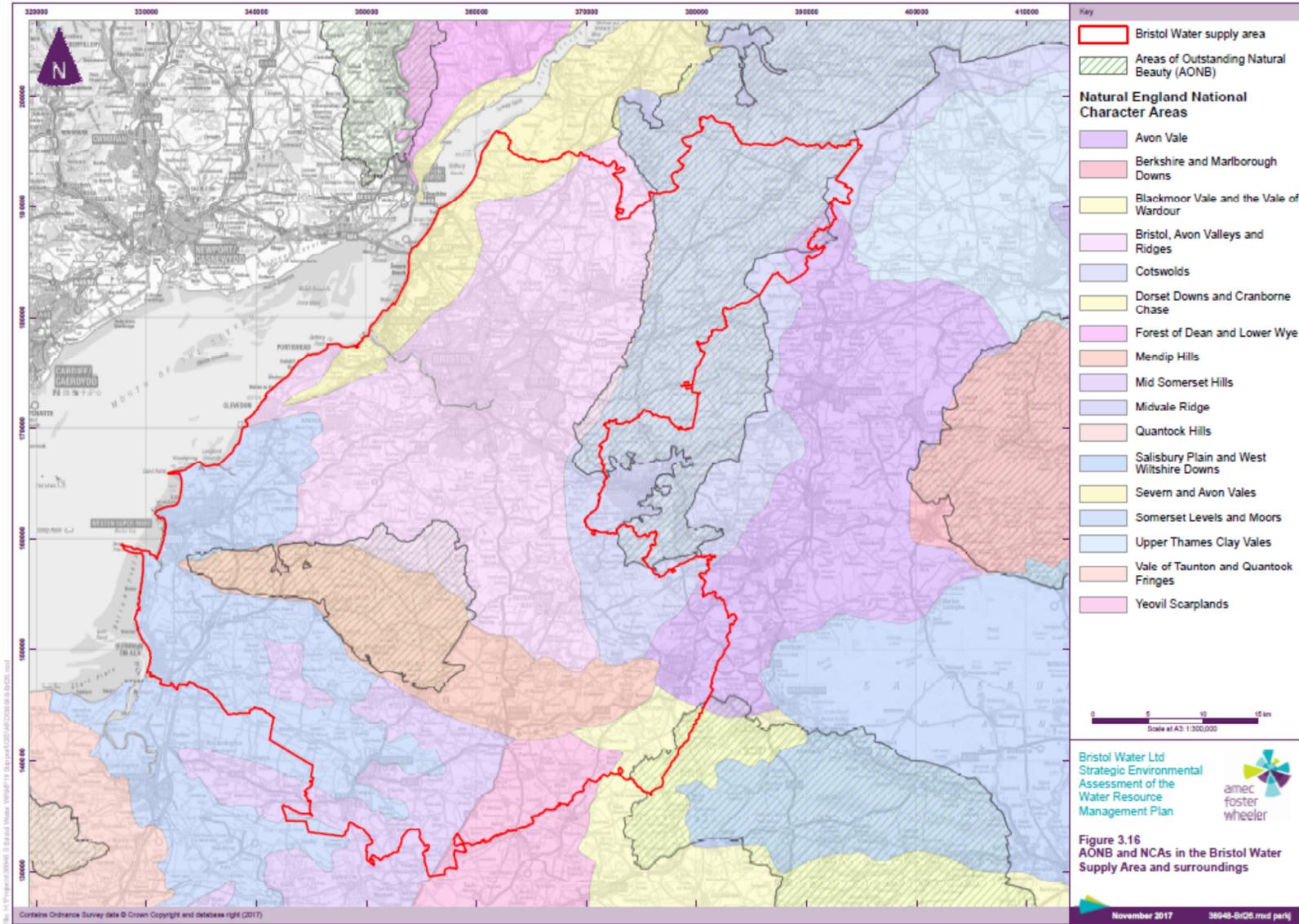
The landscape character network⁹⁵ defines landscape character as 'a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse'. Some landscapes are special because they have a particular amenity value, such as those designated as Areas of Outstanding Natural Beauty (AONB). Others may have an intrinsic value as good examples or be the only remaining examples of a particular landscape type. Some landscapes are more sensitive to development whereas others have a greater capacity to accommodate development. Assessments of landscape character and landscape sensitivity enable decisions to be made about the most suitable location of development to minimise impacts on landscapes. AONBs and Natural England National Character Areas (NCAs) are shown on **Figure 3.16** for the study area.

Implementation of WRMP options has the potential to influence landscape and visual amenity, for example, through effects arising from construction of new infrastructure, the raising of reservoir levels or the abstraction of water affecting existing water levels in rivers.

⁹⁴ English Heritage (2010) Climate Change and the Historic Environment

⁹⁵ www.landscapecharacter.org.uk

Figure 3.16 AONB and NCAs in the Bristol Water supply Area



Nationally Designated Sites

AONBs are defined as 'precious landscapes whose distinctive character and natural beauty are so outstanding that it is in the nation's interest to safeguard them'⁹⁶. They are designated under the National Parks and Access to the Countryside Act, 1949, strengthened by the Countryside and Rights of Way Act, 2000. The primary purpose of the AONB is 'to conserve and enhance the natural beauty of the landscape.' There are 3 AONBs within or partially within the study area:

- ▶ Cotswolds AONB;
- ▶ Mendip Hills AONB;
- ▶ Cranborne Chase and West Wiltshire Downs AONB.

The main characteristic of Green Belt land is its openness and permanence. The main aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open. The Green Belt therefore aims to check the unrestricted sprawl of large built-up areas; prevent neighbouring towns merging into one another; assist in safeguarding the countryside from encroachment; preserve the setting and special character of historic towns; and assist in urban regeneration while encouraging the recycling of derelict and other urban land.

Natural England National Character Areas and Heritage Coasts

Natural England National Character Areas also take account of landscape (also referred to in the Biodiversity, Flora and Fauna topic). These are shown geographically in **Figure 3.15** and they are listed within **Table 3.15** which also summarises the key features⁹⁷.

Table 3.15. Landscape Character Areas within the SEA Assessment Area

LCA	Key Features
Severn and Avon Vales	Diverse range of flat and gently undulating landscapes, united by broad river valley character; Riverside landscapes with little woodland, often very open. Variety of land uses from small pasture fields and commons in the west to intensive agriculture in the east; Distinct and contrasting vales: Evesham, Berkeley, Gloucester, Leadon, Avon; Many ancient market towns and large villages along the rivers; Nucleated villages with timber frame and brick buildings; Prominent views of hills - such as the Cotswolds, Bredon and the Malverns - at the edges of the character area.
Bristol, Avon Valleys and Ridges	A landscape of very mixed landform, geology and settlement pattern, strongly influenced by the Avon Valley, Bristol at its centre and by its industrial history; Low-lying, shallow valleys which contrast with limestone ridges and scarps; Frequent large villages, small towns and major conurbations but also undisturbed rural areas; Wooded scarps - with ancient woodland - and high, open, downland ridges; Legacy of coal industry evident in tips, settlement patterns and reclaimed areas; Waterside mills and other features of former rural industries; Frequent parks, mansions and manor houses.
Mendip Hills	A chain of prominent limestone hills extending inland from the coast and rising up sharply from surrounding lowlands; An open, largely treeless, limestone plateau with karst features, cave systems, dry stone walls and sparse settlement; Dramatic gorges, cliffs and escarpment slopes around the plateau; A sharp contrast between the open plateau and steep escarpment slopes of the karst landscape and the more complex, gentler landforms in the east; Many industrial archaeological sites reflecting the lead, coal and cloth industries; Perpendicular church towers;

⁹⁷ Source: Natural England (undated) *National Character Areas: South West*, available from <http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/southwest.aspx> (accessed February 2017)

LCA	Key Features
	Country houses in the east with wooded parks; Buildings in local stone with pantile roofs: stones include grey limestone, reddish dolomitic limestone and grey or honey-coloured oolitic limestone; Outstanding prehistoric ritual landscapes.
Somerset Levels and Moors/ Mid Somerset Hills	Flat, open landscape of wet pasture, arable and wetland divided up by wet ditches or 'rhynes'; Absence of dispersed farmsteads or any buildings on levels and moors. Nucleated settlements on ridges/islands; Surrounded, and divided up, by low hills, ridges and islands which form distinctive skylines; Peat working and nature reserves contrasting with the rectilinear planned landscape of the Moors; Dramatic and prominent hills such as Brent Knoll, the Isle of Avalon and Barrow Mump, rising above the Levels and Moors; Sparse tree cover on Levels and Moors contrasting with woodland, hedges and orchards of surrounding hills; Sparsely populated Moors but settlements common on hills, ridges and islands; Historic landscape strongly evident in features ranging from prehistoric trackways and lake villages to post-medieval enclosures and peat working; International nature-conservation significance for wetland, waders and waterfowl; Narrow dune belt fringing Bridgwater Bay; Raised rivers and levees, with main roads and causeways flanked by houses. Flooding in winter over large areas.
Cotswolds	Defined by its underlying geology: a dramatic scarp rising above adjacent lowlands with steep combs, scarp foot villages and beech woodlands; Rolling, open, high wold plateaux moulded by physical and human influences, with arable and large blocks of woodland, divided up by small, narrow valleys; Incised landscapes with deep wide valleys; Flat, open dip slope landscape with extensive arable farmland; Prominent outliers within the lowlands; Honey-coloured Cotswold stone in walls, houses and churches; Attractive stone villages with a unity of design and materials.

A Heritage Coast is a section of coast exceeding one mile in length that is of exceptionally fine scenic quality, substantially undeveloped and containing features of special significance and interest. They are agreed between Natural England and the local authority. There are no Heritage Coast areas in the Bristol Water's supply area.

Tranquillity Areas

'Tranquillity' can be defined as the quality of calm that is experienced by people in places full of the sights and sounds of nature. The Campaign for Rural England (CPRE) developed tranquillity mapping for England to identify areas that are either disturbed or undisturbed by urban areas (towns and cities), traffic (road, rail and airports), power stations, pylons, power lines and open-cast mines⁹⁸. Effects on tranquil areas will be considered when assessing the WMRP options.

Likely Evolution of the Baseline without the WMRP

With the pressures for housing in parts of the assessment area, there are likely to be some threats to visual amenity more broadly beyond designated landscape areas (including within Green Belt). Climate change and land use change (e.g. due to agricultural reform associated with the UK's exit from the EU and Common Agricultural Policy) may also, in the longer term, lead to changes to landscape character.

Key Sustainability Issues Relevant to the WMRP

- ▶ the need to protect and improve the natural beauty of the area's AONBs and other areas of natural beauty; and
- ▶ the need to protect and improve the character of landscapes and townscapes.

⁹⁸ CPRE tranquillity mapping for England: <http://www.cpre.org.uk/what-we-do/countryside/tranquil-places>

3.11 Summary of Key Sustainability Issues

A summary of the key issues identified by the policies, plans and programmes review (Section 2) and the baseline data review (this section) is presented in **Table 3.16**. These key issues have been used to develop the SEA objectives in Section 4.

Table 3.16 Summary of the key sustainability issues identified for the SEA

SEA Topic	The key sustainability issues arising from the review of the plans, programmes and policies and baseline
Biodiversity, flora and fauna	<ul style="list-style-type: none"> The need to protect and enhance sites designated for nature conservation. The need to protect and enhance non-designated sites. The need to take opportunities to improve connectivity between fragmented habitats to create functioning habitat corridors and to improve the resilience of habitats. The need to continue to increase and improve the condition of priority habitats and habitats of priority species, and restore populations of these species and other specially protected species. The need to avoid activities likely to cause irreversible damage to natural heritage. The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services. The need to prevent the spread/introduction of invasive non-native species. The need to recognise the importance of allowing wildlife to adapt to climate change.
Geology, land use and soils	<ul style="list-style-type: none"> The need to maintain or improve the quality of soils/agricultural land. The need to protect and enhance sites designated for their geological interest. The need to maintain and enhance soil function and health. The need to make use of PDL, and to reduce the prevalence of derelict land. The need to manage land more holistically at the catchment level, benefiting landowners and other stakeholders, the environment and sustainability of natural resources.
Water	<ul style="list-style-type: none"> The need to further improve the quality of the region's river, estuarine and coastal waters taking into account WFD objectives. The need to maintain the quantity and quality of groundwater resources taking into account WFD objectives. The need to ensure the risk of flooding is not increased, and options for flood avoidance and resilience are investigated. The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters. The need to ensure sustainable abstraction to protect the water environment and meet society's needs for a resilient water supply. The need to ensure that people understand the value of water.
Air Quality and climate	<ul style="list-style-type: none"> The need to minimise emissions of pollutant gases and particulates and enhance air quality. The need to reduce the need to travel and promote sustainable modes of transport. The need to reduce greenhouse gas emissions arising from implementation of the WRMP. The need to take into account, and where possible adapt to, the potential effects of climate change. The need to increase environmental resilience to the effects of climate change.
Human Environment	<ul style="list-style-type: none"> The need to ensure water supplies remain affordable especially for deprived or vulnerable communities, reflecting the importance of water for health and wellbeing. The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas. The need to maintain a resilient, reliable public water supplies. The need to ensure water quantity and quality is maintained for a range of uses including tourism, recreation, navigation and other uses such as agriculture. The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists for access to green infrastructure and the natural and historic environment, as well as protecting and enhancing recreational resources. The need to accommodate an increasing population and local housing growth through provision of essential services including water supply. Sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and wellbeing and the economy.
Material assets and resource use	<ul style="list-style-type: none"> The need to minimise the consumption of resources, including water and energy. The need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill. The need to continue to reduce leakage from the water supply system to help reduce demand for

SEA Topic	The key sustainability issues arising from the review of the plans, programmes and policies and baseline
	<p>water.</p> <ul style="list-style-type: none"> The need to continue to encourage more efficient water use by consumers.
Archaeology and cultural heritage	<ul style="list-style-type: none"> The need to conserve or enhance sites of archaeological importance and cultural heritage interest, and their setting, particularly those which are sensitive to the water environment. The need to protect water-dependent heritage sites during drought conditions.
Landscape and visual	<ul style="list-style-type: none"> The need to protect and improve the natural beauty of the area's AONBs and other areas of natural beauty. The need to protect and improve the character of landscapes and townscapes.

3.12 Limitations of the Data and Assumptions Made

The data collated and presented for the baseline builds upon work undertaken for the previous Environmental Report for WRMP14, and the draft drought plan 2017, and have been updated where appropriate. However, in some cases no updated information is available and the original datasets have been re-presented.

The information used has been sourced, so far as is possible, from the most recent datasets available utilising a wide range of authoritative and official sources. It is important to acknowledge that there are variable time lags between raw data collection and its publication. Consequently, at the time of this Environmental Report's publication, the baseline or predicted future trends may have varied from those described above.

4. Approach to the Assessment

4.1 Introduction

This section describes the scope of, and approach to, the SEA of the WRMP. In particular, it draws on the information contained in Sections 2 and 3 to develop the assessment framework and sets out how this framework will be used to support the assessment of water resources management options.

4.2 Scope of the Assessment

The aim of SEA is to identify, describe and evaluate the likely significant effects of implementing the WRMP on the environment. Annex I of the SEA Directive and Schedule 2 of the SEA regulations require that the assessment includes information on the “*likely significant effects on the environment, including on issues such as: biodiversity; population; human health; fauna; flora; soil; water; air; climatic factors; material assets; cultural heritage, including architectural and archaeological heritage; landscape; and the inter-relationship between the issues referred to*”.

The key policy objectives identified from the review of other plans and programmes relevant to the assessment of the WRMP (**Section 2.3**) and the economic, social and environmental issues arising from the analysis of the baseline (**Section 3.11**), together with the characteristics of the potential water management options, have been used to define the scope of the assessment. In **Table 4.1**, each of the 12 SEA topic areas is considered in turn, with justification provided for scoping out the topic areas where relevant.

Table 4.1 Basis for Scoping Out Topic Areas from the SEA

SEA Topic Area	Included in WRMP SEA?	Justification for Scoping the Topic Out of the SEA
Biodiversity	Yes	Included within SEA framework
Population	Yes	Included within SEA framework
Human Health	Yes	Included within SEA framework
Fauna	Yes	Included within SEA framework
Flora	Yes	Included within SEA framework
Soils	Yes	Included within SEA framework
Water	Yes	Included within SEA framework
Air	No	<p>Some of the feasible options (predominantly the supply side options) will involve the construction of new infrastructure which, during the construction phase, will result in an increase in vehicle movements and on-site construction plant operation and an associated effect on air quality from emissions, and potential effects on air quality from dust. However, these effects will be localised, intermittent and limited to the duration of the construction phase, as there will be no effects on air quality during the operational phase. There are also standard, best practice mitigation measures that it is assumed will be implemented to minimise any adverse air quality effects during construction.</p> <p>The majority of the demand side and leakage measures will not have any impact on air quality, with only limited, short term effects expected from mains replacement to reduce leakage – again due to an increase in vehicle movements and dust from excavation of the network to target specific leaks. At any one location, excavations would typically only last 1-2 days.</p> <p>For the reasons presented above, effects on air quality are not considered likely to be significant and therefore are not material to the SEA of the WRMP and it is proposed to scope this topic out of the assessment.</p>

SEA Topic Area	Included in WRMP SEA?	Justification for Scoping the Topic Out of the SEA
Climatic factors	Yes	Included within SEA framework
Material assets	Yes	Included within SEA framework
Cultural Heritage	Yes	Included within SEA framework
Landscape	Yes	Included within SEA framework

In consequence, the SEA topic ‘Air’ has been scoped out of the assessment. The primary reason for its exclusion is that any air quality effects arising from the feasible options are likely to be as a result of the construction of new infrastructure or the replacement of the existing supply network and therefore will be localised, temporary, limited in duration and can be effectively mitigated by implementing standard best practice measures. This is also consistent with the approach taken to the SEA of the 2014 WRMP.

4.3 Assessment Framework

Establishing appropriate SEA objectives and guide questions is central to assessing the effects of the WRMP on the environment. Each of the water management options that make up the final proposed planning solution in the WRMP have been assessed against the objectives to determine the scale and significance of the effect. By assessing each option against the objectives, it is more apparent where the WRMP will contribute to sustainability, where it might have a negative effect and where enhancements could be made.

The SEA objectives and guide questions developed as part of the SEA of the 2014 WRMP provided the basis for the proposed assessment framework that was presented in the Scoping Report as they had already been subject to extensive consultation with the statutory SEA bodies. These existing SEA objectives and guide questions have, however, been reviewed to take into account the key policy objectives and messages derived from the review of plans and programmes (**Section 2.3**) and the key socio-economic and environmental issues derived from the baseline analysis (**Section 3.10**).

A number of further amendments to the assessment framework presented in the Scoping Report were made in light of comments received from statutory consultees. A summary of the scoping consultation is provided in **Appendix C**. The final assessment framework is presented in **Table 4.2**. The performance of each of the feasible, preferred and revised preferred options has been assessed against the 12 SEA objectives to ensure that each option is appraised in a robust and consistent manner

Table 4.2 Assessment Framework for the WRMP

Topic Area	SEA Objective	Guide Questions
Biodiversity	1. To protect and enhance biodiversity, key habitats and species, working within environmental capacities and limits.	<i>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</i>
		<i>Will the option protect and enhance non-designated sites and local biodiversity?</i>
		<i>Will the option provide opportunities for new habitat creation or restoration and link existing habitats as part of the development process?</i>
		<i>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</i>
		<i>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</i>
		<i>Will the option prevent the spread/introduction of invasive non-native</i>

Topic Area	SEA Objective	Guide Questions
		<i>species?</i>
Geology, Land Use and Soils	2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.	<i>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</i>
		<i>Will the option utilise previously developed land?</i>
		<i>Will the option protect and enhance protected sites designated for their geological interest and wider geodiversity?</i>
		<i>Will the option minimise the loss of best and most versatile agricultural land?</i>
		<i>Will the option minimise conflict with existing land use patterns?</i>
		<i>Will the option minimise land contamination?</i>
Water - Quantity	3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.	<i>Will the option minimise the demand for water resources?</i>
		<i>Will the option result in changes to river flows?</i>
		<i>Will the option result in changes to groundwater levels?</i>
Water - Quality	4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.	<i>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</i>
		<i>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</i>
		<i>Will the option support the achievement of protected area objectives?</i>
		<i>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</i>
		<i>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</i>
Water – Flood Risk	5. To reduce the risk of flooding.	<i>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</i>
		<i>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</i>
		<i>Will the option be at risk of flooding now or in the future?</i>
Climate Change	6. To limit the causes and potential consequences of climate change.	<i>Will the option reduce or minimise greenhouse gas emissions?</i>
		<i>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</i>
		<i>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</i>
		<i>Will the option increase environmental resilience to the effects of climate change?</i>
Human Environment - Health	7. To ensure the protection and enhancement of human health.	<i>Will the option ensure the continuity of a safe and secure drinking water supply?</i>
		<i>Will the option affect opportunities for recreation and physical activity?</i>
		<i>Will the option maintain surface water and bathing water quality within statutory standards?</i>

Topic Area	SEA Objective	Guide Questions
		<i>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</i>
Human Environment - Social and Economic Well-Being	8. To maintain and enhance the economic and social well-being of the local community.	<i>Will the option ensure sufficient infrastructure is in place for predicted population increases?</i>
		<i>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</i>
		<i>Will the option help to meet the employment needs of local people?</i>
		<i>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</i>
		<i>Will the option improve access to local services and facilities (e.g. sport and recreation)?</i>
		<i>Will the option contribute to sustaining and growing the local and regional economy?</i>
		<i>Will the option avoid disruption through effects on the transport network?</i>
		<i>Will the option be resilient to future changes in resources (both financial and human)?</i>
Material Assets and Resource Use - Water Resources	9. To ensure the sustainable and efficient use of water resources.	<i>Will the option lead to reduced leakage from the supply network?</i>
		<i>Will the option improve efficiency in water consumption?</i>
Material Assets and Resource Use – Waste and Resource Use	10. To promote the efficient use of resources.	<i>Will the option seek to minimise the demand for raw materials?</i>
		<i>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</i>
		<i>Will the option encourage the use of sustainable design and materials?</i>
		<i>Will the option reduce or minimise energy use?</i>
Cultural Heritage	11. To conserve and enhance cultural and historic assets.	<i>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings</i>
		<i>Will the option avoid or minimise damage to archaeologically important sites?</i>
		<i>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</i>
		<i>Will the option affect public access to, or enjoyment of, features of cultural heritage?</i>
Landscape	12. To conserve and enhance landscape character.	<i>Will the option avoid adverse effects on, and enhance where possible, protected/designated landscapes (including woodlands) such as National Parks or AONBs?</i>
		<i>Will the option protect and enhance landscape character, townscape and seascape?</i>
		<i>Will the option affect public access to existing landscape features?</i>
		<i>Will the option minimise adverse visual impacts?</i>

4.4 Assessment Methodology

The SEA has used a three stage process to assess the effects of the draft and revised draft WRMP. The first stage is a high level assessment of all feasible (constrained) water management options (including supply side, demand side and leakage options) against the 12 SEA assessment objectives outlined in **Table 4.3** with the findings presented in a summary matrix. The second stage is a more detailed assessment (where information permits) of the preferred options identified in the draft WRMP. For this stage, the potential effects (positive, negative or neutral) and the significance of the effects of each of the preferred options against each of the SEA objectives has been recorded, along with commentary setting out the reasons for the assessment results, any assumptions and uncertainties and, where appropriate, potential mitigation measures. The third stage is an assessment of the revised preferred options that, in combination, form Bristol Water’s final proposed programme of options using the same assessment matrix as for stage two. Each stage is described in more detail below.

Feasible (Constrained) Options

Both the construction and operational effects of each feasible (constrained) option have been assessed against all of the SEA objectives. This approach recognises that many of the options under consideration are likely to be very different in nature in their construction and operational phases. For example, whilst metering options will involve vehicle movements during the construction phase, construction activity will be limited (with works being undertaken within properties). Conversely, supply-side options are likely to involve more substantial construction works potentially including new above ground infrastructure.

A matrix similar to that shown in **Table 4.3** has been used to capture the assessment of each option in a consistent manner. A key to the meaning of the symbols is presented in **Table 4.4**.

Table 4.3 Feasible (Constrained) Options Assessment Matrix

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	Etc...
Option Name	Construction	--	-	0	-	0	--/?	
	Operation	--/?	0	0	-	0	--	
Construction								
<i>A description of the likely significant effects of the option on the SEA objectives during construction is included here.</i>								
Operation								
<i>A description of the likely significant effects of the option on the SEA objectives during operation is included here.</i>								

Table 4.4 Qualitative Scoring System

Score	Description	Symbol
Significant Positive Effect	Significant positive effect of the Water Resources Management Plan option on this objective	++

Score	Description	Symbol
Minor Positive Effect	Positive effect of the Water Resources Management Plan option on this objective	+
Neutral	Overall neutral effect of the Water Resources Management Plan option on this objective	0
Minor Negative Effect	Negative effect of the Water Resources Management Plan option on this objective	-
Significant Negative Effect	Significant negative effect of the Water Resources Management Plan option on this objective	--
No Relationship	There is no clear relationship between the Water Resources Management Plan option and the achievement of the objective or the relationship is negligible.	~
Uncertain	The Water Resources Management Plan option has an uncertain relationship to the objective or the relationship is dependent on the way in which the aspect is managed. In addition, insufficient information may be available to enable an assessment to be made.	?
Mixed Effect	Mixed positive and negative effect of the Water Resources Management Plan option on this objective	+/-

To ensure a consistent approach to interpreting the significance of effects and to help the reader understand the decisions made in the assessment, a series of quantitative and semi-quantitative 'thresholds' have been defined (shown in **Appendix D**) to provide direction on what constitutes a significant effect. These have been employed for both the assessment of the feasible options and preferred options.

The feasible options have been assessed based on the nature of the effect, its timing and geographic scale, the sensitivity of the human or environmental receptor that could be affected, and how long any effect might last. Where relevant, other information and assessment provided by Bristol Water (e.g. to inform any quantification of embodied and operational carbon) have been referenced as appropriate.

Preferred Programme of Options

The feasible (constrained) options assessments, along with a range of other assessments, enabled Bristol Water to make an informed choice on which options to take forward as the preferred programme of option(s) that are included in the draft WRMP. The preferred options were then be subject to more detailed appraisal with the results recorded in a matrix similar to that shown in **Table 4.5**.

Table 4.5 Preferred Option Assessment Matrix

Objective	Guide Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species, working within environmental capacities and limits.</p>	<ul style="list-style-type: none"> Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)? Will the option protect and enhance non-designated sites and local biodiversity? Will the option provide opportunities for new habitat creation or restoration and link existing habitats as part of the development process? Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity? Will the option protect, and enhance where appropriate, coastal and marine habitats and species? Will the option prevent the spread/introduction of invasive species? 	-	0	<p>Effects of Construction <i>A description of the likely significant effects of the option on the SEA objective during construction will be included here.</i></p> <p>Effects of Operation <i>A description of the likely significant effects of the option on the SEA objective during operation will be included here.</i></p> <p>Mitigation <i>Mitigation and enhancement measures will be outlined here.</i></p> <p>Assumptions <i>Any assumptions made in undertaking the assessment will be listed here.</i></p> <p>Uncertainties <i>Any uncertainties encountered during the assessment will be listed here.</i></p>
Etc...	<ul style="list-style-type: none"> 			

The commentary section of the matrices provides justification for how the assessment was reached (including, where relevant, why the assessment scoring differs from the assessment of the option as a feasible option) and includes consideration of the following:

- ▶ the nature of the potential effect (what is expected to happen);
- ▶ the timing and duration of the potential effect (e.g. short, medium or long term);
- ▶ the geographic scale of the potential effect (e.g. local, regional, national);
- ▶ the location of the potential effect (e.g. whether it affects rural or urban communities, or those in particular parts of the supply area);
- ▶ the potential effect on vulnerable communities or sensitive habitats;
- ▶ the reasons for whether the effect is considered significant;

- ▶ the reasons for any uncertainty, where this is identified; and
- ▶ the potential to avoid, minimise, reduce, mitigate or compensate for the identified effect(s) with evidence (where available).

The commentary section also includes details of any assumptions made during the assessment, uncertainties encountered and further measures that could mitigate adverse effects and enhance positive effects.

The revised preferred options were subject to the same more detailed assessment process with the results recorded in a matrix similar to that shown in **Table 4.5**.

4.5 Secondary, Cumulative and Synergistic Effects

The SEA regulations require that the cumulative effects of a plan or programme are taken into account. This includes the cumulative effects of the revised draft WRMP in combination with other plans and programmes.

The cumulative assessment considers the in-combination effects of the revised preferred options, planned to be implemented within the plan period 2020 to 2025. However, there is also the need for a cumulative assessment of the options that are likely to proceed over a longer time frame i.e. from 2025 onwards. This would necessarily be a high level assessment given the uncertainties around which other options would be implemented beyond 2025, and future unforeseen changes in the baseline environmental conditions.

The cumulative assessment considers the impact of the revised preferred option(s) set out in the revised draft WRMP with those in other relevant plans and programmes identified in Section 2. It is anticipated that the greatest potential for cumulative impacts will be from other water company WRMPs, especially where there is the potential for transfers between water company supply areas; e.g. Wessex Water and Severn Trent Water; and from other Bristol Water plans, such as the Drought Plan. As Bristol Water operates one WRZ there will be no requirement to undertake an assessment of the cumulative impacts of options within different WRZs.

4.6 Difficulties Encountered

Quantitative information provided for each option (estimates of land take, yield value, deployable output, capital investment, duration and carbon emissions) have been provided to Wood by Bristol Water. These estimates have been reviewed as part of the assessment and have been assumed to be current and correct.

In undertaking the detailed assessments of feasible, preferred and revised preferred options it has been necessary to make some assumptions. An example of this is the use of embodied carbon estimates as a proxy for the amount of construction materials used in each option. Any assumptions made have been captured in the detailed options assessments.

Reflecting the strategic nature of the WRMP and SEA, for some supply side options exact site locations and pipeline routes are approximated at this stage whilst the final design of new infrastructure is unknown. However, the assessments of feasible, preferred and revised preferred options have been based on the best available information provided by Bristol Water and any assumptions used in the assessment have been highlighted where appropriate. For some option types (e.g. leakage options), the location of works are not known at this stage and would (if taken forward) be subject to more detailed analysis during the implementation of the WRMP. In consequence, effects on some objectives such as biodiversity are uncertain for these options. Where this is the case, the assessment has reflected this uncertainty.

In undertaking detailed options assessments, where appropriate, impacts have been assessed in the short, medium and long term. In undertaking these assessments it should be noted that “short, medium and long term” relate to the date that option would be implemented, allowing comparison between options. For example, although an option may be identified as being required in the latter stages of the planning period, say 2042 (i.e. in the longer term), the short-term impacts of that option would occur from 2042.

5. Assessment of Feasible Options

5.1 Introduction

Bristol Water has one WRZ for the Company's whole supply area, within which all available resources are shared and all customers experience the same risk from any shortage of water. Bristol Water has identified a total of 21 feasible options for potential consideration in this WRZ. This includes six customer demand options, six production options, six resource options and three distribution options.

All of the options have been assessed using the framework and approach set out in **Section 4** to identify the likely environmental effects. A summary of the results of the assessment, by WRZ, are set out in this section with the full assessments contained in **Appendix E**.

5.2 Description of the Feasible Options

A brief description of each of the feasible options and their estimated yield is shown in **Table 5.1**.

Table 5.1 Descriptions of Feasible Options

Option Number	Option Name	Yield (MI/d)	Description
Customer Demand			
C26-01	Enhanced water efficiency communications campaign (different messages for different seasons)	0.08	This option includes enhanced water efficiency communication campaigns within the local community for different seasons, for example during the summer months and periods of peak demand. The concept of this option is to vary the message of water efficiency to reduce the risk of customers becoming desensitised to the message. It is assumed that all communications are via the internet, customer magazine and local events.
C26-02	Water efficiency on different key stages (primary, secondary, further and higher education)	0.06	This option involves working in partnership with schools to promote water efficiency, undertaken for the different key stages. The aim is that education regarding water efficiency starts at an early age and therefore will result in long term demand savings. It is assumed that 40 school visits would be made each year, reaching 30 students per visit. The work would be undertaken by three full time employees.
C26-03	Household water efficiency devices installation programme	0.27	This option involves household audits and a programme of installation of water efficiency devices such as fitting of showers, low flow shower heads, cistern displacement, low flush toilets, dual flush toilets, timing devices, water butts, flush controllers for urinals, trigger nozzles for hoses, timing devices, fitting people detectors, spray taps and water efficient taps. The activity associated with installation will be within a property and will not result in construction of new infrastructure outside of customer properties. It is assumed that 35,000 properties would be targeted with a 20% uptake up which equates to 7,000 properties and a yield of 0.27 MI/d.
CO8	Selective metering of domestic customers based on high consumption e.g. sprinkler use and/or zones of high demand.	0.57	This option involves selective metering of all customers with a large water consumption, e.g. large gardens or swimming pools and/or areas of high demand, with the assumption that the largest users of water will be targeted first. It is estimated that up to 2,000 domestic properties would be targeted per annum over a 5 year period (up to 10,000 properties overall). On average, operation of this scheme would result in a 15% reduction in total demand (50 litres per property per day), equivalent to a yield of 0.57 MI/d. It should be noted that this option has been assessed on the basis that the estimated averages will be met; however, effects would be smaller if a reduced volume of meters are installed.

Option Number	Option Name	Yield (MI/d)	Description
C12	Enhanced promotion of free water meters to unmeasured households beyond the promotion assumed in baseline demand forecast.	0.57	This option involves the enhanced promotion of free water meters to unmeasured households beyond the promotion assumed in the baseline demand forecast. The option should promote additional uptake of metering and therefore additional water savings.
C20	Installation of rainwater harvesting in new build households and non-households.	0.03	This option would involve the installation of rainwater harvesting systems in new build households (500 properties over AMP7) where installation activity would be within property development sites.
Production			
P01-01	Increase performance of existing sources (P01-01R) to increase deployable output to near licensed volume.	1.7	This option would maximise the yields from existing operational sources at P01-01R WTW which is currently constrained by the performance of the membrane plants. The existing pipeline would be utilised but upgrade and refurbishment of the existing WTW, as well as the decommissioning and removal of obsolete equipment including the pressurised membrane system, would be required. In addition, there would be a requirement for a building extension and to install building services (ventilation and insulation) at the site.
P01-02	Increase performance of existing sources (P01-02R) to increase deployable output to near licensed volume.	2.6	This option would involve the maximisation of the yield to near licensed volume from an existing operational source at P01-02R (which is currently constrained by the performance of the membrane plants). The key works are likely to include: decommissioning and removal of obsolete equipment including the pressurised membrane system; building extension and building services (to include building ventilation and insulation); new Boll prefiltration (300 µm); installation of submerged membranes; refurbishment/modification of control and telemetry systems as required to integrate new works; condition survey of retained existing structures and repair/renovation as required; and replacement of gas chlorine with on-site electrolytic chlorination (OSEC). Other than the upgraded treatment processes at the site, no further infrastructure requirements are expected as the pipe network already exists.
P06	Catchment Management of the Mendip Lakes (Chew, Blagdon and Cheddar) to manage outage risk from algal blooms.	0.39	This option would improve outage risk of Blagdon and Chew Valley reservoirs which currently suffer from high algal counts, which at times affect production at P17R, P16R and P10R. Both reservoirs are part of catchment management schemes to reduce phosphorus levels, currently funded for AMP6 but not necessarily longer term; catchment schemes require long term funding in order to be effective. The option would include implementation of the catchment grant scheme to support farms investing in improved infrastructure to aid clean and dirty water separation, storage of slurry, effluent and manures. Also, advice and support towards management to reduce diffuse pollution risk, such as cultivation of over-wintering cover crops after maize, and use of an integrated manures and fertiliser management plan would be provided. A reduction in nutrients is expected to reduce algal blooms and therefore reduce the outage risk at P17R, P16R and P10R.
P08	P08R Water Treatment Works (WTW) (increased production).	2.0	This option would involve increasing the present production of P08R WTW (5 MI/d) in order to produce 7 MI/d of potable water. The proposed scheme would require the modification of P08R WTW's UV treatment process which would include the replacement of current filtration membranes.
P10	P10R (increased production).	4.0	This option would involve the upgrade of P10R to include Dissolved Air Flotation (DAF) and Rapid Gravity Filters (RGF) in the treatment process in order to achieve near design output. Production at P10R is currently

Option Number	Option Name	Yield (MI/d)	Description
			constrained by the operational maintenance requirements for the Slow Sand Filters which generally occur during periods of high algal blooms.
P20	Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement).	3.9-5.5	This option would address leakage from raw water mains. It is assumed that all raw water mains would be investigated for potential leakage; Bristol Water has 94 km of raw water mains spread throughout the supply area. The work would include detection of leakage via metering (24 sites in total) and replacement/repair of the mains network. It is assumed that 1% (0.94km) of the network would be replaced each year, over a 5 year period.
Resource			
R08-02	New water sources within Bristol Water Catchment Management Strategy (CAMS) area for the location R08-02R.	1.4	This option relates to the development of a new supply source on the middle River Avon. Abstraction would be from the R08-02R (a new pumping station of 2.5 MI/d, 93 metres head (mhd) would be adjacent). Water would be treated on site via a new membrane plant (capacity of 2.5 MI/d). Water would be then pumped to Tolldown Service Reservoir via a 12.7km (300mm diameter) pipeline. A booster pumping station would be located at Bannerdown (2.5 MI/d, 93 mhd). The option was developed based on the assessment in the Bristol Avon and North Somerset CAMS that water is available for abstraction in the middle River Avon. The option would result in a total water main length of 3.3km and would have a yield of 1.4MI/d.
R08-03	New water sources within Bristol Water CAMS area for the location R08-03R.	1.1	This option would involve the provision of a new river abstraction and intake on the R08-03R together with a raw water transfer to Littleton Water Treatment Works via a 13.2km pipeline. The option would have a capacity of 1.1MI/d.
R11	Cheddar Reservoir standard WRMP14 design.	16.0	This option would involve the development of a new impounding/pumping storage reservoir with a capacity of 9,000 MI on land immediately south of Cheddar Reservoir. The infrastructural requirements associated with the option would include the construction of the reservoir, including an inflow weir and multi-level draw-off tower. The reservoir embankments would be constructed from earth bund (clay core) lined with a concrete wave wall. Additionally, the proposed reservoir would require the redesign of intake arrangements for the monitoring weir and to increase the intake capacity to the full 250 MI/d to capture storm inflows. This would require a 10m by 20m concrete intake chamber and automated valves and compensation control. The scheme would require 5km of 1,500mm diameter HDPE pipe. In contrast to the existing reservoir, the construction of the reservoir would include environmental enhancements such as reduction of bund gradient, screening and planting and naturalising of embankments. The option would have a yield of 16 MI/d.
R23-01	Purchase water from third parties from water companies.	10.0	This option would involve a supply being made available from Wessex Water's infrastructure at Bridgwater, and transferred via a new 27.6 km main to Bristol Water's Banwell treatment works. A 2.5km spur from this main would feed Brent Knoll service reservoir. A new pumping station would be required at Danesborough. The option would have a yield of 10MI/d.
R24	Bring R24R source back into supply.	2.4	R24R Well is currently out of service due to high turbidity and associated risk of cryptosporidium. To bring this well back into service, it is proposed to pump water from R24R to P10R. This option would involve the construction of a new pumping station at the R24R site and a new 4.2km 300mm diameter pipeline. The option would have a yield of 2.4 MI/d.

Option Number	Option Name	Yield (Ml/d)	Description
R32	Reduction of bulk transfer agreement with Wessex Water.	11.4	This option would involve the termination of the existing bulk supply agreement to Wessex Water in order to recover up to 11.4 Ml/d to restore Bristol Water's supply demand balance. The water would be made available from the Purton source.
Distribution			
D21	Active leakage Control	4.5	This option covers the continuation of the current leakage detection find and fix policy. The methods of this form of leakage control include using leak noise detection equipment and zonal step tests to isolate areas of leakage and then repair. This will reduce the length of time that leaks run, which will reduce leakage. The option would have a yield of 4.5 Ml/d.
D22	Pressure Management	2.1	The planned activity for this option is to establish a programme of further pressure management and control within the current distribution network. This would enable greater control of pressure within the distribution system and reduce the amount of water lost through existing (undetected) leaks and also reduce the rate at which new leaks occur (due to reduced pressure within mains). This will be achieved by optimisation of areas currently controlled by PRVs (Pressure Reduction Valves) by use of flow modulating or other more sophisticated pressure control, and by the installation of new PRVs; this would include the construction of a new chamber to house new PRVs. The assumed number of number of pressure management schemes implemented is 45 over years 1 to 3 of AMP7.
D23	Asset Renewal	0.5	This option would involve the replacement and renewal of trunk mains. This option excludes replacement of communication pipes and Customer Supply Pipes (CSP) (from the property boundary to inside the property).

A summary of the assessments of the feasible options (grouped into customer demand options, production options, resource options and distribution options) is shown in **Sections 5.3 to 5.6**. The assessment considers both short term (construction) and medium/long term (operational) effects of each option against each SEA objective. This approach recognises that many of the options under consideration for the draft WRMP are likely to be very different in nature in their construction and operational phases. Full details of the construction and operation impacts for each option are provided in **Appendix E**.

The following factors have been taken into account when identifying and assessing the likely effects of the feasible options on the SEA objectives:

- ▶ the nature of the potential effect (what is expected to happen);
- ▶ the timing of the potential effect;
- ▶ the potential effect on vulnerable communities, sensitive habitats and/or ecosystems;
- ▶ the geographic scale of the potential effect (e.g. local, regional, national);
- ▶ the location of the potential effect; and
- ▶ the duration of the potential effect (e.g. short, medium or long term).

Specific guidance has also been used to inform what constitutes a significant effect, a minor effect or a neutral effect for each of the SEA objectives. These 'definitions of significance' help to ensure a consistent approach to interpreting the significance of effects and assist the reader in understanding the decisions made by the assessor. To understand why the outcomes presented in the tables below have been determined, reference should be made to the thresholds of significance presented in **Appendix D**. These

thresholds explain why two options that may appear similar in nature have different assessments recorded against one objective.

In completing the assessments, we have used information made available to us from Bristol Water. We have endeavoured to ensure that the information presented in each assessment reflects the most recent option information received from Bristol Water.

5.3 Assessment of Customer Demand Options

The assessment of the six feasible customer demand options (C26-01, C26-02, C26-03, C02, C12 and C20) is presented in **Table 5.2**.

Construction Effects

No significant positive or significant negative construction effects have been identified during the assessment.

Options C26-01, C26-02 and C26-03 are assessed as having neutral effects against all objectives during construction. This reflects the absence of construction activity (options C26-01 and C26-02) or the very minor and localised scale of construction activity associated with the installation of water efficiency devices (option C26-03).

Options C08, C12 and C20 are assessed as having neutral effects against ten of the twelve objectives during construction. Minor negative effects are expected from the installation of meters (options C08 and C12) or rainwater harvesting systems (option C20) on climate change (Objective 6) due to embodied carbon associated with the materials used to produce the water meters and rainwater harvesting systems, and waste and resource use (Objective 10) due to resource use, generation of waste along with fuel usage for vehicles and plant.

Operational Effects

No significant positive or significant negative operational effects have been identified during the assessment.

Operational effects have been assessed as neutral against ten of the twelve objectives. Minor positive effects are expected against water quantity (Objective 4) and water resources (Objective 9) reflecting benefits of water savings. Some uncertainty remains at this stage on impacts on climate change (Objective 6) and waste and resource use (Objective 10) due to the lack of quantification of energy savings from the reduced treatment and pumping of water (although depending on the scale of the effect, there is potential for it to be positive against this objective).

Table 5.2 Customer Demand Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C26-01	Enhanced water efficiency communications campaign (different messages for different seasons)	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0
C26-02	Water efficiency on different key stages (primary, secondary, further and higher education)	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0
C26-03	Household water efficiency devices installation programme	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0
C08	Selective metering of domestic customers based on (a) high consumption e.g. sprinkler use and/or (b) zones of high demand	C	0	0	0	0	0	-	0	0	0	-	0	0
		O	0	0	+	0	0	0/?	0	0	+	0/?	0	0
C12	Enhanced promotion of free water meters to unmeasured households	C	0	0	0	0	0	-	0	0	0	-	0	0

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
	beyond the promotion assumed in baseline demand forecast	O	0	0	+	0	0	0/?	0	0	+	0/?	0	0
C20	Installation of rainwater harvesting in new build households	C	0	0	0	0	0	-	0	0	0	-	0	0
		O	0	0	+	0	0	0/?	0	0	+	0/?	0	0

5.4 Assessment of Production Options

The assessment of the six feasible production options (P01-01, P01-02, P06-01, P08, P10 and P20) is presented in **Table 5.3**.

Construction Effects

One option (P10) has been assessed as having a significant positive effect (P10) and a further three (P01-01, P01-02 and P20) as having a positive effect effects on economic and social wellbeing (Objective 8) during the construction phase. This reflects the potential for capital investment to generate supply chain benefits and employment opportunities as well as increased spend in the local economy by contractors and construction workers. However, vehicle movements associated with options P10 (upgrade of P10R) and P20 (reduction/repair of mains network) are considered to have the potential to cause traffic disruption. Reflecting both the positive and negative effects, options P10 and P20 are assessed as having a mixed positive and negative effect on this objective. The low capital expenditure associated with options P06-01 (catchment Management of the Mendip Lakes to manage outage risk from algal blooms) and P08 (increase production of P08R WTW) is not expected to have a discernible effect in respect of this objective.

Given the scale of construction activity associated with the implementation of the options, significant negative (options P10 and P20) or negative (options P01-01, P01-02 and P06-01) effects on climate change (Objective 6) have been identified except for option P08. This reflects the anticipated emissions of greenhouse gases from vehicle movements, construction plant and the embodied carbon in construction materials to be used in the options. Option P08 (increase production of P08R WTW by 2.0 Ml/d) would not require significant works and anticipates very low levels of additional traffic and in consequence, neutral effects have been identified in respect of climate change (Objective 6).

Material use, energy requirements and waste generation would be substantial and therefore all production options have also been assessed as having either a significant negative (options P10 and P20) or negative effect (options P01-01, P01-02, P06-01 and P08) on waste and resource use (Objective 10).

No further significant positive or significant negative effects have been identified during the assessment.

Four of the feasible options (P01-01, P01-02, P08 and P10) have been assessed as having minor positive effects in respect of land use/soils (Objective 2), due to the construction works associated with modification of treatment processes at WTW sites being contained within the pre-existing operation sites. Options P06-01 (catchment Management of the Mendip Lake to manage outage risk from algal blooms) and P20 (reduction/repair of mains network) would not require new land take and therefore are expected to have neutral effects on this objective.

All options have been assessed as having neutral effects on human health (Objective 7) except for options P10 (upgrade of P10R) and P20 (reduction/repair of mains network). Greenhouse gases emissions to air from vehicle movements and construction plant together with noise/vibration associated with the implementation of these options are likely to have minor negative effects on this objective.

With the exception of options P01-01 and P20, all options are expected to have neutral effects on landscape (Objective 12). A minor negative effect on this objective has been identified for options P01-01 (located within the Mendip Hills AONB) and P20 (reduction/repair of mains network across BWOA) given the potential for construction works to affect local landscape character and/or visual amenity.

Effects on biodiversity (Objective 1), water quantity (Objective 3), water quality (Objective 4), water resources (Objective 9) and cultural heritage (Objective 11) have been assessed as neutral for all options during the construction phase.

Operational Effects

No significant positive or significant negative effects associated with the operation of the feasible production options have been identified during the assessment.

Operational effects on climate change (Objective 6) and waste and resource use (Objective 10) vary between options. Options P01-01 and P01-02 are likely to have negative effects on both objectives. This reflects the additional energy requirements (and related greenhouse gas emissions) associated with the treatment and pumping of water. In contrast, options P06-01, P08 and P10 are unlikely to substantially increase carbon emissions, resource use, energy consumption or waste production and have therefore been assessed as having neutral effects on these two objectives except for option P06-01 where a positive effect is expected on waste and resource use. This reflects the implementation of revised fertiliser and nutrient management plans in Option P06-01 which may reduce the resource inputs into the catchment. In the case of option P20, water savings as a result of reduced leakage are expected to have positive effects on these two objectives by lowering demand for water abstraction and decreasing the energy use associated with the treatment and pumping of water.

All options, except for P06-01, have been assessed as having a positive effect on human health (Objective 7) and economic and social wellbeing (Objective 8) by helping to ensure the continuity of a safe and secure drinking water supply which may in-turn support economic and population growth. In the case of option P06-01, the yield from catchment management of the Mendip Lakes is too low to have a discernible effect on these objectives.

With the exception of options P08, P10 and P20, all options have neutral effects on water quantity (Objective 3). Options P08 and P10 would result in additional water abstraction which has been assessed as having a negative effect on this objective although this remains uncertain until further investigation is conducted on the availability of water for use. Option P20 would reduce leakage and result in water savings which are expected to have positive effects on this objective.

All options, except for option P06-01, have been assessed as having neutral effects on biodiversity (Objective 1), geology and soils (Objective 2) and water quality (Objective 4). The measures to reduce diffuse pollution from agricultural land run off to be implemented via option P06-01 could lead to improvements in water quality in rivers that feed Blagdon and Chew Valley reservoirs and which would have long term positive effects on river biota. This option has therefore been assessed as having a positive effect on biodiversity and water quality. In addition this option would reduce the sources and incidents of soil contamination, particularly from slurry spillage or slurry tank rupture and would have a positive (albeit localised and precautionary) effect on geology and soils.

Effects on flood risk (Objective 5) and cultural heritage (Objective 11) have been assessed as neutral for all feasible options during the operational phase.

Table 5.3 Supply Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P01-01:	Increase performance of existing sources (P01-01R) to increase deployable output to near licensed volume	C	0/?	+	0	0	0	-	0	+	0	-	0	-
		O	0	0	0/?	0/?	0	-	+	+	0	-	0	0
P01-02	Increase performance of existing sources (P01-02R) to increase deployable output to near licensed volume	C	0	+	0	0	0	-	0	+	0	-	0	0
		O	0	0	0/?	0/?	0	-	+	+	0	-	0	0
P06-01:	Catchment Management for Chew and Blagdon Reservoir to manage outage risk from algal blooms	C	0	0	0	0	0	-	0	0	0	-	0	0
		O	+	+	0	+	0	0	0	0	0	+	0	0
P08	P08R WTW (increased production)	C	0	+	0	0	0	0	0	0	0	-	0	0
		O	0/?	0	-/?	0	0	0	+/?	+	0	0	0	0
P10	P10R (increased production)	C	0	+	0	0	0	--	-	++/-	0	--	0	0

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
		O	0	0	-/?	0	0	0	+	+	0	0	0	0
P20	Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	C	0/?	0	0	0	0	--/?	-	+/-	0	--/?	0	-/?
		O	0	0	+	0	0	+/?	+	+	+	+	0	0

5.5 Assessment of Resource Options

The assessment of the six feasible resource options (R08-02, R08-03, R11, R23-01, R24 and R32) is presented in **Table 5.4**.

Construction Effects

Four of the six options have been assessed as having significant positive (R08-02, R11 and R23-01) or positive (R08-03) effects on economic and social wellbeing (Objective 8): the exceptions being options R24 and R32. The positive effects are due to the potential for capital investment to generate supply chain benefits and employment opportunities as well as increased spend in the local economy by contractors and construction workers. However, vehicle movements associated with these options are considered to have the potential to cause traffic disruption. Reflecting both the positive and negative effects, options P10 and P20 are assessed as having a mixed positive and negative effect on this objective.

Options R24 and R32 have neutral effects on this objective due to the low capital expenditure associated with option R24 and the absence of construction works for option R32.

With the exception of option R32, significant negative or negative effects have been identified on a number of objectives for all options, namely biodiversity (Objective 1), geology and soils (Objective 2), flood risk (Objective 5), climate change (Objective 6), waste and resource use (Objective 10) and landscape (Objective 12).

Negative effects have been assessed on: biodiversity (Objective 1) due to potential loss of/disturbance to habitats and species; geology and soils (Objective 2) due to the loss of greenfield land; flood risk (Objective 5) due to the location of some development sites and pipeline works within Flood Zones 2 and 3; climate change (Objective 6) and waste and resource use (Objective 10) due to the anticipated emissions of greenhouse gases from vehicle movements, construction plant and the embodied carbon in raw materials; and landscape (Objective 12) due to the potential for works to affect landscape character and/or visual amenity. Only option R11 has been assessed as having significant negative effects on all of these six objectives. This option would involve the development of a new impounding/pumping storage reservoir with a capacity of 9.0 Ml on land immediately south of Cheddar Reservoir. Construction of the reservoir would represent a considerable undertaking that would result in the significant loss of greenfield land (Objective 2) and noise disturbance and air quality impacts which could result in adverse impacts on aquatic and terrestrial ecological features (Objective 1). The proposed reservoir and ancillary infrastructure/pipeline would be partly located within Flood Zone 3 and therefore is liable to an increased risk of flooding (Objective 5). Given the large scale of construction activity associated with this option, significant emissions of greenhouse gases from vehicle movements, construction plant and the embodied carbon in raw materials (Objective 6) and significant resource use and waste generation (Objective 10) are expected. As the development site would be visible from Mendip Hills AONB the visual amenity of associated recreational users could be affected by the development and a significant negative effect is assessed against landscape (Objective 12).

No further significant positive or significant negative effects have been identified during the assessment.

All options have been assessed as having neutral effects on water quality (Objective 3), water quantity (Objective 4) and water resources (Objective 9) except for option R11 on water quantity. Option R11 could affect water quality through construction derived pollutants escaping into the water, although it is assumed that these impacts could be mitigated by the implementation of best construction practices such as dust suppression, soil containment and emergency response procedures but some uncertainty remains.

All options (except R32) have been assessed as having negative effects on cultural heritage (Objective 11). This is due to the potential for direct impacts on designated heritage sites associated with the construction works.

Option R32 has been assessed as having neutral effects against all objectives during the construction phase as it does not require any new infrastructure.

Operational Effects

All options have been assessed as having positive effects on human health (Objective 7) and economic and social wellbeing (Objective 8) as they will help to ensure the continuity of a safe and secure drinking water supply which may in turn support economic and population growth. In the case of two options (R11 and R32), effects on these objectives have been assessed as significant positive which is a reflection of the larger capacity/deployable output of these options.

Significant positive effects were also identified on climate change (Objective 6) and waste and resource use (Objective 10) for option R32. The implementation of this option would result in water being transferred over a shorter distance than under current operation which would generate substantial energy savings and a significant reduction in greenhouse gas emissions

The only significant negative effect identified is on climate change (Objective 6) for option R08-02. This reflects the greenhouse gas emissions associated with operation (pumping and treatment) of a new supply source on the middle River Avon.

No further significant positive or significant negative effects have been identified during the assessment.

A number of options have been assessed as having negative effects in respect of water quantity (Objective 3) due to additional water abstraction (R08-02, R08-03 and R11) and water quality (Objective 4) due to the effects arising from increased abstraction on the remaining waters (R11).

Two options (R23-01 and R32), meanwhile, have been assessed as having a positive effect on water resources (Objective 9) reflecting the more efficient use of water by utilising excess water from Wessex Water supply network.

Effects on biodiversity (Objective 1) and geology and soils (Objective 2) have been assessed as neutral or neutral/uncertain for all options except option R11 which has a mixed positive and negative effect on biodiversity. This option would involve the development of a new reservoir which may have beneficial effects (e.g. create new habitat and promote habitat connectivity through the creation of open water habitat next to the existing Cheddar Reservoir) however, this will be dependent on the exact nature of finalised proposals and specific measures.

Table 5.4 Resource Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R08-02:	New water sources within Bristol Water CAMS area for the location R08-02R	C	-/?	-	0	0	-	--	-	++/-	0	--	-/?	-/?
		O	0	0	-/?	0	0	--	+	+	0	-	0/?	0/?
R08-03	New water sources within Bristol Water CAMS area for the location R08-03R	C	-	-	0	0	-	--	-	+/-	0	--	-	-
		O	0/?	0	-	0	-	0	+	+	0	0	0	-
R11	Resource Cheddar Reservoir Standard WRMP14 Design	C	--	--	0/?	-/?	--	--	-	++/-	0	--	-/?	--
		O	+/-/?	0	-/?	-/?	+/-	0	++	++	0	0	-	-
R23-01	Purchase Water from Third Parties from Water Companies	C	--/?	-	0	0	-	--	-	++/-	0	--	-	-
		O	0/?	0	0	0	0	-	+	+	+	-	0	0
R24	Bring R24R source back into supply	C	--/?	0	0	0	-	--	-	0	0	--	-	-
		O	0	0	?	?	-	-	+	+	0	-	0	0

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R32	Resource Reduction of bulk transfer agreement with Wessex Water	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	0	0	0	++	++	++	+/?	++	0	0

5.6 Assessment of Distribution Options

The assessment of the three feasible distribution options (D21, D22 and D23) is presented in **Table 4.5**.

Construction Effects

Option D22 (pressure management) has been assessed as having neutral effects against all objectives during construction.

Option D23 has been assessed as having a significant positive effect on economic and social wellbeing (Objective 8). This reflects the anticipated high capital investment which will generate supply chain benefits and employment opportunities as well as increased spend in the local economy by contractors and construction workers. The minor negative effect identified for D21 against the economic and social wellbeing (Objective 8) reflects the likelihood of temporary traffic disruption and that for this option, the scale of capital investment is insufficient to have a positive effect on local employment or the supply chain.

Significant negative effects are assessed against climate change (Objective 6) and waste/resource use (Objective 10) during construction of option D23. This is due to the potential significant carbon emissions from vehicle movements and embodied carbon in replacement pipes and significant resource use and waste generation. Some uncertainty remains at present as carbon emissions are unquantified and the full scale of works is unknown. Negative effects are expected on this objective from option D21 as a result of minor increase in resource use and construction waste along with fuel usage for vehicles and plant.

No further significant positive or significant negative effects associated with the construction of the feasible leakage options have been identified during the assessment.

There is uncertainty over the effects of options D21 and D23 on biodiversity (Objective 1) and option D21 on landscape (Objective 12) as the location of works is unknown. Whilst these options are generally not expected to affect biodiversity or landscape with works expected to be undertaken beneath road surfaces in most instances, it is possible that works would be undertaken within or in close proximity to locations important for biodiversity or landscape which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) or give rise to landscape and visual effects in these instances.

Operational Effects

No significant positive or significant negative effects have been identified with respect to the operation of the leakage management options.

Once operational, the options will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise, and therefore the options are likely to have neutral operational effects across the majority of objectives.

Water savings as a result of reduced leakage are expected to have positive effects on water quantity (Objective 4) and water resources (Objective 9) by lowering demand for water abstraction. With the exception of Option D23, positive effects are also expected on climate change (Objective 6) by decreasing the energy use associated with the treatment and pumping of water and on human health (Objective 7) by helping to secure drinking water supply. Water savings under Option D23 are likely to be too low to make a meaningful impact on climate change (Objective 6) or human health (Objective 7).

Table 5.5 Distribution Feasible Options Assessment Summary

Ref	Option	Construction (C) or Operation (O)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D21	Active Leakage Control	C	?	0	0	0	0	-/?	0	-	0	-	0	0/?
		O	0	0	+	0	0	+	+	0	+	0	0	0
D22	Pressure Management	C	0	0	0	0	0	0	0	0	0	0	0	0
		O	0	0	+	0	0	+	+	0	+	0	0	0
D23	Asset Renewal	C	0/?	0	0	0	0	--/?	0/?	++	0	--/?	0	0
		O	0	0	+	0	0	0	0	0	+	0	0	0

6. Assessment of Preferred and Revised Preferred Options

6.1 Introduction

The process for developing a WRMP includes a clear series of steps to balance the need to develop solutions that are technically feasible, cost-effective, and take into account the impacts on the community and environment.

The findings of the first stage of the SEA were used by Bristol Water when reviewing the feasible options and considering any environmental constraints. The findings were also included in the investment appraisal model by informing (along with the findings of the HRA and WFD assessment) the assessment of the environmental metric for each feasible option. The metric was based on a graded scale (0 – 10), with the assessment process keeping beneficial and adverse effects separate consistent with the SEA. Likely significant adverse effects of an option would be assigned a minimum of 9 to reflect the fact that such an option would be unlikely to be acceptable and therefore carry a high “penalty” grading. The values assigned were revised to align with any revisions to the source assessments (whether SEA, HRA or WFD assessment). The SEA findings were also included in the Economics of Balancing Supply and Demand by checking that the potential impacts identified in the SEA were included in the environmental and social costs already taken into account.

Informed by the environmental, social and economic assessments and ongoing discussion with stakeholders, the list of feasible options was refined to identify the preferred options. Four preferred options were identified for the draft WRMP which provided a combined yield of between 21.9 to 23.5 MI/d (see Table 6.1).

Following consultation on the draft WRMP and the responses from the regulators and consultees, further changes were made to the WRMP. This included further revisions to the supply demand balance in which Bristol Water forecast a small residual supply deficit of 0.2 MI/d at 2035 rising to 9.18 MI/d at 2045. Three revised preferred options have been identified to address the deficit, which have a combined yield of 9.83 MI/d.

This chapter sets out a summary of the assessments of the preferred and revised preferred options. It includes, where relevant, the effects of mitigation that will be incorporated into the design of each option by Bristol Water and more detailed analyses where further information could be ascertained regarding the option. The inclusion of these factors in the assessment of the preferred and revised preferred options may result in differences in the scoring against some SEA objectives between the assessments of the same option during the feasible and preferred option assessments. This chapter also outlines further mitigation measures that could be incorporated, where relevant into the preferred option to reduce negative effects.

The full assessments and potential mitigation measures for each of the preferred options are included in **Appendix F**.

The full assessments and potential mitigation measures for each of the revised preferred options are included in **Appendix G**.

After the summaries of the preferred option assessments, an assessment of the cumulative effects of the revised preferred options is set out, including consideration of in-combination effects of proposals with other plans and projects.

Finally, this section concludes by identifying the reasons for selection of the revised preferred options.

6.2 Assessment of Preferred Options in the Draft WRMP

Four preferred options were selected for inclusion in the draft WRMP. The preferred options together with the scale of implementation and yield are shown in **Table 6.1**.

Table 6.1 Preferred Combination of Options in the Draft WRMP

Option	Description	Yield (MI/d)
R32	Resource Reduction of bulk transfer agreement with Wessex Water	11.4
D21	Active Leakage Control	4.5
D22	Pressure Management	2.1
P20	Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement).	3.9-5.5

Construction

The full assessments and potential mitigation measures for each of the preferred options are included in **Appendix F**.

The findings of the detailed assessments of the preferred options during construction are presented in **Table 6.2**.

The preferred options are assessed as having neutral effects against the majority of the objectives during construction.

Option D21 (the leakage detection find and repair scheme) is assessed as having negative effects on Objectives 6 (climate change), 8 (economic and social wellbeing) and 10 (waste and resource use).

Option P20 (reduced leakage from raw water mains) is assessed as having significant negative effects against climate change (due to embodied carbon emissions associated with new mains and emissions from plant and vehicle movements repair and replace leaking mains), and waste and resource use (due to increase in resource use and construction waste along with fuel usage for vehicles and plant), although some uncertainty remains due to uncertainties over the location, duration and scale of activities (which will be responsive to the leaks identified). Minor negative effects are assessed against human health (due to impact local air quality and generation of noise/vibration disturbance by vehicle movements and the operation of plant) and landscape (due to potential for localised landscape and visual effects). Mixed minor positive and minor negative effects are assessed against economic and social wellbeing as the option would generate positive effects such as jobs creation and supply chain benefits but would also generate negative effects from potential for localised disruption to traffic.

Table 6.2 Preferred Combination of Options in the Draft WRMP – Construction Effects

Option	Yield (Ml/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R32: Resource Reduction of bulk transfer agreement with Wessex Water	11.4	0	0	0	0	0	0	0	0	0	0	0	0
D21: Active Leakage Control	4.5	0/?	0	0	0	0	-/?	0	-	0	-	0	0/?
D22: Pressure Management	2.1	0	0	0	0	0	0	0	0	0	0	0	0
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	3.9-5.5	0/?	0	0	0	0	--/?	-/?	+/-	0	--/?	0	-/?
Preferred combination of options	21.9-23.5	0/?	0	0	0	0	--/?	0/?	+/-	0	--/?	0	0/?

Operation

The findings of the detailed assessments of the preferred options during operation are presented in **Table 6.3** and are discussed in more detail below.

The preferred options are assessed as having neutral or positive effects against all objectives during operation except for option R32. This option would involve the termination of the existing bulk supply agreement to Wessex Water in order to recover up to 11.4 Ml/d and is assessed as having significant positive effects on Objectives 6 (climate change), 7 (human health), 8 (economic and social wellbeing) and 10 (waste and resource use). This is due to a reduction in annual greenhouse gas emissions (Objective 6), ensuring a continual supply of clean drinking water (Objective 8), support economic growth in the area (Objective 8) and energy savings (Objective 10).

Table 6.3 Preferred Combination of Options in the Draft WRMP – Operational Effects

Option	Yield (Ml/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R32: Resource Reduction of bulk transfer agreement with Wessex Water	11.4	0	0	0	0	0	++	++	++	+/?	++	0	0
D21: Active Leakage Control	4.5	0	0	+	0	0	+	+	0	+	0	0	0
D22: Pressure Management	2.1	0	0	+	0	0	+	+	0	+	0	0	0
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	3.9-5.5	0	0	+	0	0	+/?	+	+	+	+	0	0
Preferred combination of options	21.9-23.5	0	0	+	0	0	++	++	++	+/?	++	0	0

6.3 Assessment of the Revised Preferred Options in the Revised Draft WRMP

Following consultation on the draft WRMP and the responses from the regulators and consultees, further changes were made to the WRMP, including:

- ▶ Further reductions in leakage to ensure alignment with the Ofwat challenge of 15% reductions during AMP7 and then going beyond this by 2045;
- ▶ Increasing the take up of water metering, from 66% by the start of 2020 to 87% by 2045;
- ▶ Increasing water efficiency to achieve a reduction in per capita consumption (PCC) from 141 litres/head/day in 2020 to 129 litres/head/day in 2045 and 110 litres/head/day in 2050;
- ▶ Further reductions in leakage from raw water systems and at water treatment works;
- ▶ Updated assessment of the deployable output (reliable supply) of water sources in line with the new national methodology for drought resilience (that was issued after completion of the draft WRMP).

Applying the changes to the supply demand balance, Bristol Water are now forecasting a small residual supply deficit of 0.2 Ml/d at 2035 rising to 9.18 Ml/d at 2045. Bristol Water propose to address this by the use of three revised preferred options (Table 6.4).

Table 6.4 Revised Preferred Combination of Options in the Revised Draft WRMP

Option	Description	Yield (Ml/d)
D21.1	Active Leakage Control (AMP7)	2.38
D21.2	Active Leakage Control (beyond AMP7)	1.5
P20	Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement).	5.5

Construction

The findings of the detailed assessments of the revised preferred options during construction are presented in **Table 6.5** and in **Appendix G**.

The preferred options are assessed as having neutral effects against the majority of the objectives during construction.

Option D21 (the leakage detection find and repair scheme) is assessed as having negative effects on Objectives 6 (climate change), 8 (economic and social wellbeing) and 10 (waste and resource use).

Option P20 (reduced leakage from raw water mains) is assessed as having significant negative effects against climate change (due to embodied carbon emissions associated with new mains and emissions from plant and vehicle movements repair and replace leaking mains), and waste and resource use (due to increase in resource use and construction waste along with fuel usage for vehicles and plant), although some uncertainty remains due to uncertainties over the location, duration and scale of activities (which will be responsive to the leaks identified). Minor negative effects are assessed against human health (due to impact local air quality and generation of noise/vibration disturbance by vehicle movements and the operation of plant) and landscape (due to potential for localised landscape and visual effects). Mixed minor positive and minor negative effects are assessed against economic and social wellbeing as the option would generate positive effects such as jobs creation and supply chain benefits but would also generate negative effects from potential for localised disruption to traffic.

Table 6.5 Revised Preferred Combination of Options for the Revised Draft WRMP – Construction Effects

Option	Yield (Ml/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D21.1: Active Leakage Control	2.83	0/?	0	0	0	0	-/?	0	-	0	-	0	0/?
D21.2: Active Leakage Control	1.5	0/?	0	0	0	0	0	0	-	0	0	0	0/?
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	5.5	0/?	0	0	0	0	--/?	-/?	+/-	0	--/?	0	-/?
Preferred combination of options	9.83	0/?	0	0	0	0	--/?	0/?	+/-	0	--/?	0	0/?

Operation

The findings of the detailed assessments of the preferred options during operation are presented in **Table 6.6** and are discussed in more detail below.

The operation of the revised preferred options are assessed as having neutral or positive effects against all objectives during operation. Minor positive effects were identified for Objectives 3 (water quantity), 6 (climate change), 7 (human health), 8 (economic and social wellbeing), 9 (water resources) and 10 (waste and resource use). This is due to savings made by leakage reduction (Objectives 3 and 9), a reduction in annual greenhouse gas emissions (Objective 6), the greater resilience (Objective 7), ensuring a continual supply of clean drinking water (Objective 8), support economic growth in the area (Objective 8) and energy savings (Objective 10). The uncertainty against Objective 6 reflects the uncertainty associated with the operation of P20, and the extent to which the option would result in a decrease in demand for water abstraction and subsequent treatment with the commensurate reduction in energy demand and greenhouse gas emissions.

Table 6.6 Revised Preferred Combination of Options in the Revised Draft WRMP – Operational Effects

Option	Yield (Ml/d)	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D21.1: Active Leakage Control	2.38	0	0	+	0	0	+	+	0	+	0	0	0
D21.2: Active Leakage Control	1.5	0	0	+	0	0	+	+	0	+	0	0	0
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	5.5	0	0	+	0	0	0	0	0	+	0	0	0
Preferred combination of options	9.83	0	0	+	0	0	+/?	+	+	+	+	0	0

6.4 Secondary, Cumulative and Synergistic Effects

The SEA regulations require that the cumulative effects of the WRMP are assessed. This includes the cumulative effects of the individual preferred options that comprise the revised plan and the effects of the revised draft WRMP in combination with other plans and programmes.

The following sections consider the potential for cumulative effects of the revised draft WRMP and the following:

- ▶ population change in the Bristol Water area;
- ▶ Nationally Significant Infrastructure Projects (NSIPs);
- ▶ Bristol Water's Statutory draft Drought Plan 2018; and
- ▶ other water company WRMPs.

The cumulative effects of the revised draft WRMP are difficult to accurately assess given the inherent uncertainties concerning (inter alia): future changes to baseline environmental conditions; future population and economic growth; the deliverability of some NSIPs (and the potential for new NSIPs to be developed); and the proposals of emerging water company WRMPs. As such, it will be necessary to keep under review the information and assumptions used, particularly regarding implementation of proposals, to ensure the assessment of cumulative effects remain valid and applicable.

Population Change

Population change in the Bristol Water supply area has already been considered in the revised draft WRMP along with the potential for further changes in demographics throughout the plan period. These forecasts have been based upon population projections published by the ONS and engagement with local and unitary authorities to determine how many household properties are likely to be built in the region over the planning horizon. The population within the Bristol Water supply area is projected to rise from 5.34 million to 5.81 million by 2024 (7 % increase).

In consequence, the 'in combination' water-resource effects of growth promoted by other plans (such as local planning authority local plans or local economic partnership strategic growth plans) are considered and accounted for during the WRMP development process. Conversely, in respect of water resources, the WRMP is unlikely to have significant effects on the other plans as the 'source' of any potential effects arises from the 'other' plan, with the WRMP having to respond to the changes.

Nationally Significant Infrastructure Projects (NSIPs)

Depending on the type of development proposed there is potential for NSIPs to act cumulatively with the WRMP if the NSIP requires significant amounts of water resource. National planning policy guidance (for developers and inspectors) is set out in National Policy Statements (NPSs). A number of these NPSs have been published and set out the definition, and in some cases the location, of NSIPs. The current status of the NPSs is set out in **Table 6.4**.

Table 6.4 Current National Policy Statement Status

National Policy Statement (NPS)	Status of NPS	Are Potential Locations of NSIPs included in the NPS?
Overarching energy EN-1	Designated June 2011	No
Fossil Fuels EN-2	Designated June 2011	No
Renewable energy EN-3	Designated June 2011	No

National Policy Statement (NPS)	Status of NPS	Are Potential Locations of NSIPs included in the NPS?
Oil and Gas Supply and Pipelines EN-4	Designated June 2011	No
Electricity Networks EN-5	Designated June 2011	No
Nuclear Power EN-6	Designated July 2011	Yes
Ports	Designated January 2012	No
National Networks (including rail and roads)	Designated December 2014	No
New Runway Capacity and Infrastructure at Airports in the South East of England (Aviation NPS)	Designated April 2018	Yes
Hazardous Waste (England only)	Designated June 2013	No
Waste Water Treatment (England only)	Designated July 2013	Yes
Water Supply	Draft not yet published	n/a
Geological Disposal Infrastructure	Draft published January 2018	No

The Nuclear Power NPS (EN-6) sets out eight potentially suitable sites for the deployment of new nuclear power stations in England and Wales before the end of 2025. Of these sites, one site (Oldbury) is located within the Bristol Water supply area, whilst a second site (Hinkley Point) is located approximately 10km to the South West of the Bristol Water supply area. The remaining sites are considered too distant from the Bristol Water supply area for in-combination effects to occur.

The NPS and accompanying HRA highlight that there is potential for impacts associated with the operation of Oldbury and Hinkley Point on the Severn Estuary SAC, SPA and Ramsar, the River Wye SAC and the River Usk SAC through impacts on water resources and quality, habitat and species loss and fragmentation/ coastal squeeze and disturbance (noise, light and visual). This is summarised in **Table 6.5**.

Table 6.5 Summary of Potential Effects arising from Development of Oldbury and Hinkley Point Nuclear Power Stations Identified in BEIS (formerly DECC) HRA Site Reports

Site	Potential Effects Arising from Development	Severn Estuary SAC, SPA, Ramsar	River Wye SAC	River Usk SAC
Oldbury ⁹⁹	Water resources and water quality	✓	✓	No
	Habitat (and species) loss and fragmentation	✓	✓	✓

⁹⁹ Taken from BEIS (formerly DECC) (2010) Habitats Regulations Assessment: Site Report for Oldbury EN-6: Revised Draft National Policy Statement for Nuclear Power Generation

Site	Potential Effects Arising from Development	Severn Estuary SAC, SPA, Ramsar	River Wye SAC	River Usk SAC
	Disturbance (noise, light, visual)	✓	✓	No
Hinkley Point¹⁰⁰	Water resources and water quality	✓	✓	✓
	Habitat (and species) loss and fragmentation	✓	✓	✓
	Coastal Squeeze	✓	No	No
	Disturbance (noise, light, visual)	✓	✓	✓

Information from the National Infrastructure Planning website¹⁰¹ indicates that proposals for the Oldbury new nuclear power station are currently at the Pre-Application stage. The project timings are uncertain and will be shaped by progress at the proposed lead nuclear power station at Wylfa Newydd, with construction unlikely to start before the late 2020s. The proposals for the Hinkley Point C new nuclear power stations have been granted consent by the Secretary of State on 19 March 2013. Consultation for a non-material change to the application is on-going until the 24 November 2017. The HRA completed to accompany the DCO application identified likely significant effects on the interest features of Severn Estuary SAC, SPA, Ramsar, Somerset Levels and Moors SPA and Ramsar, Exmoor and Quantocks Oakwoods SAC, River Wye SAC, River Usk SAC and Afon Tywi SAC. As a result an Appropriate Assessment was undertaken which concluded that the '*construction and operation of Hinkley Point C (including associated development) would not have an adverse effect on upon the integrity of any of the relevant designated European and international sites for nature conservation importance*'.¹⁰²

A number of further NSIPs that are not detailed in the NPSs are set out on the Planning Inspectorate website in the South West¹⁰³. It lists seven additional projects at the pre-application stage (three power generation projects: one tidal lagoon and two gas fired power stations; two railway projects and two road enhancement projects) and two granted additional projects (grid connection and road enhancement).

The three road enhancement projects (A303 Stonehenge; and A30 Temple to Higher Carblake Improvement; and A30 Chiverton to Carland Cross Scheme), the tidal lagoon project (The West Somerset Tidal Lagoon) and the railway project (Bere Alston to Tavistock Railway Reinstatement and Associated Trails) are located outside the Bristol Water supply area and are not expected to have significant cumulative effects with Bristol Water's preferred options.

One of the railway projects (Portishead Branch Line - MetroWest Phase 1) is within the Bristol Water supply area. The water demands associated with the provision of new/upgraded train services have been assessed as negligible to minor (dependent on sensitivity of resource and nature of water requirements) in the Scoping Report (2015) for the Environmental Statement to accompany the DCO application.

The two gas fired power stations (Seabank 3 CCGT and Avon Power Station 950 MW output) would be located at Severnside (near Avonmouth). The water demands of these projects should be considered in their applications for approval to the Planning Inspectorate and if significant demand is forecast, this should be considered by Bristol Water during monitoring of the WRMP and in the five year review.

¹⁰⁰ Taken from BEIS (formerly DECC) (2010) Habitats Regulations Assessment: Site Report for Hinkley Point EN-6: Revised Draft National Policy Statement for Nuclear Power Generation

¹⁰¹ <https://infrastructure.planninginspectorate.gov.uk/projects/> [Accessed November 2017].

¹⁰² EDF (2011), Hinkley Point C Report to Inform Habitats Regulation Assessment, Doc Ref 3.16, October 2011

¹⁰³ <https://infrastructure.planninginspectorate.gov.uk/projects/> [Accessed November 2017].

The grid connection project (Hinkley Point C connection) will replace existing power lines between Bridgewater, Somerset and Seabank (Sevenside) to increase transmission capacity. The corridor route for this overhead power line broadly follows the route of an existing 132 kV overhead powerline, which follows the M5 Motorway approximately, passing approximately 6 km to the west of the existing Cheddar reservoir. The construction of this project may generate additional demand for water however; once operational no significant cumulative effects are anticipated.

The Habitats Regulations Assessment accompanying the revised draft WRMP has not identified effects on these sites from the development of the preferred options and therefore no cumulative effects are anticipated. Nonetheless, Bristol Water should consider the potential implications of water demands associated with the construction and operation of the identified (and any new) NSIPs as part of monitoring and through the five year review of the WRMP when more details of the schemes should be available.

Drought Plan 2018

Water companies in England and Wales are required to prepare and maintain Statutory Drought Plans under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 and subsequently Water Act 2014, which set out the sort of operational steps a company will take before, during and after a drought. The Water Industry Act 1991 defines a Drought Plan as *'a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits'*.

Bristol Water published its Drought Plan¹⁰⁴ in June 2018. The Drought Plan provides a comprehensive statement of the actions Bristol Water will consider implementing during drought conditions to safeguard essential water supplies to customers and minimise environmental impact. It is consistent with Bristol Water's Water Resources Management Plan, the objective of which is to set the strategic plan for ensuring a supply-demand balance over a 25 year planning period. As part of the development of the Updated Drought Plan, the emerging draft plan has been subjected to SEA and HRA.^{105,106}

Bristol Water has identified drought plan action triggers to identify when the water resource situation is moving into a drought. Increasing levels of drought severity have been defined, aligned with the Environment Agency's 'drought stages'¹⁰⁷, to ensure that the drought actions are proportionate to the level of drought risk being experienced. These triggers act as decision-points for implementation of drought management measures. There are two broad categories of drought management actions: demand management measures and supply side measures.

Demand management measures identified in the Drought Plan include:

- ▶ Enhanced publicity and awareness of water efficiency;
- ▶ Publicity and media campaign to appeal for water use restraint and raise awareness of the developing drought situation;
- ▶ Temporary Use Ban (TUB);
- ▶ Non Essential Use Ban (NEUB); and
- ▶ Emergency Drought Order.

Supply side measures considered by Bristol Water include using temporary variations to bulk supply agreements with Wessex Water; bringing disused, licensed water sources back into supply; and applying for drought permits to temporarily vary the conditions of abstraction licences for specific water sources. The

¹⁰⁴ Bristol Water (2018), Bristol Water Drought Plan 2018 <https://www.bristolwater.co.uk/wp-content/uploads/2018/08/Bristol-Water-Drought-Plan-2018.pdf>

¹⁰⁵ Ricardo Energy and Environment (2018), Bristol Water Drought Plan 2018: Strategic Environmental Assessment Environmental Report, June 2018

<https://www.bristolwater.co.uk/wp-content/uploads/2018/08/Bristol-Water-Drought-Plan-2018-Strategic-Environmental-Assessment.pdf>

¹⁰⁶ Ricardo Energy and Environment (2018), Bristol Water Drought Plan 2018: Habitats Regulations Assessment Screening Report, June 2018

<https://www.bristolwater.co.uk/wp-content/uploads/2018/08/Bristol-Water-Drought-Plan-2018-Habitats-Regulations-Assessment-REDACTED....pdf>

¹⁰⁷ Environment Agency (2017), Drought response: our framework for England, June 2017

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625006/LIT_10104.pdf

water source identified in the Drought Plan is the R24R and R24Ra (Well Head) which is a licensed water source that has not been in operation for approximately 20 years. In the event of a drought, it would require recommissioning before it could be used to supply water. Drought permits are drought management measures available to water companies which, if granted by the Environment Agency, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment.

Overall, measures included in the Drought Plan to reduce demand for water serve to reduce pressure on limited water resources during a drought by reducing amount of water required to be abstracted from the water environment. The SEA of the Drought Plan concluded that the potential for the R24R and R24Ra (Well Head) option to have adverse effects on surface waters (River Axe) was low; however, that this would need to be further assessed and confirmed through monitoring to demonstrate 'no deterioration' under the WFD as a result of bringing this source back into supply. It was noted that mitigation measures would be needed to address effects arising from construction.

The SEA of the Drought Plan concluded that '*No significant adverse effects have been identified as a result of cumulative effects of each of the options being implemented at the same time, or with respect to other plans and programmes*'.

The revised preferred combination options in the revised draft WRMP combines three leakage options. During construction, the revised preferred options are assessed as having either neutral or minor effects, with the exception of climate change (Objective 6) and waste and resources (Objective 10) where significant negative effects have been identified. These reflect one option, P20. For climate change, this is due to embodied carbon emissions associated with new mains and emissions from plant and vehicle movements repair and replace leaking mains. For waste and resource use, this is due to increase in resource use and construction waste along with fuel usage for vehicles and plant, although some uncertainty remains due to uncertainties over the location, duration and scale of activities (which will be responsive to the leaks identified). The preferred options are assessed as having neutral or positive effects against all objectives during operation.

Given the conclusions of the two SEAs and that the Drought Plan has been developed to be consistent with WRMP, no cumulative significant effects are anticipated.

Other Water Company WRMPs

The potential for Bristol Water's revised draft WRMP to have cumulative effects with the WRMPs with other water companies has been considered.

Following ongoing dialogue with Wessex Water since publication of the draft WRMP19, Bristol Water has now agreed a reduction to our bulk supply export agreement in dry weather from 2024/25 from 11.37 MI/d to 4.4 MI/d and therefore option R32 (reduce Wessex Water bulk supply) is no longer included in the final constrained list of options.

A review of the existing WRMP proposals in neighbouring water company areas including Dŵr Cymru Welsh Water, Severn Trent Water and Wessex Water is included in **Appendix B** of this report. Other water companies that are more distant from the Bristol Water supply area were also considered; they either have resources located upstream on the River Severn (United Utilities and South Staffordshire Water) or have included feasible options that are relevant to Bristol Water's plan (Thames Water). Similarly draft WRMPs have been reviewed, and whilst it is acknowledged that they do not reflect the final position, provide a sound indication of any intentions. In consequence, at this stage, none of the current and draft WRMPs reviewed include preferred options that are considered to have in-combination effects with the revised preferred options in Bristol Water's draft WRMP. In light of this, no cumulative effects are likely to occur.

The information used to carry out this review is considered to be the most up to date information available at the time of writing. However, it should be noted that all water company WRMPs are currently subject to review with updated WRMP19s expected to be submitted to Defra imminently. Bristol Water will continue to monitor the potential effects on water resources as part of the five yearly review of their WRMP.

6.5 Mitigation and Enhancement

The potential effects of the preferred options are set out in the sections above. In some cases, there is an opportunity to reduce some of the potential negative effects. The detail of this mitigation needs to be considered during the planning phases of each of the individual component schemes within the preferred options. Where relevant, potential mitigation measures are included within each of the preferred option assessment matrices in **Appendix F** and the revised preferred option assessment matrices in **Appendix G** although these should be considered as a starting point for more detailed consideration as options are planned and developed.

There is a substantial body of general construction good-practice which is applicable to all of the proposed options where ground works are required and can be relied on (at this level) to prevent significant or adverse effects on a European or national designated site occurring as a result of construction site-derived pollutants. The following guidance documents detail the current industry best-practices in construction that are relevant to the preferred options:

- ▶ NRW, SEPA & NIEA, Guidance for Pollution Prevention (GPPs) (which are replacing the previous Pollution Prevention Guidelines (PPGs) when published) [online]. Available at: <http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>
 - PPG1: Understanding Your Environmental Responsibilities - Good Environmental Practices (July 2013; under review);
 - GPP5: Works and maintenance in or near water (January 2017);
 - PPG6: Working at construction and demolition sites (March 2012; under review);
 - GPP21: Pollution incident response planning (July 2017); and
 - PPG22: Incident response - dealing with spills (April 2011; under review).
- ▶ Venables R. et al. (2000) Environmental Handbook for Building and Civil Engineering Projects. 2nd Edition. Construction Industry Research and Information Association (CIRIA), London.

The best-practice procedures and measures detailed in these documents should be followed for all construction works derived from the WRMP as a minimum standard, unless scheme-specific investigations identify additional measures and / or more appropriate non-standard approaches for dealing with potential site-derived pollutants.

Construction activities should be undertaken so as to minimise short term adverse effects on recreational areas, such as footpaths, and on landscape and biodiversity. Noise, traffic disruption and visual impacts should also be considered. Care should also be taken during construction regarding the potential for contaminants such as silt, concrete or fuel oil to pollute water courses via surface run off. This can be mitigated by undertaking all construction activities in accordance with relevant best practice pollution prevention guidance.

To maximise economic benefits in the Bristol Water supply area, it is recommended that, where possible, work is carried out by local firms and contractors or by those with a policy for training and skills development that could help contribute to the local economy and meet employment needs.

Where significant raw materials are required for options, this can be mitigated by utilising recycled and locally sourced materials. Construction and operational wastes should also be reused/recycled where appropriate.

The potential for adverse impacts of the settings of cultural heritage assets should be considered early in the design process.

Effects on landscape character and visual amenity should also be considered at an early stage in the design process.

6.6 Conclusions and Reasons for the Selection of the Revised Preferred Options and Rejection of Alternatives

Bristol Water chose the revised preferred WRMP options using a standard industry method that includes consideration of technical feasibility, financial costs and benefits, and quantified impacts on the environment and community, taking into account the findings of the SEA and HRA as well as input from key stakeholders.

Bristol Water's preferred approach to maintaining the supply-demand balance is therefore focused on optimising the use of existing water sources while continuing to drive down leakage and water consumption to achieve a more sustainable use of water resources. This accords very well with the consultation feedback on the draft WRMP19 and reflects strong customer support for this approach as evidenced by our WRMP19 customer engagement activity. In particular, there was strong feedback from customers, our regulators and stakeholders that we should be more ambitious on our plans to reduce leakage and water consumption.

In response, Bristol Water now plan to deliver a 15% reduction in leakage by the end of 2025 (to 36.5 Ml/day) and to further reduce leakage in the longer term to 35.0 Ml/day by 2035. The revised leakage reduction programme meets Ofwat's challenge to water companies on leakage and aligns with the policy recommendations set out in the recent (April 2018) National Infrastructure Commission Report on future water infrastructure needs.

Bristol Water has also strengthened the commitment to reduce water consumption over the next 25 years. This includes increased household metering allied to further water efficiency activities to work towards our long-term aspiration of reducing average per capita consumption to 110 litres/person/day by 2050. Bristol Water plan to increase household metering from 66% of properties in 2020 to 87% by 2045. Together with additional water efficiency actions, it is forecast that average per capita consumption will reduce from 141.6 to 129.4 litres/person/day between 2020 and 2045.

This leaves a 15% gap to the 110 litre/head/day aspirational target for 2050. Closing this gap will require collaborative working with other water companies and local authorities as well as action by government over the coming years to:

- ▶ Influence customer consumption behaviour to become more water efficient;
- ▶ Modify government policy to better support water efficiency actions, such as mandatory water labelling, more water efficiency standards for water using appliances and enhanced water efficiency requirements for new homes;
- ▶ Incentivise manufacturers and innovators to reduce water consumption rates for household and commercial water using appliances.

Bristol Water has already instigated the creation of the Resource West partnership with Bristol City Council, University of West of England (UWE) and other organisations to enhance the promotion of water efficiency in our supply area, and we will also work with neighbouring water companies through the West Country Water Resources group on water efficiency promotion.

7. Next Steps and Proposals for Monitoring

7.1 Next Steps

This revised Environmental Report has been completed to assess the changes to the WRMP. It also includes changes made in response to comments received from the consultation.

The revised draft WRMP has been submitted to the Secretary of State for Environment, Food and Rural Affairs. A statement of response will also be submitted containing all the consultation submissions received and Bristol Water's response. The statement of response and revised draft WRMP will be set to the Environment Agency for review. A decision will then be taken as to whether the revised draft WRMP can be published or whether further work is required before it can be published.

As soon as is reasonable practicable after the publication of the final WRMP, Bristol Water will also publish a Post Adoption Statement which is the final output of the SEA process. This will summarise

- ▶ how environmental considerations have been integrated into the plan or programme;
- ▶ how the Environmental Report has been taken into account;
- ▶ how opinions expressed in response to consultation have been taken into account;
- ▶ how the results of any transboundary consultations entered into have been taken into account;
- ▶ the reasons for choosing the plan or programme as adopted, in the light of the other reasonable alternatives dealt with; and
- ▶ the measures that are to be taken to monitor the significant environmental effects of the implementation of the plan or programme.

As the WRMP is implemented, Bristol Water will monitor its effects on the environment through their existing processes, helping to ensure that the potential impacts identified in the SEA are considered in practice.

7.2 How Environmental Effects will be Considered Going Forward

Once the WRMP has been adopted, the preferred options for managing water supply and demand contained in it will need to be implemented through specific projects. As part of this process, each project may be subject to further assessment to understand and manage its potential environmental and social impacts. These assessments will take account of the issues discussed in this report but will also be informed by the greater detail available as the work progresses about construction techniques, building materials, and agreed locations and routes.

One form of assessment that may be required for some of the works undertaken could be a Habitats Regulations Assessment, required by the Conservation of Habitats and Species Regulations 2017. Habitats Regulations Assessment must be undertaken to assess whether a plan or project could have a significant effect on an internationally important nature conservation site (a SAC, SPA or Ramsar site) and adversely affect the achievement of the conservation objectives for the site. In many cases, a Habitats Regulation Assessment is undertaken alongside an Environmental Impact Assessment, which is the requirement of separate legislation. Environmental Impact Assessment assesses the potential positive and negative effects of development projects, and identifies the opportunities to enhance the positive and mitigate the negative effects.

7.3 Monitoring the Effects of the WRMP

Bristol Water will continue to develop its Final WRMP in consultation with EA, Natural England (NE) and other stakeholders.

Once the WRMP is implemented, with its component projects in place, its effects on the environment and people will need to be taken into account. Bristol Water expect to monitor the effects of the WRMP alongside the other impacts of their operations, and as such, are likely to rely on existing sources of information that are collected either by Bristol Water or by other relevant organisations such as the EA. For example, Bristol Water already collects information for a robust annual review process (the Water Resources Management Plan Annual Review) that is submitted to the EA. This includes information such as the quantity of water abstracted, treated and put into supply, along with other information such as the volumes lost through leakage and saved through demand management/water efficiency measures.

Bristol Water updates the WRMP and Drought Plan at regular intervals, and there are a number of statutory controls which must be monitored. In addition Bristol Water collects information on an annual basis for its own Annual Report.

As shown in Section 3, a substantial amount of relevant information is collated by central and local government. These collated data are reported through government department (primarily Defra and BEIS) and Local Authority websites.

Monitoring Requirements

Monitoring the sustainability effects of the WRMP can help to answer questions such as:

- ▶ Were the SEA predictions of effects accurate?
- ▶ Is the WRMP contributing to the achievement of the SEA objectives?
- ▶ Are mitigation measures performing as well as expected?
- ▶ Are there any adverse effects? Are these within acceptable limits, or is remedial action desirable?

It is not necessary to monitor everything or monitor an effect indefinitely. Instead monitoring should be focussed on:

- ▶ Significant effects that may give rise to irreversible damage, with a view to identifying trends before such damage is caused; and
- ▶ Significant effects where there was uncertainty in the SEA and where monitoring would enable preventative or mitigation measures to be undertaken.

Bristol Water will need to take a broad view of the findings of their ongoing monitoring processes to identify whether the WRMP has any significant unforeseen effects. Where these are identified, the company may be required to put in place specific monitoring arrangements and will consider how best to mitigate or avoid the adverse consequences. **Table 7.1** provides a provisional and indicative list of indicators based on a range of existing measures (including those identified in the previous SEA); monitoring proposals will then be considered further and a final monitoring framework that satisfies the requirements of the SEA Directive will be presented in the Post Adoption Statement.

Table 7.1 Potential Indicators for Monitoring Effects

Objective	Indicator	Source of Information	Commentary
1. To protect and enhance biodiversity, key habitats and species, working within environmental capacities and limits.	Condition of specific protected sites (e.g. SACs and SPAs)	NE	Open communication between NE and Bristol Water results in up-to-date information and identification of any potential issues.
	Condition of SSSIs on water industry land holdings	Bristol Water	Condition assessment of designated land on Bristol Waters landholdings, both area and condition may change.
	Biological monitoring	EA, Bristol Water,	Using these data sets and comparing

Objective	Indicator	Source of Information	Commentary
	(macroinvertebrates, macrophytes, fisheries, Bird surveys)	Angling clubs, British Trust for Ornithology	them against other monitored information such as levels and flows will assist in identifying whether there are any adverse effects and if mitigation measures are performing as well as expected.
	Increase in biodiversity (e.g. increase in diversity of species by planting, seeding and trans-locating plants)	Bristol Water Annual Performance Report Performance Commitment H3	Bristol Water has an on-going programme of improvements in biodiversity at a number of their sites
2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.	Number/ floorspace of water infrastructure built on previously developed land	Bristol Water	Bristol Water could record the number and floorspace of new buildings that are built on previously developed land.
3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.	River flow and level characteristics	Bristol Water, EA	Monitoring can be compared to historic records.
	River flows, river levels, lake and reservoir levels.	Bristol Water, EA	At sensitive sites previous studies should be used to inform monitoring and assessment. For example RoC documentation, WFD Post Implementation Monitoring data, and any Drought Permit (DP) Environmental Assessments and associated environmental monitoring plans.
	Groundwater levels and recharge characteristics	Bristol Water, EA	At sensitive sites previous studies should be used to inform monitoring and assessment. For example RoC, WFD Post Implementation Monitoring data, documentation and any Drought Permit (DP) Environmental Assessments and associated environmental monitoring plans.
	Leakage	Bristol Water Annual Performance Report Performance Commitment F1	Bristol Water report these data to Ofwat and the EA as part of the annual returns process.
	Water saved through demand management/ water efficiency measures	Bristol Water	Bristol Water report these data to Ofwat and the EA as part of the annual returns process.
4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.	Water quality of surface waters.	Bristol Water, EA	At sensitive sites previous studies should be used to inform monitoring and assessment. For example RoC documentation, WFD Post Implementation Monitoring data, and any Drought Permit (DP) Environmental Assessments and associated environmental monitoring plans.
	Abstracted groundwater quality	Bristol Water, EA	At sensitive sites previous studies should be used to inform monitoring and assessment. For example RoC documentation, WFD Post Implementation Monitoring data, and any Drought Permit (DP) Environmental Assessments and associated environmental monitoring plans.

Objective	Indicator	Source of Information	Commentary
	Negative water quality consumer contacts	Bristol Water Annual Performance Report Performance Commitment E1	Bristol Water record the total number of consumer contacts (telephone, letter and email) about the appearance, taste and odour of the water for the previous calendar year.
5. To reduce the risk of flooding.	Number of properties that experience flooding as a result of burst in the water supply distribution network.	Bristol Water	Bristol Water could record the number of properties that experience flooding as a result of bursts on the water supply distribution network.
6. To limit the causes and potential consequences of climate change.	Quantity of greenhouse gas emissions as kgCO ₂ e/person. Energy use used in the operational phase of water treatment and supply.	Bristol Water Annual Performance Report Performance Commitment H1	Bristol Water can use company data, and guidance from the UKWIR greenhouse gas workbook and Defra conversion factors to derive this information
	Renewable energy generated; renewable energy purchased.	Bristol Water	
7. To ensure the protection and enhancement of human health.	Compliance with drinking water standards at customers' taps (%).	Bristol Water – drinking water quality report	Bristol Water report these data to the Drinking Water Inspectorate.
	Compliance with water quality standards under the EC Bathing Waters Directive.	EA	The EA monitors the compliance of bathing waters and reports this annually.
	Number of Bristol Water sites with public access which provide sporting, recreational and leisure resources and number of visits per year.	Bristol Water	Bristol Water hold information on the number of annual visitors to sites where specific visitor facilities are provided (e.g. Chew Valley Lake Visitor Centre)
8. To maintain and enhance the economic and social well-being of the local community.	Population and projected population change over time	Bristol Water, ONS	Bristol Water report these data to the EA as part of the annual return process and to Ofwat as part of the Strategic Business Plan.
	Percentage of customers in water poverty	Bristol Water Annual Performance Report Performance Commitment I1	Bristol Water identifies the proportion of customers who pay more than 2% of their disposable income on water charges.
	Population in centres >25,000 at risk from asset failure	Bristol Water Annual Performance Report Performance Commitment B1	This measures the total number of consumers in areas of population of greater than 25,000 who are at risk of interruption to their water supply in the event that a critical asset such as a treatment works is unable to operate.
9. To ensure the sustainable and efficient use of water resources.	Chemicals Use in Water Supply	Bristol Water (services data)	Information on chemical use should be held in accounts.
10. To promote the efficient use of resources.	Amount of primary and recycled aggregates used.	Bristol Water (contractors/consultants)	Information on aggregate use and recycling should be held by Construction managers and accounts (contractors / consultants accounts, waste or procurement records)
11. To conserve and enhance cultural and	Loss / damage or discovery / protection of cultural, historic	Bristol Water, English Heritage	English Heritage monitor the condition of all statutorily protected

Objective	Indicator	Source of Information	Commentary
historic assets.	and industrial heritage features.		monuments.
12. To conserve and enhance landscape character.	Loss or damage to landscape character and features of designated sites.	Bristol Water	Bristol Water could record the number and floorspace of new buildings that are built on previously developed land.

Appendix A

Quality Assurance Checklist

The Government’s Guidance on SEA¹⁰⁸ contains a quality assurance checklist to help ensure that the requirements of the SEA Directive are met. Those requirements relevant to the scoping stage of the SEA of Bristol Waters’ WRMP have been highlighted below.

Quality Assurance Checklist	
Objectives and Context	
The plan’s or programme’s purpose and objectives are made clear.	The purpose of the revised draft WRMP is set out in Section 1 of this report. The objectives of the revised draft WRMP are set out in Section 1 .
Environmental issues and constraints, including international and EC environmental protection objectives, are considered in developing objectives and targets.	Key environmental, social and economic issues (including protection objectives) identified through a review of relevant plans and programmes (see Section 2 of this report) and analysis of baseline conditions (see Section 3) have informed the development of the assessment framework presented in Section 4 .
Scoping	
Consultation Bodies are consulted in appropriate ways and at appropriate times on the content and scope of the Environmental Report.	The SEA Scoping Report was consulted upon in April/May 2017 and responses are summarised in this Environmental Report (see Appendix C).
The assessment focuses on significant issues.	Sustainability issues have been identified in the baseline analysis contained in Section 3 on a topic-by-topic basis. Section 3.11 summarises the key sustainability issues identified.
Technical, procedural and other difficulties encountered are discussed; assumptions and uncertainties are made explicit.	Section 4.6 describes the key difficulties encountered during the preparation of this Environmental Report.
Reasons are given for eliminating issues from further consideration.	N/a.
Alternatives	
Realistic alternatives are considered for key issues, and the reasons for choosing them are documented.	All feasible, preferred and revised preferred options have been assessed, as set out in Section 5 and Section 6 and Appendix E and Appendix F of this report. For the purposes of the WRMP, the reasonable alternatives are the feasible options considered. The reasons for selection of the revised draft WRMP as proposed and for the rejection of alternatives is set out in Section 6 .
Alternatives include ‘do minimum’ and/or ‘business as usual’ scenarios wherever relevant.	The Feasible Options include ‘business as usual’ options for production and resource options; customer demand options; and distribution options where relevant. This is assessed in Section 6 .
The environmental effects (both adverse and beneficial) of each alternative are identified and compared.	This is included in Section 5 , Section 6 , Appendix E and Appendix F of this report.
Inconsistencies between the alternatives and other relevant plans, programmes or policies are identified and explained.	No inconsistencies were identified.
Reasons are given for selection or elimination of alternatives.	The reasons for selection of the revised draft WRMP as proposed and for the rejection of alternatives is set out in

¹⁰⁸ Office of the Deputy Prime Minister (2005) *A Practical Guide to the Strategic Environmental Assessment Directive*.

Quality Assurance Checklist	
	Section 6.
Baseline Information	
Relevant aspects of the current state of the environment and their likely evolution without the plan or programme are described.	Section 3 of this report characterises the current environmental baseline conditions, along with how these are likely to change in the future.
Environmental characteristics of areas likely to be significantly affected are described, including areas wider than the physical boundary of the plan area where it is likely to be affected by the plan.	Throughout Section 3 of this report, reference is made to areas which may be affected by the WRMP.
Difficulties such as deficiencies in information or methods are explained.	Section 3.12 details limitations of the data used in the report and assumptions made.
Prediction and Evaluation of Likely Significant Environmental Effects	
Effects identified include the types listed in the Directive (biodiversity, population, human health, fauna, flora, soil, water, air, climate factors, material assets, cultural heritage and landscape), as relevant; other likely environmental effects are also covered, as appropriate.	This is set out in Sections 5, 6, Appendix E and Appendix F and of this report.
Both positive and negative effects are considered, and the duration of effects (short, medium or long-term) is addressed.	This is set out in Sections 5, 6, Appendix E Error! Reference source not found. and Appendix F and of this report.
Likely secondary, cumulative and synergistic effects are identified where practicable.	Likely secondary, cumulative and synergistic effects are considered in Section 6 of this report.
Inter-relationships between effects are considered where practicable.	This is set out in Sections 5, 6, Appendix E and Appendix F and of this report.
The prediction and evaluation of effects makes use of relevant accepted standards, regulations, and thresholds.	Relevant standards have been used where appropriate in undertaking the assessment.
Methods used to evaluate the effects are described.	Information on the methods used for evaluation of potential effects is included in Section 4 and Appendix D .
Mitigation Measures	
Measures envisaged to prevent, reduce and offset any significant adverse effects of implementing the plan or programme are indicated.	Mitigation measures are set out in Section 6 and Appendix D and E and of this report.
Issues to be taken into account in project consents are identified.	This is set out in Sections 5, 6, Appendix E and Appendix F and of this report.
The Environmental Report	
Is clear and concise in its layout and presentation.	We believe the report is clear and concise.
Uses simple, clear language and avoids or explains technical terms.	The report uses accessible language wherever possible.
Uses maps and other illustrations where appropriate.	Maps and illustrations have been utilised in the report.
Explains the methodology used.	The method used is set out in the report in Section 4 .
Explains who was consulted and what methods of consultation were used.	Appendix C of this report outlines the consultation that has been carried out to-date.
Identifies sources of information, including expert judgement and matters of opinion.	Sources of information are included throughout the report.
Contains a non-technical summary covering the overall	A Non-Technical Summary has been included as part of the

Quality Assurance Checklist	
approach to the SEA, the objectives of the plan, the main options considered, and any changes to the plan resulting from the SEA.	report.
Consultation	
The SEA is consulted on as an integral part of the plan-making process.	The previously issued SEA Scoping Report was consulted upon and responses to these are included in this Environmental Report (see Appendix C). The previous version of the Environmental Report was issued for consultation along with the draft WRMP, with the responses included in this revised Environmental Report (see Appendix C).
Consultation Bodies and the public likely to be affected by, or having an interest in, the plan or programme are consulted in ways and at times which give them an early and effective opportunity within appropriate time frames to express their opinions on the draft plan and Environmental Report.	Consultation on the draft WRMP and the previous Environmental Report was undertaken by Bristol Water for a 12 week period ending 31 st May 2018 (see Appendix C).
Decision-making and Information on the Decision	
The environmental report and the opinions of those consulted are taken into account in finalising and adopting the plan or programme.	This will be incorporated in the revised draft WRMP following consultation on the draft WRMP and Environmental Report. These will be summarised in the Post Adoption Statement.
An explanation is given of how they have been taken into account.	This will be incorporated in the revised draft WRMP following consultation on the draft WRMP and Environmental Report. These will be summarised in the Post Adoption Statement.
Reasons are given for choosing the plan or programme as adopted, in the light of other reasonable alternatives considered.	This will be incorporated in the revised draft WRMP following consultation on the draft WRMP and Environmental Report. These will be summarised in the Post Adoption Statement.
Monitoring Measures	
Measures proposed for monitoring are clear, practicable and linked to the indicators and objectives used in the SEA.	The report sets out potential indicators that Bristol Water could use in Section 6 .
Monitoring is used, where appropriate, during implementation of the plan or programme to make good deficiencies in baseline information in the SEA.	The suggestions for monitoring are included in Section 6 of the report. These will be confirmed in the Post Adoption Statement. Monitoring will take place following implementation WRMP.
Monitoring enables unforeseen adverse effects to be identified at an early stage. (These effects may include predictions which prove to be incorrect.)	The suggestions for monitoring made in Section 6 are for Bristol Water to act on, with monitoring taking place following implementation of the WRMP. The monitoring measures will be summarised in the Post Adoption Statement.
Proposals are made for action in response to significant adverse effects.	Mitigation is outlined in Section 6 and Appendix E and F of this report.



Appendix B

Review of Plans and Programmes

International / European Plans and Programmes	
Purpose of the Document, including Objectives and Targets relevant to the Water Resources Management Plan and SEA	Relationships and Influences on the WRMP and the SEA
The Bonn Convention (or CMS) 1975 <i>The Convention on the Conservation of Migratory Species of Wild Animals</i>	
<p>The Convention on the Conservation of Migratory Species of Wild Animals (also known as the Bonn Convention or CMS) is an intergovernmental treaty under the United Nations Environment Programme. The convention was signed in 1979 ratified in the UK in 1985.</p> <p>The convention aims to ensure contracting parties work together to conserve terrestrial, marine and avian migratory species and their habitats (on a global scale) by providing strict protection for endangered migratory species.</p> <p>Overarching objectives set for the Parties are:</p> <ul style="list-style-type: none"> - Should promote, co-operate in and support research relating to migratory species; - Shall endeavour to provide immediate protection for migratory species; - Shall endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II. <p>Setting targets is the responsibility of member states.</p>	<p>The WRMP should take into account the habitats and species that have been identified under this directive, and should include provision for their protection, preservation and improvement.</p> <p>The SEA assessment framework should include biodiversity, incorporating the importance of conserving migratory species.</p>
The Bern Convention 1979	
<p>The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) was adopted in Bern, Switzerland in 1979, and came into force in 1982.</p> <p>The principal objectives are:</p> <ul style="list-style-type: none"> - To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co-operation of several States; - To promote such co-operation. Particular emphasis is given to endangered and vulnerable species, including endangered and vulnerable migratory species; - In order to achieve this the Convention imposes legal obligations on contracting parties, protecting over 500 wild plant species and more than 1000 wild animal species. <p>Targets for Contracting Parties are:</p> <ul style="list-style-type: none"> - Promoting national policies for the conservation of wild flora, wild fauna and natural habitats, with particular attention to endangered and vulnerable species, especially endemic ones, and endangered habitats, in accordance with the provisions of this Convention; - Undertaking in its planning and development policies, and in its measures against pollution, to have regard to the conservation of wild flora and fauna; - Promoting education and disseminating general information on the need to conserve species of wild flora and fauna and their habitats. 	<p>The WRMP should take into account the habitats and species that have been identified under the Convention, and should include provision for the preservation, protection and improvement of the quality of the environment as appropriate.</p> <p>The SEA assessment framework should incorporate the conservation provisions of the Convention particularly the protection of wild flora, fauna and natural habitats.</p>
UNESCO (1971) <i>The Ramsar Convention on Wetlands</i>	
<p>The Convention on Wetlands of International Importance was signed in Ramsar, Iran in 1971. It is an intergovernmental treaty which provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources, as a means to achieving sustainable development throughout the world.</p> <p>The original emphasis was on the conservation and wise use of wetlands primarily to provide habitat for water birds, however over the years the Convention has broadened its scope to incorporate all aspects of wetland conservation and wise use, recognising wetlands as ecosystems that are extremely important for biodiversity conservation and for the well-being of human communities.</p> <p><i>'The Convention's mission is the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world'</i> (Ramsar COP8, 2002).</p> <p>A Strategic Plan 2009-2015 has been adopted to provide guidance on how efforts for</p>	<p>The WRMP should ensure the protection and wise use of wetlands.</p> <p>The SEA assessment framework should incorporate the protection of wetland sites listed under the Ramsar convention.</p>

International / European Plans and Programmes	
Purpose of the Document, including Objectives and Targets relevant to the Water Resources Management Plan and SEA	Relationships and Influences on the WRMP and the SEA
<p>implementing the Convention on Wetlands should be focussed. The strategy has 5 goals:</p> <ul style="list-style-type: none"> - Wise use: The wise use of all wetlands being achieved in all Parties, including more participative management of wetlands, and conservation decisions being made with an awareness of the importance of the ecosystem services provided by wetlands; - Wetlands of International Importance: Parties designating and managing Ramsar sites within their territories with a view to supporting an international network of Wetlands of International Importance, fully implementing their reporting commitments under Articles 3 and 8.2, and using the Montreux Record as part of the Convention's governance process, as appropriate; - International cooperation: Parties developing their coherent national approaches to the implementation of the Ramsar Convention in such a way as to benefit from developing effective partnerships with related conventions and international agencies and with other Parties to the Convention on Wetlands; - Institutional capacity and effectiveness: Increasing success of the Convention in achieving the conservation and wise use of wetlands, as measured by agreed effectiveness indicators, and increased recognition of the Convention's achievements by other sectors of governments and civil society; - Membership: All countries eligible for accession to have joined the Ramsar Convention by 2015. <p>A number of strategic key results are set out in the strategy against each of the 5 goals, e.g. by 2015 global wetland distribution and status data and information should be available through Web portal mechanisms, Ramsar guidance on the maintenance of ecological character to be have been applied with a priority upon recognized internationally important wetlands not yet designated as Ramsar sites.</p>	
UNESCO World Heritage Convention (1972)	
<p>The Convention defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List. In addition to this, countries are required to:</p> <ul style="list-style-type: none"> • Ensure that measures are taken for the protection, conservation and presentation of cultural and natural heritage • Adopt a general policy that gives cultural and natural heritage a function in the life of the community • Integrate the protection of heritage into comprehensive planning programmes. 	<p>The assessment framework should include an objective on heritage and archaeological issues.</p>
The Kyoto Protocol 1997	
<p>The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. It is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for industrialized countries for reducing greenhouse gas (GHG) emissions. These amounted to an average of five per cent against 1990 levels in the first commitment period (2008 to 2012). The Protocol is planned to be extended to 2020 (the Kyoto second commitment period), pending ratification of the Doha Agreement.</p>	<p>The WRMP should aim to reduce greenhouse gas emissions.</p> <p>The SEA assessment framework should include objectives/guide questions related to reducing greenhouse gas emissions.</p>
The Aarhus Convention 1998	
<p>To contribute to the protection of present and future generations to live in an environment adequate to his or her health and well-being. This will be achieved through each Party subject to the convention guaranteeing the rights of access to information, public participation in decision-making, and access to justice in environmental matters in accordance with the provisions of this Convention.</p> <p>To establish and maintain a clear, transparent and consistent framework to implement the provisions of this Convention. This will be achieved through each Party taking the necessary legislative, regulatory and other measures, including measures to achieve compatibility between the provisions implementing the information, public participation and access-to-justice provisions in this Convention, as well as proper enforcement measures.</p> <p>Responsibility for implementation is deferred to the member states.</p>	<p>The development of the WRMP needs to be a transparent process.</p> <p>SEA should show a strong sense of safeguarding the lives of future generations and ensure that enough time is provided for consultation on the SEA documents in line with the Aarhus convention of establishing and maintaining a transparent clear framework.</p>
The Convention for the Protection of the Architectural Heritage of Europe (Granada Convention, 1987)	
<p>The main purpose of the convention is to reinforce and promote policies for the conservation and enhancement of Europe's heritage and to foster closer European co-operation in defence of heritage. Recognition that conservation of heritage is a cultural purpose and integrated</p>	<p>The SEA assessment framework should include an objective on the conservation and</p>

International / European Plans and Programmes	
Purpose of the Document, including Objectives and Targets relevant to the Water Resources Management Plan and SEA	Relationships and Influences on the WRMP and the SEA
conservation of heritage is an important factor in the improvement of quality of life.	enhancement of heritage and decision making criteria on architectural heritage.
The European Convention on the Protection of Archaeological Heritage (Valetta Convention)	
Agreement that the conservation and enhancement of an archaeological heritage is one of the goals of urban and regional planning policy. It is concerned in particular with the need for co-operation between archaeologists and planners to ensure optimum conservation of archaeological heritage.	The SA Framework should include an objective on the conservation and enhancement of heritage and decision making criteria on archaeological heritage.
World Commission on Environment and Development (1987) <i>Our Common Future (The Brundtland Report)</i>	
<p>The Brundtland Report is concerned with the world's economy and its environment. The objective is to provide an expanding and sustainable economy while protecting a sustainable environment. The Report was a call by the United Nations:</p> <ul style="list-style-type: none"> to propose long-term environmental strategies for achieving sustainable development by the year 2000 and beyond; to strengthen co-operation among developing countries and between countries at different stages of economic and social development to achieve common and mutually supportive objectives which take account of the interrelationships between people, resources, environment and development; to consider ways and means by which the international community can deal more effectively with environment concerns; and to help define shared perceptions of long-term environmental issues and the appropriate efforts needed to deal successfully with the problems of protecting and enhancing the environment, a long term agenda for action during the coming decades, and aspirational goals for the world community. 	The SEA and WRMP should seek to contribute to sustainable development.
The World Summit on Sustainable Development, Johannesburg (September 2002)	
<p>The World Summit resulted in the Johannesburg Declaration on Sustainable Development and a Plan of Implementation. The declaration reaffirms principles already agreed upon at the Rio Earth Summit UNCED in 1992 and the UN Millennium Summit in 1999. It recognises that poverty eradication is a key condition for sustainable development and addresses issues such as cultural diversity, patterns of production and consumption, health issues, armed conflicts, the new dimension created by globalisation, gender issues and financing for development.</p> <p>The implementation plan sets out actions to achieve sustainable development such as poverty eradication, changing unsustainable patterns of consumption and production, protecting and managing the natural resource base of economic and social development, sustainable development in a globalizing world and health and sustainable development.</p> <p>Sustainable development in England is delivered through the sustainable development strategy, <i>Securing the Future</i>, and in Wales through <i>One Wales: One Planet</i>, The Sustainable Development Scheme of the Welsh Government.</p>	<p>The WRMP should promote sustainable development.</p> <p>The SEA should help to deliver sustainable development through the balanced assessment of the WRMP.</p>
United Nations Convention on Biodiversity (the Rio Convention, 1992)	
The Convention on Biodiversity called for the development and enforcement of national strategies and associated action plans to identify, conserve and protect existing biological diversity, and to enhance it wherever possible. In the UK, the UK Biodiversity Action Plan was then established to conserve and enhance biodiversity in the UK through the use of Habitats and Species Action Plans to help the most threatened species and habitats to recover and to contribute to the conservation of global biodiversity.	The assessment framework should include protection and enhancement of biodiversity.
European Landscape Convention 2000 (became binding March 2007)	
<p>The European Landscape Convention was adopted on 20 October 2000 in Florence and came into force on 1 March 2004 (Council of Europe Treaty Series no. 176). It is open for signature by member states of the Council of Europe and for accession by the European Community and European non-member states. The UK Government signed the European Landscape Convention in 2006 and it became binding from March 2007.</p> <p>The aims of the Convention are to promote landscape protection, management and planning, and to organise European co-operation on landscape issues.</p>	<p>The WRMP should take landscape into account.</p> <p>The SEA assessment framework should include landscape.</p>

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<p>Responsibility for implementation has been deferred to the signatories. Articles 5 (general measures) and 6 (specific measures) set out measures that the signatories will undertake, e.g. integrating landscape into policies with possible direct or indirect impact on landscape and to introduce instruments aimed at protecting, managing and/or planning the landscape.</p>	
The Paris Agreement 2016	
<p>The Paris Agreement was adopted at the 2015 Climate Change Conference, which aims to limit global temperature rises to 2 degrees. It was adopted by 195 countries at the Conference but will not come into force in 2020 unless ratified by at least 55 countries. The Agreement opened for signature in April 2016.</p>	<p>The WRMP should aim to reduce greenhouse gas emissions.</p> <p>The SEA assessment framework should include greenhouse gas emissions.</p>
European Commission (2006) <i>Thematic Strategy for Soil Protection</i>	
<p>The <i>Thematic Strategy for Soil Protection</i> consists of a Communication from the Commission to the other European Institutions, a proposal for a framework Directive (a European law), and an Impact Assessment.</p> <p>It sets out an EU strategy for soil protection with an overall objective of the protection and sustainable use of soil, based on the following guiding principles:</p> <p>(1) Preventing further soil degradation and preserving its functions:</p> <ul style="list-style-type: none"> - when soil is used and its functions are exploited, action has to be taken on soil use and management patterns; and - when soil acts as a sink/receptor of the effects of human activities or environmental phenomena, action has to be taken at source. <p>(2) Restoring degraded soils to a level of functionality consistent at least with current and intended use, thus also considering the cost implications of the restoration of soil.</p> <p>The strategy proposes introducing a framework Directive setting out common principles for protecting soils across the EU, with Member States deciding how best to protect soil and how use it in a sustainable way on their own territory.</p>	<p>The WRMP should take potential effects on soil into account.</p> <p>The SEA assessment framework should include soils.</p>
European Commission (EC) (2011) <i>A Resource- Efficient Europe- Flagship Initiative Under the Europe 2020 Strategy, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (COM 2011/21)</i>	
<p>This flagship initiative aims to create a framework for policies to support the shift towards a resource-efficient and low-carbon economy which will help to:</p> <ul style="list-style-type: none"> • Boost economic performance while reducing resource use; • Identify and create new opportunities for economic growth and greater innovation and boost the EU's competitiveness; • Ensure security of supply of essential resources; and • Fight against climate change and limit the environmental impacts of resource use. 	<p>The WRMP provides an opportunity to ensure reductions in resource use and to ensure security of supply of water.</p> <p>The SEA framework should include objectives relating to resource use.</p>
European Commission (2011) <i>A Roadmap for Moving to a Competitive Low Carbon Economy in 2050</i>	
<p>The EU already has short term targets in place to reduce its emissions to 20% below 1990 levels by 2020; to increase the share of renewable energy to 20%; and to make a 20% improvement in energy efficiency. The 2050 roadmap looks beyond 2020 at longer term objectives.</p> <p>The roadmap suggests that by 2050, the EU should cut its emissions to 80% below 1990 levels through domestic reductions alone. It sets out milestones which form a cost-effective pathway to this goal - reductions of 40% by 2030 and 60% by 2040. It also shows how the main sectors responsible for Europe's emissions - power generation, industry, transport, buildings and construction, as well as agriculture - can make the transition to a low-carbon economy most cost-effectively.</p>	<p>The assessment framework should recognise that certain development proposals require an EIA to be undertaken, resulting in the identification of any likely significant environmental effects and associated mitigation measures.</p>
European Commission (2013) <i>Strategy on Adaptation to Climate Change</i>	
<p>The EU strategy aims to make Europe more climate-resilient by adapting to the changing climate. It aims to provide a coherent approach to enhance preparedness and capacity to respond to the impacts of climate change. The three key objectives of the strategy are:</p> <ul style="list-style-type: none"> • Promoting action by Member States – encouraging Member States to adopt 	<p>The assessment framework should include criteria relating to climate resilience.</p>

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<p>adaptation strategies and provide funding to boost capacity;</p> <ul style="list-style-type: none"> • 'Climate-proofing' action at EU level – promoting adaptation in vulnerable sectors such as agriculture and fisheries; and • Better informed decision-making – addressing gaps in knowledge and improving the European information sharing platform, Climate-ADAPT. 	
European Commission (2014) A Policy Framework for Climate and Energy in the Period from 2020 to 2030	
<p>The 2030 climate and energy framework was adopted in 2014 and builds on the 2020 targets. It sets three key targets for 2030:</p> <ul style="list-style-type: none"> • at least 40% cuts in greenhouse gas emissions (from 1990 levels); • at least 27% share for renewable energy; and • at least 27% improvement in energy efficiency. <p>The greenhouse gas emissions and renewable energy targets are binding, while the energy efficiency target will be reviewed in 2020.</p>	<p>The WRMP should support longer term targets for reducing greenhouse gas emissions, increasing renewable energy and energy efficiency.</p> <p>The SEA assessment framework should include the consideration of energy and greenhouse gas emissions.</p>
European Commission (2015) 'Closing the loop - An EU Action Plan for the Circular Economy' policy package	
<p>This document sets out actions to implement the European Commission's long term vision of significantly reducing waste landfilling and increasing recycling.</p>	<p>The SEA should consider opportunities for the WRMP to contribute/enable the circular economy.</p>
European Union (1991) The Nitrates Directive (91/676/EEC)	
<p>The Nitrates Directive is designed to reduce water pollution caused by nitrate from agriculture. The directive requires Defra and the Welsh Government to identify surface or groundwaters that are, or could be high in nitrate from agricultural sources.</p> <p>Once a water body is identified as being high in nitrate all land draining to that water is designated a Nitrate Vulnerable Zone. Within these zones, farmers must observe an action programme of measures which include restricting the timing and application of fertilisers and manure, and keeping accurate records.</p>	<p>The WRMP should be consistent with the aim to reduce water pollution caused by nitrate from agriculture.</p> <p>The SEA assessment framework should include water quality.</p>
European Union (1991) 91/271/EEC for Urban Waste-water Treatment	
<p>The aim of the Urban Waste Water Directive is to protect the environment from the adverse effects of waste water discharges. It sets out guidelines and legislation for the collection, treatment and discharge of urban waste water. The Directive was adopted by member states in May 1991 and is transposed into law in England and Wales by The Urban Waste Water Treatment (England & Wales) Regulations 1994 (as amended*). The Regulations require that all significant discharges are treated to at least secondary treatment. They also set standards and deadlines for the provision of sewage systems, the treatment of sewage according to the size of the community served by the sewage treatment works and the sensitivity of receiving waters to their discharges.</p> <p>* The Regulations were amended in 2003 by The Urban Waste Water Treatment (England & Wales) (Amendment) Regulations 2003.</p> <p>Responsibility for Implementation is deferred to member states.</p>	<p>The WRMP needs to consider the implication of the Directive.</p> <p>The SEA assessment framework should include water quality.</p>
European Union (1992) The Habitats Directive 92/43/EEC	
<p>The Habitats Directive seeks to conserve natural habitats. Conservation of natural habitats requires member states to identify special areas of conservation and to maintain where necessary landscape features of importance to wildlife and flora.</p> <p>It is required that each Member State propose a list of sites indicating which natural habitat types and which species the sites host. The information would include a map of the site, its name, location and its extent. The Commission will then establish, in agreement with each Member State, a draft list of sites of Community importance drawn from the Member States' lists identifying those which host one or more priority natural habitat types or priority species.</p>	<p>The WRMP should take into account the habitats and species that have been identified under this Directive, and include provision for the preservation, protection and improvement of the quality of the environment as appropriate.</p> <p>The SEA assessment framework should incorporate sites protected for their nature conservation importance.</p>
European Union (1998) Drinking Water Directive (98/83/EC)	

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<p>The Drinking Water Directive (DWD) concerns the quality of water intended for human consumption. The objective of the DWD is to protect the health of the consumers in the EU and to make sure the water is wholesome and clean. To do this, the DWD sets standards for 48 (microbiological and chemical) parameters that can be found in drinking water. The parameters must be monitored and tested regularly. In principle WHO guidelines for drinking water are used as a basis for the standards in the DWD. While translating the DWD into their own national legislation (transposition of the DWD), the Member States of the European Union can include additional requirements e.g. regulate additional substances that are relevant within their territory or set higher standards. However, Member States are not allowed to set lower standards as the level of protection of human health should be the same within the whole EU. Member States have to monitor the quality of the drinking water supplied to their citizens and of the water used in the food production industry. Member States report at three yearly intervals the monitoring results to the European Commission.</p> <p>Standards constitute legal limits. Sets limits for microbiological and chemical parameters in drinking water. Also gives indicator parameters.</p>	<p>The WRMP should contain objectives for drinking water quality to ensure that limits are not exceeded.</p> <p>The SEA assessment framework should include drinking water quality.</p>
European Union (1999) <i>Directive on the Landfill of Waste (99/31/EC)</i>	
<p>The Directive aims at reducing the amount of waste landfilled; promoting recycling and recovery; establishing high standards of landfill practice across the EU, and preventing the shipping of waste from one Country to another.</p> <p>The objective of the Directive is to prevent or reduce as far as possible negative effects on the environment (in particular on surface water, groundwater, soil, air and human health) from the land-filling of waste, by introducing stringent technical requirements for waste and landfills.</p> <p>The Directive requires the reduction of the amount of biodegradable municipal waste sent to landfill to 75% of the total generated in 1995 by 2006, 50% by 2009 and 35% by 2016.</p>	<p>The WRMP should take the effects on waste to landfill into account.</p> <p>The SEA assessment should consider the effects on water, soil, air, human health and waste</p>
European Union (2000) <i>EU Water Framework Directive (2000/60/EC)</i>	
<p>The purpose of this Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. The framework aims to:</p> <ul style="list-style-type: none"> - Protect any further deterioration and enhance the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems; - Promote sustainable water use based on a long-term protection of available water resources; - Enhance protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances; - Ensure the progressive reduction of pollution of groundwater and prevent its further pollution; - Contribute to mitigating the effects of floods and droughts. <p>Key targets and indicators relevant to the WRMP and SEA are:</p> <ul style="list-style-type: none"> - Achievement of good ecological status and good surface water chemical status by 2015; - Achievement of good ecological potential and good surface water chemical status for heavily modified water bodies and artificial water bodies; - Prevention of deterioration from one status class to another; - Achievement of water-related objectives and standards for protected areas; - Achievement of good groundwater quantitative and chemical status by 2015; - Prevention of deterioration from one status class to another; - Reversal of any significant and sustained upward trends in pollutant concentrations and prevent or limit input of pollutants to groundwater; - Achievement of water related objectives and standards for protected areas. 	<p>The WRMP needs to consider the implication of the Directive in terms of sustainable water use, protection and improvement of the aquatic environment, reducing and preventing pollution and mitigating the effects of droughts.</p> <p>The SEA assessment framework should include water quality, water resources, sustainable water use, and biodiversity.</p>
European Union (2001) <i>Directive on the Assessment of the Effects of Certain Plans and Programmes on the Environment (SEA Directive) (2001/42/EC)</i>	
<p>The objective of the SEA Directive is "to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the</p>	<p>Driver for SEA. Need to ensure all topics identified in the SEA</p>

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<p>preparation and adoption of plans and programmes with a view of contributing towards sustainable development".</p> <p>Throughout the course of the development of the plan, policy or programme, the aim of SEA is to identify the potential impact of options proposed in the plan in terms of their environmental, economic and social effects. If any adverse effects are identified, these options can then be avoided or proposals modified to manage or mitigate adverse effects.</p>	<p>Directive are considered within the scope of the assessment. Need to ensure that the subsequent Environmental Report meets the requirements of Annex I of the SEA Directive.</p>
European Union (2001) National Emissions Ceiling Directive 2001/81/EC	
<p>The Directive sets upper limits for each Member State for the total emissions in 2010 of the four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia). The UK 2010 ceilings for each of these pollutants were 585 kilotonnes, 1,167 kilotonnes, 1,200 kilotonnes and 297 kilotonnes, respectively.</p> <p>This is being revised through the Thematic Strategy on Air Pollution and emissions ceilings for the four compounds and particulate matter (PM2.5) up to 2020 are anticipated.</p>	<p>Consider the need for air quality to be included in the SEA framework.</p>
European Union (2002) The Environment Noise Directive (Directive 2002/49/EC)	
<p>The END aims to "define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to the exposure to environmental noise". For that purpose several actions are to be progressively implemented. It furthermore aims at providing a basis the harmful effects, including annoyance, due to the exposure to environmental noise". For that purpose several actions are to be progressively implemented. It furthermore aims at providing a basis for developing EU measures to reduce noise emitted by major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment and mobile machinery.</p> <p>The underlying principles of the Directive are similar to those underpinning other overarching environment policies (such as air or waste), i.e.:</p> <ul style="list-style-type: none"> - Monitoring the environmental problem; by requiring competent authorities in Member States to draw up "strategic noise maps" for major roads, railways, airports and agglomerations, using harmonised noise indicators Lden (day-evening-night equivalent level) and Lnight (night equivalent level). These maps will be used to assess the number of people annoyed and sleep-disturbed respectively throughout Europe. - Informing and consulting the public about noise exposure, its effects, and the measures considered to address noise, in line with the principles of the Aarhus Convention. - Addressing local noise issues by requiring competent authorities to draw up action plans to reduce noise where necessary and maintain environmental noise quality where it is good. The directive does not set any limit value, nor does it prescribe the measures to be used in the action plans, which remain at the discretion of the competent authorities. - Developing a long-term EU strategy, which includes objectives to reduce the number of people affected by noise in the longer term, and provides a framework for developing existing Community policy on noise reduction from source. With this respect, the Commission has made a declaration concerning the provisions laid down in article 1.2 with regard to the preparation of legislation relating to sources of noise. <p>It is important to note, however, that the present Directive does not set binding limit values, nor does it prescribe the measures to be included in the action plans thus leaving those issues at the discretion of the competent authorities.</p> <p>The long-term exposure indicators supersede those in the 1999 World Health Organisation (WHO) Guidelines for Community Noise, which are now in the process of being updated in line with the Directive.</p>	<p>The WRMP will need to have regard to the requirements of the END.</p> <p>The SEA assessment framework should include for the protection against excessive noise.</p>
European Union (2002) Directive 2002/91/EC on the Energy Performance of Buildings	
<p>The European Union Energy Performance of Buildings Directive was published in the Official Journal on the 4th January 2003. The overall objective of the Directive is to <i>promote the improvement of energy performance of buildings within the Community taking into account outdoor climate and local conditions as well as indoor climate requirements and cost effectiveness.</i></p> <p>The Directive highlights how the residential and tertiary sectors, the majority of which are based in buildings, accounts for 40% of EU energy consumption.</p>	<p>The SEA should highlight any opportunities for new buildings associated with the WRMP to contribute to improved energy performance.</p>
European Commission (2004), Environmental Liability Directive (2004/35/EC)	
<p>The Directive establishes a framework for environmental liability based on the "polluter pays"</p>	<p>The SEA should take account of the need to ensure that</p>

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principle, with a view to preventing and remedying environmental damage.	proposals in the WRMP avoids causing direct or indirect damage to the aquatic environment or contamination of land that creates a significant risk to human health.
European Union (2005) <i>Thematic Strategy on Air Pollution</i>	
This strategy supplements current legislation. It sets out objectives for air pollution and proposes measures for achieving them by 2020.	The SEA undertaken for the last iteration of the WRMP scoped out air quality and consideration should be given to this approach.
European Union (2006), <i>Animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals (2006/88/EC)</i>	
<p>The Directive establishes:</p> <ul style="list-style-type: none"> • Animal health requirements for the placing on the market, importation and transit of aquaculture animals and their products; • Minimum measures to prevent diseases in aquaculture animals; • Minimum measures to be taken in response to suspected or established cases of certain diseases in aquatic animals. 	The SEA should take account of the need to maintain or enhance the quality of habitats and biodiversity.
European Union (2006) <i>Directive 2006/118EC on the protection of groundwater against pollution and deterioration</i>	
This Directive establishes specific measures as provided for in Article 17(1) and (2) of Directive 2000/60/EC (Water Framework Directive) in order to prevent and control groundwater pollution. This Directive is designed to prevent and combat groundwater pollution.	The SEA should take account of the need to maintain, protect and improve water quality across the WRMP area.
European Union (2006) <i>The Bathing Waters Directives 2006 2006/7/EC</i>	
<p>The Bathing Waters Directive set standards for the quality of bathing waters (with the exception of water intended for therapeutic bathing purposes and water used in swimming pools).</p> <p>It lays down the minimum quality criteria to be met by bathing water:</p> <ul style="list-style-type: none"> - the physical, chemical and microbiological parameters; - the mandatory limit values and indicative values for such parameters; - the minimum sampling frequency and method of analysis or inspection of such water. <p>Member States fix the values that they apply to bathing water in accordance with the guidelines of Directive 76/160/EEC. Member States may fix more stringent values than those laid down in the Directive. Where it does not give any values for certain parameters, Member States are not obliged to fix any.</p> <p>The Directive is transposed into law in England and Wales through the Bathing Water (Classifications) Regulations 2003.</p> <p>In March 2006, a revised Bathing Water Directive was adopted and become law in the UK in March 2008. As well as stricter water quality standards, it contains a requirement to provide more detailed and standardised information about bathing waters across Europe. Directive 2006/7/EC will repeal the Directive 76/160/EEC in 2014.</p> <p>Bathing waters are protected areas under the Water Framework Directive.</p> <p>Mandatory standards are given for 10 parameters: total coliforms, faecal coliforms, salmonella, enteroviruses, pH, colour, mineral oils, surface active substances (detergents), phenols and transparency.</p> <p>The Directive also sets the minimum frequency at which bathing waters should be sampled.</p>	<p>The WRMP will need to comply with set limits.</p> <p>The SEA assessment should include a guide question relating to the effects of options on the water quality at designated bathing waters.</p>
European Union (2006) <i>Sustainable Development Strategy</i>	
This document sets out a single coherent strategy outlining how the EU will meet long-standing commitments to sustainable development. This document presents a renewed version of the 2001 EU Sustainable Development Strategy (SDS). The aim of the SDS is to identify and develop actions to enable the EU to achieve continuous improvement of quality of life both for current and for future generations, through the creation of sustainable communities able to manage and use resources efficiently, and to tap the ecological and social innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion.	<p>The WRMP should reflect all of the aims and targets set out in the Sustainable Development Strategy.</p> <p>The SEA assessment framework should reflect the core and supporting principles of the</p>

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<p>The key objectives of the strategy are:</p> <ul style="list-style-type: none"> - Environmental protection; - Social equity and cohesion; - Economic prosperity; and - Meeting our international responsibilities. <p>The following key challenge areas include a number of targets in achieving their respective objectives:</p> <ul style="list-style-type: none"> - Climate Change and clean energy; - Sustainable Transport; - Sustainable consumption and production; - Conservation and management of natural resources; - Public Health; - Social inclusion, demography and migration; - Global poverty and sustainable development challenges. <p>The strategy was reviewed by the European Commission in 2009 (<i>Mainstreaming sustainable development into EU policies: 2009 Review of the European Union Strategy for Sustainable Development</i>), which underlined that the EU has mainstreamed sustainable development into a broad range of its policies in recent years, but that efforts still need to be intensified to address unsustainable trends such as energy consumption.</p>	<p>strategy including climate change, sustainable transport, public health, social inclusion and poverty.</p>
European Union (2006) Mining Waste Directive (2006/21/EC)	
<p>The Directive aims to prevent or reduce as far as possible any adverse effects on the environment, and any resultant risks to human health, brought about as a result of the management of waste from the extractive industries. The Directive covers the management of waste resulting directly from prospecting, extraction, treatment and storage of mineral resources and from quarrying. Operators are required to use Best Available Techniques in the management of waste facilities and the prevention of major accidents.</p>	<p>The WRMP should have regard to the aim to avoid adverse effects from extractive waste.</p> <p>The SEA assessment framework should include consideration of waste.</p>
European Union (2007) Floods Directive 2007/60/EC	
<p>The Floods Directive requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.</p> <p>Member States are required to carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas at risk of flooding.</p>	<p>The WRMP should take account of the flood risk management plans as they become available through the life of the plan.</p> <p>The SEA assessment framework should include flood risk.</p>
European Union (2007) The Eel Directive 2007/1100/EC	
<p>The Eel Directive establishes measures for the recovery of the stock of European eel and requires member states to produce Eel management plans for each catchment.</p>	<p>The WRMP should ensure that there are no adverse impacts on eel as a result of water resource management measures.</p>
European Union (2008) Environmental Quality Standards Directive 2008/105/EC	
<p>The Directive aims to control the concentration of certain substances which pose a risk to the aquatic environment. The 33 'priority substances' addressed by the Directive are defined by the Water Framework Directive (2000/60/EC), including cadmium, lead, mercury, nickel, benzene and polyaromatic hydrocarbons.</p> <p>The Directive sets thresholds of concentration that must not be exceeded, with limits to average values over a year to ensure long-term water quality and maximum allowable concentrations to limit short term pollution peaks. Member States must comply with the water quality standards and record an inventory of emissions and discharges of all substances in the Directive.</p>	<p>The assessment framework should include assessment criteria relating to water quality.</p>
European Union (2008) Marine Strategy Framework Directive 2008/56/EC	
<p>The Directive sets out a framework for an ecosystem-based approach to the management of human activities which supports the sustainable use of marine goods and services. The overarching goal of the Directive is to achieve 'Good Environmental Status' (GES) by 2020 across Europe's marine environment. The Directive establishes four European Marine</p>	<p>The assessment framework should incorporate assessment criteria relating to the quality of the marine environment.</p>

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<p>Regions, based on geographical and environmental criteria. The North East Atlantic Marine Region is divided into four subregions, with UK waters lying in two of these (the Greater North Sea and the Celtic Seas).</p> <p>Each Member State is required to develop a marine strategy for their waters, in coordination with other countries within the same marine region or subregion. Marine strategies must be implemented to protect and conserve the marine environment, prevent its deterioration, and, where practicable, restore marine ecosystems in areas where they have been adversely affected. The marine strategies must contain:</p> <ul style="list-style-type: none"> • An initial assessment of the current environmental status of that Member State's marine waters; • A determination of what Good Environmental Status means for those waters; • Targets and indicators designed to show whether a Member State is achieving GES; • A monitoring programme to measure progress towards GES; • A programme of measures designed to achieve or maintain GES. <p>The Directive also requires Marine Protected Areas (MPAs) to be established to support the achievement of GES.</p>	
European Union (2008) <i>EU Air Quality Directive (2008/50/EC) and previous directives (96/62/EC; 99/30/EC; 2000/69/EC & 2002/3/EC)</i>	
<p>The Directive:</p> <ul style="list-style-type: none"> - defines and establishes objectives for ambient air quality to avoid, prevent or reduce harmful effects on human health and the environment as a whole; - assesses the ambient air quality in Member States using common methods and criteria; - obtains information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures; - ensures that such information on ambient air quality is made available to the public; - seeks to maintain air quality where it is good and improving it in other cases; and - promotes increased cooperation between the Member States in reducing air pollution. 	<p>The WRMP should contribute towards achieving air quality standards set out in the Directive.</p> <p>Consider the need for air quality to be included in the SEA framework.</p>
European Union (2008) <i>Directive on Waste (Directive 75/442/EEC, 2006/12/EC 2008/98/EC as amended)</i>	
<p>The essential objective of all provisions relating to waste management should be the protection of human health and the environment against harmful effects caused by the collection, transport, treatment, storage and tipping of waste. Some key objectives include:</p> <ul style="list-style-type: none"> - The recovery of waste and the use of recovered materials as raw materials should be encouraged; - Member States should, in addition to taking responsible action to ensure the disposal and recovery of waste, take measures to restrict the production of waste; - It is important for the Community as a whole to become self-sufficient in waste disposal and desirable for Member States individually to aim at such self-sufficiency; - Waste management plans should be drawn up in the Member States; - Movements of waste should be reduced; - Ensure a high level of protection and effective control; - Subject to certain conditions, and provided that they comply with environmental protection requirements, some establishments which process their waste themselves or carry out waste recovery may be exempted from permit requirements; - That proportion of the costs not covered by the proceeds of treating the waste must be defrayed in accordance with the 'polluter pays' principle. 	<p>The WRMP should seek to ensure the protection of human health and the environment in relation to waste management.</p> <p>The SEA assessment should include objectives on the protection of human health and the environment.</p>
European Union (2009) <i>EU Directive on the Conservation of Wild Birds (09/147/EC) (codified version of Council Directive 79/409/EEC as amended)</i>	
<p>The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. The main provisions of the Directive include:</p>	<p>The WRMP should seek to protect and enhance biodiversity, particularly</p>

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<ul style="list-style-type: none"> • The maintenance of the populations of all wild bird species across their natural range (Article 2) with the encouragement of various activities to that end (Article 3). • The identification and classification of Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance (Article 4). (Together with Special Areas of Conservation designated under the Habitats Directive, SPAs form a network of European protected areas known as Natura 2000). • The establishment of a general scheme of protection for all wild birds (Article 5). • Restrictions on the sale and keeping of wild birds (Article 6). • Specification of the conditions under which hunting and falconry can be undertaken (Article 7). (Huntable species are listed on Annex II of the Directive). • Prohibition of large-scale non-selective means of bird killing (Article 8). • Procedures under which Member States may derogate from the provisions of Articles 5-8 (Article 9) — that is, the conditions under which permission may be given for otherwise prohibited activities. • Encouragement of certain forms of relevant research (Article 10 and Annex V). • Requirements to ensure that introduction of non-native birds do not threatened other biodiversity (Article 11). 	<p>designated sites.</p> <p>The SEA assessment framework should include objectives, indicators and targets that cover biodiversity.</p>
European Union (2010) <i>Industrial Emissions Directive (integrated pollution prevention and control) 2010/75/EU</i>	
<p>This Directive brings together the IPPC Directive (2008/1/EC) and six other Directives on titanium dioxide, VOCs and waste incineration, with the aim of reducing pollutant emissions. It covers industries with high polluting potential such as energy, production and processing of metals, minerals, chemicals, waste management and rearing of animals.</p> <p>It defines the obligations to be met by industrial activities with a major pollution potential. This includes establishing a permit procedure, requirements for Best Available Techniques (BAT) and setting out requirements for discharges.</p>	<p>The assessment framework should include criteria that ensure the protection of the environment through the prevention of pollution.</p>
European Union (2010) <i>Energy 2020 - A Strategy for Competitive, Sustainable and Secure Energy</i>	
<p>EU energy and climate goals have been incorporated into the Europe 2020 Strategy for smart, sustainable and inclusive growth. The energy strategy includes five priorities for Europe:</p> <ol style="list-style-type: none"> 1. Achieving an energy-efficient Europe; 2. Building a truly pan-European integrated energy market; 3. Empowering consumers and achieving the highest level of safety and security; 4. Extending Europe's leadership in energy technology and innovation; 5. Strengthening the external dimension of the EU energy market. <p>Energy 2020 is part of Resource-Efficient Europe, one of the seven key initiatives of Europe 2020.</p>	<p>The assessment framework should include criteria relating to energy where appropriate</p>
European Union (2010) <i>Europe 2020 : A strategy for smart, sustainable and inclusive growth</i>	
<p>Europe 2020 is the EU's ten-year growth strategy. It aims to change the EU's growth model and create the conditions for growth that is smarter, more sustainable and more inclusive. It contains seven 'flagship initiatives' to provide a framework for innovation, the digital economy, employment, youth, industrial policy, poverty, and resource efficiency.</p> <p>There are also five key target areas for the EU to achieve by 2020:</p> <ol style="list-style-type: none"> 1. Employment: 75% of the 20-64 year-olds to be employed. 2. R&D: 3% of the EU's GDP to be invested in R&D. 3. Climate change and energy sustainability: greenhouse gas emissions 20% (or even 30%, if the conditions are right) lower than 1990; 20% of energy from renewable; 20% increase in energy efficiency. 4. Education: reducing the rates of early school leaving below 10%; at least 40% of 30-34-year-olds completing third level education. 5. Fighting poverty and social exclusion: at least 20 million fewer people in or at risk of 	<p>The assessment framework should include criteria relating to employment, R&D, climate change and poverty where relevant.</p>

International / European Plans and Programmes	
Purpose of the Document, including Objectives and Targets relevant to the Water Resources Management Plan and SEA	Relationships and Influences on the WRMP and the SEA
poverty and social exclusion.	
European Union (2011) <i>EU Biodiversity Strategy to 2020 – towards implementation</i>	
<p>The European Commission has adopted an ambitious new strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020.</p> <p>The strategy provides a framework for action over the next decade and covers the following key areas:</p> <ul style="list-style-type: none"> • Conserving and restoring nature; • Maintaining and enhancing ecosystems and their services; • Ensuring the sustainability of agriculture, forestry and fisheries; • Combating invasive alien species; • Addressing the global biodiversity crisis. 	<p>The WRMP should seek to protect and enhance biodiversity, particularly designated sites.</p> <p>The SEA assessment framework should include objectives, indicators and targets that cover biodiversity.</p>
European Union (2009) <i>Renewable Energy Directive (2009/28/EC)</i>	
<p>This Directive establishes a common framework for the use of energy from renewable sources in order to limit greenhouse gas emissions and to promote cleaner transport. It encourages energy efficiency, energy consumption from renewable sources and the improvement of energy supply.</p> <p>The Member States are to establish national action plans which set the share of energy from renewable sources consumed in transport, as well as in the production of electricity and heating, for 2020. These action plans must take into account the effects of other energy efficiency measures on final energy consumption (the higher the reduction in energy consumption, the less energy from renewable sources will be required to meet the target). These plans will also establish procedures for the reform of planning and pricing schemes and access to electricity networks, promoting energy from renewable sources.</p> <p>Each Member State has a target calculated according to the share of energy from renewable sources in its gross final consumption for 2020. The UK is required to source 15 per cent of energy needs from renewable sources, including biomass, hydro, wind and solar power by 2020. From 1 January 2017, biofuels and bioliquids share in emissions savings should be increased to 50%.</p>	<p>The WRMP should seek to contribute towards increasing the proportion of energy from renewable energy sources.</p> <p>The SEA assessment framework should include consideration of use of energy from renewable energy sources.</p>
EU Directives on <i>Environmental Impact Assessment (Codified Directive 2011/92/EU and Revised Directive 2014/52/EU)</i>	
<p>The Directive, as enacted in 1985, amended, codified in 2011 and revised in 2014, sets out procedural requirements for certain development proposals to undergo an Environmental Impact Assessment (EIA) before being granted consent through the town and country planning or other consenting regimes. The UK Government is obliged to transpose the Revised EIA Directive by May 2017.</p>	<p>The SEA should recognise that certain development proposals require an EIA to be undertaken, resulting in the identification of any likely significant environmental effects and associated mitigation measures.</p>
European Union 2012 <i>Energy Efficiency Directive (2012/27/EU)</i>	
<p>The Directive establishes a set of binding measures to help the EU reach its 20% energy efficiency target by 2020. Under the Directive, all EU countries are required to use energy more efficiently at all stages of the energy chain from its production to final consumption.</p> <p>Specific measures relate to:</p> <ul style="list-style-type: none"> • energy distributors achieving 1.5% energy savings per year through energy efficiency measures; • improving the efficiency of heating systems, installing double glazed windows or insulating roofs; • purchasing energy efficient buildings, products and services, and performing energy efficient renovations; • access to data on consumption; • large companies to audit energy consumption (implemented in the UK through the Energy Savings Opportunity Scheme Regulations 2014); • national incentives for SMEs to undergo energy audits; and • monitoring efficiency levels in new energy generation capacities. 	<p>The WRMP should seek to contribute towards targets for energy efficiency.</p> <p>The SEA assessment framework should include consideration of energy consumption and efficiency.</p>



International / European Plans and Programmes	
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European Union (2014) <i>Seventh Environmental Action Programme to 2020 'Living well, within the limits of our planet'</i>	
<p>The seventh Environmental Action Programme defines environmental priority objectives to be achieved by the EU up to 2020. As part of the programme, the EU aims to protect natural capital; promote resource-efficient and low-carbon growth; and safeguard health and wellbeing linked to pollutants, chemicals and climate change. The nine objectives and actions set out in the programme are:</p> <ul style="list-style-type: none"> • to protect, conserve and enhance the Union's natural capital; • to turn the Union into a resource-efficient, green, and competitive low-carbon economy; • to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing; • to maximise the benefits of the Union's environment legislation by improving implementation; • to increase knowledge about the environment and widen the evidence base for policy; • to secure investment for environment and climate policy and account for the environmental costs of any societal activities; • to better integrate environmental concerns into other policy areas and ensure coherence when creating new policy; • to make the Union's cities more sustainable; and • to help the Union address international environmental and climate challenges more effectively. 	<p>The assessment framework should, where relevant, reflect the objectives of the programme.</p>
European Union (2015) <i>Invasive Alien Species Regulation (1143/2014/EU)</i>	
<p>This Regulation seeks to address the problem of invasive alien species in a comprehensive manner so as to protect native biodiversity and ecosystem services, as well as to minimize and mitigate the human health or economic impacts that these species can have.</p>	<p>The SEA assessment framework should include guide questions relating to invasive species.</p>

National Plans and Programmes	
Purpose of the Document, including Objectives and Targets relevant to the Water Resources Management Plan and SEA	Relationships and Influences on the WRMP and the SEA
Department for Business, Energy and Industrial Strategy (BEIS) formerly the Department for Energy and Climate Change (DECC) (2010) <i>CRC Energy Efficiency Scheme</i>	
<p>The CRC Energy Efficiency Scheme is a Government backed legislative carbon emissions trading scheme and covers large business and public sector organisations in the UK. RC was intended to have a significant impact on reducing UK carbon emissions, offering the potential to save money through energy efficiency. It was designed to drive changes in behaviour and infrastructure, generate corporate awareness of the detrimental impacts of carbon emissions, and improve energy management practice. The Government announced in March 2016 that the scheme will be abolished from the end of the 2018/2019 compliance year.</p>	<p>The WRMP should seek to help contribute towards achieving carbon reduction.</p> <p>The SEA assessment should cover topics that will help to ensure that carbon emissions are reduced.</p>
BEIS (formerly DECC) (2011) <i>National Policy Statements for Energy Infrastructure</i>	
<p>The energy National Policy Statements (NPSs) set out national policy against which proposals for major energy projects will be assessed and decided on by the Infrastructure Planning Commission. The following six NPSs have been designated:</p> <ul style="list-style-type: none"> - Overarching NPS for Energy (EN1); - Fossil Fuel Electricity Generating Infrastructure NPS (EN2); - Renewable Energy Infrastructure NPS (EN3) ; - Gas Supply Infrastructure & Gas and Oil Pipelines NPS (EN4); - Electricity Networks Infrastructure NPS (EN5); - Nuclear Power Generation NPS (EN6). <p>The Overarching NPS for Energy sets out that the purpose of the NPSs is to develop a clear, long-term policy framework which facilitates investment in the necessary new infrastructure (by the private sector) and in energy efficiency. The NPS highlights that the construction, operation and decommissioning of this infrastructure can lead to increased demand for water, involve discharges to water and cause adverse ecological effects resulting from physical modifications to the water environment. The NPSs expect applicants to undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment.</p> <p>Of these sites, one site (Oldbury) is located within the Bristol Water supply area, whilst a second site (Hinkley Point) is located approximately 10km to the South West of the Bristol Water supply area. The remaining sites are considered too distant from the Bristol Water supply area for in-combination effects to occur.</p> <p>The NPSs reiterate and are underpinned by the target to cut greenhouse gas emissions by at least 80 per cent by 2050, compared to 1990 levels.</p>	<p>The WRMP may need to consider the potential impact of major energy proposals on water resources in the Bristol Water area. This may include the potential development of nuclear power stations at Hinkley and Oldbury.</p> <p>The SEA should consider the cumulative effects of the WRMP and any major energy proposals which may affect water resources in the Bristol Water area.</p>
Department for Communities and Local Government (DCLG) (2014) <i>National Planning Policy for Waste</i>	
<p>Sets out detailed waste planning policies for local authorities. States that planning authorities need to:</p> <ul style="list-style-type: none"> • Need to use a proportionate evidence base in preparing Local Plans • Identify sufficient opportunities to meet the identifies needs of their area for the management of waste streams <p>Identifying suitable sites and areas for waste facilities.</p>	<p>The WRMP may need to consider the potential impact of proposals on waste generation and on waste management facilities in the WRMP area.</p> <p>The SEA should consider the effects of the WRMP on waste generation and management capacity.</p>
Department for the Environment, Food and Rural Affairs (Defra) (2000) <i>Waterways for Tomorrow</i>	
<p>The key objective of this document is the promotion of waterways, encouraging their use and development whilst maximising the opportunities the waterways offer for leisure and recreation as a catalyst for urban and rural regeneration and for freight transport. The strategy also encourages the innovative use of waterways such as water transfer and telecommunication.</p>	<p>The WRMP should contribute towards meeting the objective of the strategy.</p> <p>The SEA assessment framework should ensure that consideration is given to the potential effects of the WRMP.</p>
Defra (2005) <i>Making Space for Water: Taking forward a new Government strategy for flood and coastal erosion risk management in England (first Government response to 2004 consultation)</i>	
<p>The programme seeks to embed flood and coastal erosion risk management across a range of Government policies, including planning, urban and rural development, agriculture, transport,</p>	<p>The WRMP may have some</p>

<p>nature conservation and conservation of the historic environment.</p> <p>Objectives:</p> <ul style="list-style-type: none"> - To reduce the threat of flooding to people and their property, and - To deliver the greatest environmental, social and economic benefit, consistent with the Government's sustainable development principles. <p>Targets:</p> <p>No formal targets or indicators.</p>	<p>linkages with this strategy.</p> <p>The SEA should seek to ensure that flood risk in the area is not adversely affected by the implementation of the WRMP.</p>
<p>Defra (2011) Shoreline Management Plan Guidance</p>	
<p>This is guidance for the second generation of Shoreline Management Plans and includes updates to guidance first published in 2006. A shoreline management plan (SMP) is a coastal defence management tool. It is a large-scale assessment of the risks associated with coastal processes and helps to reduce these risks to people and the developed, historic and natural environment. This guidance document sets out Defra's and the Welsh Government's strategy for managing flooding and coastal erosion.</p> <p>The guidance includes the following objectives:</p> <ul style="list-style-type: none"> - set out the risks from flooding and erosion to people and the developed, historic and natural environment within the SMP area; - identify opportunities to maintain and improve the environment by managing the risks from floods and coastal erosion; - identify the preferred policies for managing risks from floods and erosion over the next century; - identify the consequences of putting the preferred policies into practice; - set out procedures for monitoring how effective these policies are; - inform others so that future land use, planning and development of the shoreline takes account of the risks and the preferred policies; - discourage inappropriate development in areas where the flood and erosion risks are high; and - meet international and national nature conservation legislation and aim to achieve the biodiversity objectives. 	<p>The WRMP should take into account its effects on areas with a SMP.</p> <p>The SEA assessment should take into account the effects of the options on the coast where relevant.</p>
<p>Defra (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services</p>	
<p>This new biodiversity strategy for England provides a comprehensive picture of how we are implementing our international and EU commitments. It sets out the strategic direction for biodiversity policy for the next decade on land (including rivers and lakes) and at sea.</p> <p>The strategy sets 20 targets across 5 strategic goals:</p> <ul style="list-style-type: none"> - Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society; - Reduce the direct pressures on biodiversity and promote sustainable use; - Improve status of biodiversity by safeguarding ecosystems, species and genetic diversity; - Enhance the benefits to all from biodiversity and ecosystem services; and <p>Enhance implementation through participatory planning, knowledge management and capacity building.</p>	<p>The WRMP should contribute towards meeting the targets and objectives within the strategy.</p> <p>The SEA should include objectives to improve status of biodiversity and enhance benefits of biodiversity and its ecosystem services, and reduce pressures on ecosystems.</p>
<p>Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland</p>	
<p>The Air Quality Strategy sets out air quality objectives and policy options to further improve air quality in the UK to benefit public health, quality of life and help to protect our environment. The strategy sets out objectives relating to particles, nitrogen dioxide, ozone, sulphur dioxide, polycyclic aromatic hydrocarbons, benzene, 1,3- butadiene, carbon monoxide, lead, nitrogen oxides and sulphur dioxide.</p>	<p>The WRMP should take account of air quality objectives in the strategy.</p> <p>The SEA should include guide questions relating to the effects of options on human health and the environment.</p>
<p>Defra (2010) Air Pollution: Action in a Changing Climate</p>	
<p>This document highlights the health benefits that can be achieved through closer integration of air quality and climate change policies. Air pollution often originates from the same activities that contribute to climate change (notably transport and electricity generation), so linkages between these policy areas could help ensure that they are managed most effectively. Air quality/climate change co-benefits can be realised through actions such as promoting low-carbon vehicles and renewable sources of energy that do not involve combustion.</p> <p>The document aims to set ambitious but realistic air quality targets, and to ensure that climate</p>	<p>The WRMP should seek to ensure that air quality, climate change and human health are not adversely affected by the options.</p> <p>The SEA should include guide questions relating to the effects of options on human health and the</p>

<p>and air quality targets are better aligned in future.</p>	<p>environment.</p>
<p>Defra, Scottish Government, Welsh Government (2015) <i>The Great Britain Invasive Non-native Species Strategy</i></p>	
<p>The strategy sets out key aims and actions for addressing the threats posed by invasive non-native species, including the prevention of invasive species arriving in Britain, early detection and monitoring, eradication and control. It also aims to:</p> <ul style="list-style-type: none"> • get people to work better together, including the government, stakeholders, land managers and the general public; and • improve co-ordination and co-operation on issues at a European and international level. <p>- The strategy covers the period 2015 to 2020.</p>	<p>The WRMP should seek to avoid the spread of invasive species.</p> <p>The SEA should consider the effects of the WRMP on biodiversity.</p>
<p>Defra (2009) <i>The Groundwater (England and Wales) Regulations 2009</i></p>	
<p>The Groundwater Regulations are designed to implement a daughter directive to the European Water Framework Directive and prevent or limit the inputs of polluting substances into groundwater. Substances controlled under these regulations fall into two categories:</p> <p>a) Hazardous substances, defined as those which are toxic, persistent or liable to bioaccumulate must be prevented from entering groundwater. Substances in this list may be disposed of to the ground, under a permit, but must not reach groundwater. They include pesticides, sheep dip, solvents, hydrocarbons, mercury, cadmium and cyanide.</p> <p>b) Non-hazardous pollutants are less dangerous, and can be discharged to groundwater under a permit, but must not cause pollution. Examples include sewage, trade effluent and most wastes. Non-hazardous pollutants include any substance capable of causing pollution and the list is much wider than the previous List 2 substances.</p>	<p>The WRPM will need to comply with the requirements of the Regulations where appropriate.</p> <p>The SEA assessment should include an objective relating to the effects of options on groundwater quality.</p>
<p>Defra (2010) <i>Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network</i></p>	
<p>The report answers two questions: Do England's wildlife sites comprise a coherent and resilient ecological network? If not, what needs to be done? The report considers why these questions are important in the context of past, current and future pressures on the environment, and describe what ecological networks are and the benefits they bring. It goes on to consider the strengths and weaknesses of our current wildlife sites, before setting out a prioritised set of ecological solutions to improve the network. Finally, the report sets out 24 recommendations for practical action to Make Space for Nature and achieve a coherent and resilient ecological network.</p> <p>We propose that the overall aim for England's ecological network should be to achieve a natural environment where, compared to the situation in 2000, biodiversity is enhanced with the diversity, functioning and resilience of ecosystems re-established in a network for nature that can sustain these levels into the future, even given continuing environmental change and human pressures.</p>	<p>The WRMP should seek to preserve the ecological network.</p> <p>The SEA framework should consider the ecological network in its objectives/guidance questions.</p>
<p>Defra (2012) <i>National Policy Statement for Waste Water</i></p>	
<p>This National Policy Statement (NPS) sets out Government policy for the provision of major waste water infrastructure. It will be used by the Infrastructure Planning Commission (IPC) to guide its decision making on development consent applications for waste water developments that fall within the definition of Nationally Significant Infrastructure Project (NSIP) as defined in the Planning Act 2008. As well as considering the general need for new waste water infrastructure, this NPS covers two NSIPs which have been assessed as required to meet this need although these do not fall within the Bristol Water or neighbouring areas and are therefore unlikely to influence, or be influenced by, the WRMP.</p>	<p>The WRMP should consider any unforeseen NSIP proposals that come forward prior to adoption which may affect water resources in the Bristol Water area.</p> <p>The SEA should consider the cumulative effects of the WRMP and any unforeseen NSIP proposals that come forward which may affect water resources in the Bristol Water area.</p>
<p>Environment Agency (2008) <i>Better Sea Trout and Salmon Fisheries: Our Strategy for 2008-2021</i></p>	
<p>The strategy has the goal of more sea trout and more salmon in more rivers bringing more benefit. This goal is to be brought about through achieving three broad targets:</p> <ol style="list-style-type: none"> 1 Self-sustaining sea trout and salmon in abundance in more rivers; 2 Economic and social benefits optimised for sea trout and salmon fisheries; 3 Widespread and positive partnerships, producing benefits. <p>There are twelve more detailed targets lying below these broad goals which relate to salmon and fisheries. These could be relevant to monitoring the effects of the WRMP, e.g. a target of 70 per cent of rivers outside the 'at risk' (i.e. better than) the 'at risk' category in 2011 and 2021 to demonstrate rivers meeting their potential for salmon</p>	<p>The WRMP should take the strategy into account where the option may have an effect on salmon and trout, e.g. where an option may involve inserting or removing a barrier to fish.</p> <p>The SEA should include a guide question in relation to the effects of options on recreation (i.e. recreational angling) and also appropriate targets in monitoring proposals.</p>
<p>Environment Agency (2016) <i>Creating a Better Place: Our Ambition to 2020</i></p>	

<p>This document includes the EA's vision, principles and purpose, and sets out its objectives to create a cleaner healthier environment which benefits people and the economy, a nation better protected against natural threats and hazards, and its commitment to work in partnership. The key objectives for 2016 to 2020 are:</p> <ul style="list-style-type: none"> - a cleaner, healthier environment which benefits people and the economy; - a nation better protected against natural threats and hazards, with strong response and recovery capabilities; and - higher visibility, stronger partnerships and local choices. 	<p>The SEA and WRMP should consider the EA's priorities.</p>
<p>Environment Agency (2011) National Flood and Coastal Erosion Risk Management Strategy for England</p>	
<p>This strategy describes what needs to be done by all organisations involved in flood and coastal erosion risk management. These include local authorities, internal drainage boards, water and sewerage companies, highways authorities, and the Environment Agency. They all act to reduce the risk of flooding and coastal erosion, and manage its consequences.</p> <p>The strategy sets out a statutory framework that will help communities, the public sector and other organisations to work together to manage flood and coastal erosion risk. It will support local decision-making and engagement in FCERM, making sure that risks are managed in a co-ordinated way across catchments and along each stretch of coast. This includes the development of local flood risk management strategies by lead local flood authorities, as well as our strategic overview of all sources of flooding and coastal erosion</p>	<p>The WRMP should seek to ensure that activities do not result in additional risk of flooding or coastal erosion.</p> <p>The SEA framework should consider flooding and coastal erosion.</p>
<p>Environment Agency (undated) Restoring Sustainable Abstraction Programme</p>	
<p>EA note that there is evidence to suggest that unsustainable abstraction of groundwater and surface water could be contributing to environmental damage of rivers and wetlands in England and Wales, including sites of national and international conservation importance. In May 1997, at the Government's Water Summit, a commitment was made to reverse the damage caused by past decisions. EA investigates where over-abstraction has occurred and work with local people to restore sustainable supplies.</p>	<p>The WRMP will need to sustainably manage abstraction.</p> <p>The SEA should include a guide question relating to whether abstraction will contribute to environmental damage of rivers and wetlands.</p>
<p>Environment Agency (2013) Areas of Water Stress: Final Classification</p>	
<p>The report is the Environment Agency's formal advice on which areas in England are of serious water stress.</p>	<p>The WRMP should seek to manage any water stressed areas.</p> <p>The SEA assessment framework should consider the effects of the WRMP on water resources and the associated socio-economic and environmental receptors.</p>
<p>Environment Agency (various) Drought Plans</p>	
<p>Drought Plans prepared by the EA:</p> <ul style="list-style-type: none"> - outline how the EA will manage water resources during a drought and defines their role and responsibilities; - aim to reconcile the competing interests of the environment, the need for public water supply and other abstractions; - show what additional environmental monitoring the EA will carry out; - provide a framework for liaison with water companies, awareness campaigns and determination of drought permits; - range from high-level activities where they co-ordinate drought management over England and Wales to a local level where they outline specific operational activities. <p>Those plans particularly relevant to the Bristol Water area include the Head Office Drought Plan (covering England and Wales), Drought Plans for Wales and the Midlands as well as area plans for south east, south west and north Wales and the west Midlands.</p>	<p>The WRMP should, where appropriate, take into account and accord with the provisions contained within the EA Drought Plans listed.</p> <p>The SEA assessment framework should include an objective/guide question on the effects of the WRMP on water resources and commentary on whether they affect the water resource zones' ability to manage drought. Data contained within the plans listed may inform the baseline and assessment of plan options.</p>
<p>HM Government (1975) Salmon and Freshwater Fisheries Act</p>	
<p>The act encompasses fishing regulation, as well as illegal obstruction of migratory pathways and prohibited modes of destroying fish. The act allows the salmon to maintain an environmentally stable population and support the fishing industry.</p>	<p>The SEA and WRMP should consider the protection of Salmon and freshwater fish.</p>
<p>HM Government (1975) Reservoirs Act</p>	
<p>The Reservoirs Act 1975 provides a legal framework to ensure the safety against failure of large raised reservoirs.</p> <p>The Reservoirs Act 1975 applies to reservoirs that hold at least 25,000 cubic metres of water above natural ground level.</p>	<p>The WRMP should consider reservoirs.</p>

<p>Safety legislation for reservoirs in the United Kingdom was introduced in 1930 after several reservoir disasters had resulted in loss of life. This law was superseded by the Reservoirs Act 1975.</p> <p>Under the Reservoirs Act 1975 reservoir owners (undertakers) have ultimate responsibility for the safety of their reservoirs.</p> <p>Reservoir owners must appoint a panel engineer (a specialist civil engineer who is qualified and experienced in reservoir safety) to supervise the design and construction of the reservoir, to continuously supervise the reservoir when built (supervising engineer) and to carry out periodic inspections (inspecting engineer).</p>	
<p>HM Government (1981) <i>Wildlife and Countryside Act</i></p>	
<p>The Act makes it an offence (with exceptions) to;</p> <ul style="list-style-type: none"> - Intentionally kill, injure or take any wild bird or their eggs or nests; - Intentionally kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5; - Prohibits interference with places used for shelter or protection, or intentionally disturbing animals; and - Pick, uproot, trade in, or possess (for the purposes of trade) and wild plant listed in Schedule 8. <p>The Act also provides for the notification of Sites of Special Scientific Interest (SSSI) and require surveying authorities to maintain up to date definitive maps and statements, for the purpose of clarifying public rights of way.</p>	<p>The WRMP must ensure full compliance with the Act.</p> <p>The SEA should ensure a positive contribution to the wildlife within the operational area.</p>
<p>HM Government (1991) <i>Water Resources Act</i></p>	
<p>The Water Resources Act applies to England and Wales and established the National Rivers Authority (now the Environment Agency) to regulate water pollution, water resources, flood defence, fisheries and navigation. The Act covers water abstraction and impounding and discharges to surface and groundwaters and coastal waters.</p>	<p>The WRMP must ensure full compliance with the Act</p>
<p>HM Government (1994) <i>UK Biodiversity Action Plan (BAP)</i></p>	
<p>The aim of the action plan is to conserve and enhance biological diversity in the UK and to contribute to the conservation of national and global biodiversity and include the follow aims to maintain and, where practicable, to enhance:</p> <ul style="list-style-type: none"> - The overall populations and natural ranges of native species and the quality and range of wildlife habitats and ecosystems; - Internationally and nationally important and threatened species, habitats and ecosystems; - Species, habitats and natural and managed ecosystems that are characteristic of Kent; - The biodiversity of natural and semi-natural habitats, where this has diminished over 3 recent decades, and - Public awareness of, and involvement in, conserving biodiversity. 	<p>Ensure that WRMP and SEA encourage conservation and offer protection to areas and species of high conservation importance as identified in this action plan.</p>
<p>HM Government (2006) <i>Natural Environment and Rural Communities Act 2006</i></p>	
<p>An act to make provision about bodies concerned with the natural environment and rural communities to make provision in connection with wildlife sites of special scientific interest. National Parks and the Broads; to amend the law relating to rights of way to make provision as to the inland Waterways Amenity Advisory Council; to provide for flexible administrative arrangements in connection with functions relating to the environment and rural affairs and certain other functions; and connected purposes.</p> <p>Section 41 (S41) of the Act required the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies in implementing their duty under section 40 of the Act, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.</p>	<p>The WRMP and SEA should have regard to protected wildlife sites and species and rights of way.</p>
<p>HM Government (2000) <i>Countryside and Rights of Way Act 2000</i></p>	
<p>This act extends the public's ability to enjoy the countryside and safeguards landowners and occupiers. The Act creates a new statutory right of access to open country and registered common land, modernise the right of way system, give greater protection to Sites of Special Scientific Interest (SSSIs), provide greater protection arrangements for Areas of Outstanding Natural Beauty (AONBs) and strengthen wildlife enforcement legislation.</p>	<p>The SEA must make sure that the Act is supported and that public rights of way and access to the countryside are maintained and where possible enhanced.</p>
<p>HM Government (2003) <i>Water Act 2003</i></p>	
<p>The four broad aims of the Act are</p> <ul style="list-style-type: none"> - the sustainable use of water resources; - strengthening the voice of consumers; 	<p>The WRMP will be used by Ofwat to assess supply-demand balance and quality enhancement elements as part of the Periodic Review of</p>

<ul style="list-style-type: none"> - a measured increase in competition; and - the promotion of water conservation. <p>It amends the Water Industry Act 1991 so that water companies:</p> <ul style="list-style-type: none"> - are given a duty to prepare and publicise drought plans; - are placed under a duty to agree and publicise water resource management plans; and - are placed under an enforceable duty to further water conservation. <p>As part of the Act the Water Services Regulation Authority (Ofwat) became the economic regulator of the water and sewage industry in England and Wales.</p>	<p>Price Limits. It is therefore important that the WRMP is a fair and transparent review of water resources and is inclusive of the environmental impacts anticipated.</p> <p>The SEA must ensure that the full obligations are met in terms of the environmental implications to abstraction and discharges.</p>
<p>HM Government (2005) UK Sustainable Development Strategy</p>	
<p>The strategy for sustainable development aims to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generations.</p> <p>This is implemented with 4 key priorities:</p> <ul style="list-style-type: none"> - Sustainable consumption and production; - Climate change; - Natural resource protection; - Sustainable communities. 	<p>The WRMP and SEA must consider and implement the key priorities and objectives of the strategy</p>
<p>HM Government (2006) Climate Change and Sustainable Energy Act 2006</p>	
<p>The Act was enacted after the publication of the UK Climate Change Programme (2006). It places an obligation on the government to report to Parliament on greenhouse gas emissions in the UK and action taken by Government to reduce these emissions.</p>	<p>The WRMP should take into account carbon emissions associated with the options.</p> <p>The SEA could include an objective/guide question in the assessment framework to reduce greenhouse gas/carbon dioxide emissions. Consider whether the monitoring arrangements can be utilised to monitor the effects of the WRMP.</p>
<p>HM Government (2008) Climate Change Act 2009</p>	
<p>This Act aims:</p> <ul style="list-style-type: none"> - to improve carbon management and help the transition towards a low carbon economy in the UK; and - to demonstrate strong UK leadership internationally, signalling that the UK is committed to taking its share of responsibility for reducing global emissions in the context of developing negotiations on a post-2012 global agreement at Copenhagen next year. <p>The Act seeks greenhouse gas emission reductions through action in the UK and abroad of at least 80 per cent by 2050, and reductions in CO₂ emissions of at least 26 per cent by 2020, against a 1990 baseline. The 2020 target will be reviewed soon after Royal Assent to reflect the move to all greenhouse gases and the increase in the 2050 target to 80 per cent.</p> <p>Further the Act provides for a carbon budgeting system which caps emissions over five year periods, with three budgets set at a time, to set out our trajectory to 2050. The first three carbon budgets will run from 2008-12, 2013-17 and 2018-22, and must be set by 1 June 2009.</p>	<p>The WRMP should take into account carbon emissions associated with the options.</p> <p>The SEA could include an objective/guide question in the assessment framework to reduce greenhouse gas/carbon dioxide emissions. Consider whether the monitoring arrangements can be utilised to monitor the effects of the WRMP.</p>
<p>HM Government (2009) Marine and Coastal Access Act 2009</p>	
<p>The Marine and Coastal Access Act sets out a number of measures including the establishment of Marine Conservation Zones (MCZs) and Marine Spatial Plans. It also includes amendments to the Salmon and Freshwater Fisheries Act, 1975.</p>	<p>The WRMP should take into account its effects on coastal areas.</p> <p>The SEA assessment should take into account the effects of the actions on the coast where relevant.</p>
<p>HM Government (2009) The Eels (England and Wales) Regulations 2009 (as amended 2011)</p>	
<p>These regulations were introduced in 2009 and amended in 2011. They afford powers to the Environment Agency to implement measures for the recovery of European eel stocks and have important implications for operators of abstractions and discharges.</p>	<p>The SEA and WRMP should have regard to Eel populations.</p>
<p>HM Government (2010) Flood and Water Management Act 2010</p>	
<p>The Flood and Water Management Act 2010 aims to provide better, more sustainable</p>	<p>The WRMP should be in</p>



<p>management of flood risk for people, homes and businesses, help safeguard community groups from unaffordable rises in surface water drainage charges and protect water supplies to the consumer. The Act will also implement recommendations made by Sir Michael Pitt in his review of the 2007 floods. This will include giving water companies new powers to better control non-essential domestic uses of water during periods of water shortage. Additionally, Lead Local Flood Authorities (LLFAs) in England and Wales have a duty to prepare and maintain local level Flood Risk Management Strategies. The Act places a number of statutory duties on water companies including:</p> <ul style="list-style-type: none"> - a duty to act consistently with the National Strategy; and - a duty to have regard to the content of the Local Flood Risk Management Strategies. <p>Does not contain any targets.</p>	<p>conformity with the Act. The SEA should include objectives relating to flooding and water use.</p>
HM Government (2011) UK Marine Policy Statement	
<p>The Marine Policy Statement (MPS) sets out the framework for preparing Marine Plans and taking decisions affecting the marine environment, supporting the delivery of the following high level marine objectives:</p> <ul style="list-style-type: none"> - Achieving a sustainable marine economy; - Ensuring a strong, healthy and just society; - Living within environmental limits; - Promoting good governance; - Using sound science responsibly. <p>Does not contain any targets.</p>	<p>The WRMP should take into account its effects on coastal areas. The SEA assessment should take into account the effects of the actions on the coast/marine environment where relevant.</p>
HM Government (2014) Water Act 2014	
<p>The purpose of the Act was to make provision about the water industry; about compensation for modification of licences to abstract water; about main river maps; about records of waterworks; for the regulation of the water environment; about the provision of flood insurance for household premises; about internal drainage boards; about Regional Flood and Coastal Committees; and for connected purposes.</p>	<p>WRMP should ensure that future water management is resilient, efficient and customer focused</p>
HM Government (2016) Environmental Permitting (England and Wales) Regulations 2016 SI 1154	
<p>The Regulations provide a consolidated system of environmental permitting in England and Wales, and transpose the provisions of 15 EU Directives. Provides a system for environmental permits and exemptions for industrial activities, mobile plant, waste operations, mining waste operations, water discharge activities, groundwater activities, flood risk activities and radioactive substances activities. It also sets out the powers, functions and duties of the regulators.</p> <p>Certain flood risk activities are now regulated under the Environmental Permitting Regulations, with environmental permits required for some activities.</p>	<p>The WRMP should accord with these Regulations.</p>
HM Government (2010) Conservation of Habitats & Species Regulations 2017	
<p>These regulations consolidate all the various amendments made to the Conservation (Natural Habitats) Regulations 1994 in respect of England and Wales. The 1994 Regulations transposed Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law.</p> <p>The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.</p> <p>Under the Regulations, competent authorities i.e. any Minister, government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive.</p>	<p>The WRMP must ensure full compliance with the Regulations. The SEA should take into account the effects of the actions on biodiversity</p>
HM Government (2015) Infrastructure Act 2015	
<p>The Infrastructure Act (inter alia) gives environmental authorities new powers to require landowners to take action on invasive non-native species or permit others to enter the land and carry out those operations.</p>	<p>The SEA assessment framework should include guide questions relating to invasive species.</p>
HM Treasury (2016) National Infrastructure Delivery Plan	
<p>This document is the Government's updated National Infrastructure Delivery Plan. It sets out the plan to 2021 and beyond and takes a targeted approach to infrastructure investment and delivery across different sectors. It contains major commitments to improve the UK's transport, energy, communications, waste, water, housing and flood and coastal erosion, as well as steps to attract new private sector investment. It includes reference to the production of Water Resources</p>	<p>The WRMP will be produced as indicated in the Delivery Plan.</p>

Management Plans and the Ofwat price review.	
JNCC and Defra (2012) UK Post-2010 Biodiversity Framework	
<p>The framework sets out UK priorities for work on the Convention on Biological Diversity, and follows on from the 1994 UK Biodiversity Action Plan. It sets out a vision that, 'by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people'. The goals and activities to meet this aim are grouped under the categories of International / European context; facilitating and contributing to common country approaches and solutions; evidence provision; and reporting.</p>	<p>The WRMP should support the protection and enhancement of biodiversity.</p> <p>The SEA assessment should include criteria relating to the protection of species and habitats.</p>
Ministry of Housing, Communities and Local Government (DCLG) (2018) National Planning Policy Framework	
<p>The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The NPPF constitutes guidance for local planning authorities and decision-takers both in drawing up plans and as a material consideration in determining applications.</p> <p>At the heart of the NPPF is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking. The NPPF sets out three overarching objectives:</p> <p>a) an economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;</p> <p>b) a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and</p> <p>c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.</p> <p>The NPPF states that these objectives should be delivered through the preparation and implementation of plans and the application of the policies in the NPPF; however, notes that the objectives are not criteria against which every decision can or should be judged.</p> <p>The NPPF then sets out the guidance for 12 key planning policies topics, for subjects such as the supply homes, building a competitive economy and conserving and enhancing the natural environment.</p>	<p>The WRMP may need to consider the potential impact of proposals on waste generation and on waste management facilities in the WRMP area.</p> <p>The SEA should consider the effects of the WRMP on waste generation and management capacity.</p>
Natural England (2011) UK Geodiversity Action Plan	
<p>The UKGAP sets out a framework for enhancing the importance and role of geodiversity across the UK, and provides a shared context and direction for geodiversity action through a common aim, themes, objectives and targets which link national, regional and local activities.</p> <p>The themes (on which the plan's objectives are based) include: furthering our understanding of geodiversity; gathering and maintaining information on our geodiversity; conserving and managing our geodiversity; inspiring people to value and care for our geodiversity; and sustaining resources for our geodiversity. It also aims to influence planning policy, legislation and development design.</p>	<p>The WRMP should take into account the aims of the UKGAP.</p> <p>The SEA assessment should consider effects of options on geodiversity and outline enhancement and mitigation opportunities where these are identified.</p>
Ofwat (2008) Water Supply and Demand Policy	
<p>Summarised the key areas of water supply and demand, focusing on water efficiency, leakage, metering, and climate change.</p>	<p>The WRMP should ensure it balances demand and supply issues.</p> <p>The SEA framework should ensure that consideration is given to the socio-economic and environmental impact of any demand and supply policies.</p>
Ofwat (2016) Water 2020	
<p>This document sets out Ofwat's decisions on the design of its water and wastewater services regulatory framework in England and Wales. The approach aims to deliver the following benefits:</p> <ul style="list-style-type: none"> • Greater customer engagement and understanding • A sustainable investment model and a fair balance of risk and reward • Choice where possible, and ensuring markets are effective for customers • A focus on the long-term, targeted and risk-based 	<p>The WRMP should take account of the regulatory framework.</p> <p>The SEA assessment should include criteria relating to the provision of water to customers and environmental protection.</p>

Support for sustainable improvements in the environment	
Welsh Government (2014) Technical Advice Note 21: Waste	
<p>This guidance note provides advice about how the land use planning system should contribute to sustainable waste resource management. The TAN states that land use planning system has an important role to play in facilitating sustainable waste management and should:</p> <ul style="list-style-type: none"> - provide a planning framework which enables adequate provision to be made for waste resource management facilities to meet the needs of society for the re-use, recovery and disposal of waste; - help meet the needs of business and encourage competitiveness; - encourage sensitive waste management, enhance the overall quality of the environment and avoid risks to human health; - have regard to the need to protect areas of designated landscape and nature conservation value from inappropriate development; - have regard to the need to protect the amenity of the community and of land uses and users affected by existing or proposed waste management facilities; - minimise adverse environmental impacts resulting from the handling, processing, transport and disposal of waste; - consider what new facilities may be needed, in the light of waste forecasts; and - ensure that opportunities for incorporating re-use/recycling facilities in new developments are properly considered. 	<p>The WRMP should contribute, where appropriate to the sustainable management of waste.</p> <p>The SEA should take into account the implication of the options on waste.</p>
Welsh Government (2004) Technical Advice Note 15: Development and Flood Risk	
<p>TAN 15 sets out a precautionary framework to guide planning decisions. The approach seeks to first, direct new development away from those areas which are at high risk of flooding and, second, where development has to be considered in high risk areas (Zone C), allow only those developments which can be justified to be located within such areas.</p>	<p>The WRMP should take account of flood risk management.</p> <p>The SEA should include a guide question relating to flood risk.</p>
Welsh Government (2008) People, Places, Futures: The Wales Spatial Plan 2008 Update	
<p>The <i>Wales Spatial Plan</i> provides the context and direction of travel for local development plans and the work of local service boards. The 2008 update brings the <i>Wales Spatial Plan</i> into line with <i>One Wales</i>, and gives status to the area work which has developed since 2006. The key themes of the update (and the <i>Wales Spatial Plan</i> before it) are set out below:</p> <p>Building Sustainable Communities</p> <p>Our future depends on the vitality of our communities as attractive places to live and work. We need to reduce inequalities between communities whilst retaining their character and distinctiveness.</p> <p>Promoting a Sustainable Economy</p> <p>We need an innovative, high value-added economy for Wales which utilises and develops the skills and knowledge of our people; an economy which both creates wealth and promotes the spreading of that prosperity throughout Wales; an economy which adds to the quality of life as well as the standard of living and the working environment.</p> <p>Valuing our Environment</p> <p>The quality of our natural environment has an intrinsic value as a life support system, but also promotes wellbeing for living and working and contributes to our economic objectives. Safeguarding and protecting our natural and historic assets, and enhancing resilience to address the challenges of climate change, will enable us to attract people to our communities and provide the wellbeing and quality of life to encourage them to stay and preserve the foundations for the future.</p> <p>Achieving Sustainable Accessibility</p> <p>We will develop access in ways that protect the environment, encourage economic activity, widen employment opportunities, ensure quality services and integrate the social, environmental and economic benefits that travel can have.</p> <p>Respecting Distinctiveness</p> <p>A cohesive identity which sustains and celebrates what is distinctive about Wales, in an open and outward-looking way, is central to promoting Wales to the World, as well as to our future economic competitiveness and social and environmental wellbeing.</p>	<p>The WRMP should have regard to the key themes of the <i>Wales Spatial Plan Update</i>.</p> <p>The SEA objectives should cover the key themes set out in the <i>Wales Spatial Plan Update</i>.</p>
Welsh Government (2009) One Wales One Planet: The Sustainable Development Scheme for Wales	
<p>One Wales One Planet seeks to build on the two previous Sustainable Development Schemes. It sets out proposals to promote sustainable development, how the Welsh Government will make sustainable development a reality for people in Wales, and the benefits that people will</p>	<p>The WRMP should consider effects of options on sustainable development in Wales.</p>

<p>see from this, particularly in less well-off communities.</p> <p>The strategy states that the Welsh Government is committed to working in partnership with others and notes that businesses can:</p> <ul style="list-style-type: none"> - Develop resource efficiency within the organisation and through supply chains, improving productivity and competitiveness; - Reduce waste; - Develop environmental and sustainability policies and targets; - Monitor performance and resource use and report publicly on them; - Engage with the workforce in both adopting sustainable practices and encouraging employees to become sustainable champions in their own communities; - Engage with and support local communities. 	<p>The SEA should include guide questions relating to improving resource efficiency, reducing waste, monitoring and public reporting, encouraging sustainable practices among the workforce and engaging with and supporting local communities. The SEA should include proposals for monitoring the effects of the WRMP on the environment and sustainability and could utilise targets that arise from this document.</p>
Welsh Government (2008) <i>The Wales Transport Strategy</i>	
<p>The Strategy sets out the Welsh Government's main aims in improving transport. The strategic priorities are:</p> <ul style="list-style-type: none"> • Reducing greenhouse gas emissions and other environmental impacts; • Improving public transport and better integration between modes; • Improving links and access between key settlements and sites across Wales and strategically important all-Wales links; • Enhancing international connectivity; and • Increasing safety and security. 	<p>The WRMP should consider any transport-related implications arising from the options and seek to reflect the transport hierarchy where possible.</p> <p>The SEA assessment should include an objective on improving and/or integrating transport and reducing greenhouse gases.</p>
Welsh Government (2006) <i>Environment Strategy for Wales</i>	
<p>The Environment Strategy for Wales sets out the challenges and vision for Wales up to 2026. It covers themes under climate change; resource use; biodiversity, landscapes and seascapes; local environment; and environmental hazards. The priorities identified in the Strategy are to</p> <ul style="list-style-type: none"> - minimise greenhouse gas emissions and adapt to the impacts of climate change; - conserve and enhance biodiversity; - monitor and regulate known and emerging environmental hazards; - tackle unsustainable practices, like waste production and disposal; and conserve and enhance land and sea, built environment, natural resources and heritage, developing and using them in a sustainable and equitable way and for the long term benefit of the people of Wales. 	<p>The WRMP should aim to contribute to the Environment Strategy for Wales.</p> <p>The SEA assessment should include effects of options on biodiversity, marine, flood and water management, the historic environment, people and the environment and environmental quality.</p>
Welsh Government (2015) <i>National Transport Finance Plan 2015</i>	
<p>The Plan sets out five strategic transport priorities for the next 5 years:</p> <ul style="list-style-type: none"> - Reducing greenhouse gas emissions and other environmental impacts; - Integrating local transport; - Improving access between key settlements and sites; - Enhancing international connectivity; - Increasing safety and security 	<p>The WRMP should consider any transport-related implications arising from the options and seek to reflect the transport hierarchy where possible.</p> <p>The SEA assessment should include an objective on improving and/or integrating transport and reducing greenhouse gases.</p>
Welsh Government (2015) <i>Wales Rural Development Programme 2014-2020</i>	
<p>The Programme was adopted by the European Commission in May 2015. It is a 7 year investment programme supporting a wide range of activities which contribute to the following objectives:</p> <ul style="list-style-type: none"> • fostering the competitiveness of agriculture; • ensuring the sustainable management of natural resources, and climate action; • achieving a balanced territorial development of rural economies and communities, including the creation and maintenance of employment. 	<p>The WRMP should consider the effect of options on rural areas.</p> <p>The SEA assessment should note where options will have significant effects on rural areas.</p>
Welsh Government (2009) <i>Technical Advice Note 16: Sport, Recreation and Open Space</i>	
<p>TAN 16 Makes provision for sport and recreational activities within the planning system. This includes the provision of recreational facilities and informal open space, as well as protecting existing recreational facilities and open spaces in urban and rural areas in Wales.</p>	<p>The WRMP should take account of sport, recreation and open spaces.</p> <p>The SEA should include a guide question relating to recreation.</p>
Welsh Government (2009) <i>Technical Advice Note 5: Nature Conservation and Planning</i>	

<p>Technical Advice Note 5 sets out how the planning system should contribute to protecting and enhancing biodiversity and geological conservation. It stipulates that the planning system should:</p> <ul style="list-style-type: none"> - work to achieve nature conservation objectives through a partnership between local planning authorities, Countryside Council for Wales (CCW), the Environment Agency Wales, voluntary organisations, developers, landowners and other key stakeholders; - integrate nature conservation into all planning decisions looking for development to deliver social, economic and environmental objectives together over time; - ensure that the UK's international and national obligations for site, species and habitat protection are fully met in all planning decisions; - look for development to provide a net benefit for biodiversity conservation with no significant loss of habitats or populations of species, locally or nationally; - help to ensure that development does not damage, or restrict access to, or the study of, geological sites and features or impede the evolution of natural processes and systems especially on rivers and the coast; and - plan to accommodate and reduce the effects of climate change by encouraging development that will reduce damaging emissions and energy consumption and that help habitats and species to respond to climate change. 	<p>The WRMP should seek to protect and enhance biodiversity and geodiversity.</p> <p>SEA objectives should reflect the need to conserve and, where possible, enhance, biodiversity and geodiversity.</p>
<p>Welsh Government (2010) <i>Climate Change Strategy for Wales</i></p>	
<p>The Climate Change Strategy for Wales and associated action plan sets out the Welsh Government's policy intentions in relation to climate change and expands on the commitments set out in One Wales.</p> <p>The strategy re-iterates the One Wales commitments to 3 per cent annual carbon reductions and sets out, that by 2020, the Welsh Government expect to see:</p> <ul style="list-style-type: none"> - Businesses have reduced energy costs and emissions; - Employees actively engaged in reducing emissions from their workplaces; - Consumers demanding low carbon goods and services and concerned about sustainability performance of businesses; - Growth of social enterprises and community businesses providing low carbon goods and services locally; <p>Core businesses operating, and people employed, in businesses that provide low carbon goods and services.</p>	<p>The WRMP should incorporate climate change mitigation and adaptation measures, e.g. reducing carbon emissions.</p> <p>The SEA should include a guide question relating to mitigation and adaptation to climate change.</p>
<p>Welsh Government (2012) <i>Energy Wales: A Low Carbon Transition</i></p>	
<p>Energy Wales and the supporting delivery plan set out what the Welsh Government intends to do to drive the change to a sustainable, low carbon economy for Wales. The Welsh Government commits to:</p> <ul style="list-style-type: none"> • Engage and support businesses that help to achieve Wales's low carbon ambition; • Ensure that regulatory processes are as simplified and efficient as they can be and provide businesses with clarity and stability; • Engage the UK Government to ensure that there is a credible framework for capital investment to support the transition to a low carbon economy; • Support vital energy intensive industries in the transition to a low carbon economy; • Pursue energy efficiency; • Focus on low carbon sources of energy generation and approaches which will help to deliver lower overall emissions; and • Assist the most vulnerable in Welsh society and work to ensure that costs of reform do not fall disproportionately on poor households. <p>The delivery plan also sets out key delivery themes around low carbon energy, Anglesey Energy Island, energy efficiency and distributed energy generation.</p>	<p>The WRMP should seek to incorporate low carbon energy and energy efficiency.</p> <p>The SEA should include a guide question relating to climate change mitigation.</p>
<p>Welsh Government (2016) <i>Technical Advice Note 12: Design</i></p>	
<p>Technical Advice Note 12 sets out the Welsh Government's land use planning policy in respect of promoting sustainability through good design. It advocates a holistic approach to design that considers:</p> <p>Movement - promoting sustainable means of travel;</p> <p>Access- ensuring access for all;</p> <p>Character - sustaining or enhancing local character, promoting legible development, promoting a successful relationship between public and private space, promoting quality, choice and variety, promoting innovative design;</p> <p>Community safety - ensuring attractive, safe public spaces and security through natural</p>	<p>The WRMP should promote good design in the development of any new facilities required as part of plan options.</p> <p>SEA objectives should include the promotion of good design.</p>

surveillance;	
Environmental sustainability - achieving efficient use and protection of natural resources, enhancing biodiversity and designing for change.	
Welsh Government (2010) <i>Towards Zero Waste, One Wales: One Planet – Overarching Waste Strategy Document for Wales</i>	
<p>Towards Zero Waste is the overarching waste strategy for Wales. The key outcomes that the Strategy aims to achieve are:</p> <ul style="list-style-type: none"> - a sustainable environment in which we reduce the impact of waste in Wales to within our environmental limits by 2050; - a Fair and Just Society, in which citizens can achieve their full human potential and contribute to the wellbeing of Wales through actions on waste prevention, reuse and recycling; - a Prosperous Society With a sustainable, resource efficient economy. <p>The strategy sets out a long-term aim of zero waste by 2050 and a medium term aim of achieving a high recycling society by 2025. This is supported by a range of recycling and other waste management targets including in relation to commercial and industrial waste.</p>	<p>The WRMP should promote waste reduction, reuse and recycling ahead of landfill disposal.</p> <p>SEA objectives should reflect aspirations of the Strategy.</p>
Welsh Government (2016) <i>Planning Policy Wales (Edition 9)</i>	
<p>Planning Policy Wales sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes and procedural advice given in circulars. It sets out key policy objectives for Local Development Plans (LDPs) in Wales which reflect the sustainable development agenda.</p>	<p>Options recommended in the WRMP will need to confirm to LDPs.</p> <p>The SEA objectives should reflect the Welsh Government's commitments to sustainable development.</p>
Welsh Government (2011) <i>Welsh Government Policy Statement: Preparing for a Changing Climate</i>	
<p>This Policy Statement sets out how the Welsh Government will implement relevant provisions of the Climate Change Act 2008. It provides technical advice on how to assess climate risks and how to develop adaptation plans.</p>	<p>The WRMP should incorporate climate change mitigation and adaptation measures where appropriate.</p> <p>The SEA should include a guide question relating to mitigation and adaptation to climate change. Monitoring recommendations in the SEA should reflect the 3 per cent year on year emission reduction target set by the Welsh Government.</p>
Welsh Government (2011) <i>National Strategy for Flood and Coastal Erosion Risk Management in Wales</i>	
<p>Provides the national framework for flood and erosion risk management setting out the four overarching objectives required to achieve this for Wales:</p> <ul style="list-style-type: none"> - reducing the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion ; - raising awareness of and engaging people in the response to flood and coastal erosion risk; - providing an effective and sustained response to flood and coastal erosion events; - prioritising investment in the most at risk communities. - The Flood and Water Management Act 2010 specifies that local flood risk management strategies for Wales (as required under the 2010 Act) must be consistent with the national flood and coastal erosion risk management strategy for Wales. 	<p>The WRMP should contribute to the reduction in flood risk and coastal erosion where possible. The SEA framework should consider flooding and coastal erosion.</p>
Welsh Government (2010) <i>The Biodiversity Framework for Wales</i>	
<p>This document sets out to provide a delivery mechanism for a number of biodiversity related Outcomes set out in the Wales Environment Strategy. It defines the importance of biodiversity, describing the current situation in Wales. It considers policy and legislative drivers at a European, British and Welsh scale and sets out the roles and responsibilities of the groups and bodies responsible for halting and ultimately reversing the loss of biodiversity in Wales.</p>	<p>This document highlights a number of bodies with whom DCWW may need to work to ensure development of the WRMP contributes to protecting and enhancing biodiversity.</p>
Welsh Government (2012) <i>Historic Environment Strategy for Wales</i>	
<p>This strategy summarises the areas which the Welsh Government will prioritise for action, and aims to protect Wales' heritage whilst encouraging public access, enjoyment and participation. The Strategy sets out the role of the historic environment in delivering tangible social, economic and environmental benefits for Welsh communities. It also aims to further develop the economic</p>	<p>The WRMP should protect and enhance the historic environment.</p> <p>The SA should include assessment criteria relating to protection and</p>

<p>role of heritage in Wales and maximise educational, training and leisure opportunities.</p>	<p>enhancement of the historic environment.</p>
<p>Welsh Government (2016) <i>Historic Environment (Wales) Act 2016</i></p>	
<p>The Act improves the existing systems for the protection and sustainable management of the Welsh historic environment. It also gives more effective protection to listed buildings and scheduled monuments and enhances existing mechanisms for the sustainable management of the historic environment. The Act also creates new measures that enables authorities to halt works if protected buildings or monuments are under threat from unauthorised activities and to take action against those who have damaged or destroyed monuments.</p>	<p>The WRMP have regard to the requirements of the Act. The SEA assessment should include criteria relating to the protection of the historic environment.</p>
<p>Welsh Government (2015) <i>Water Strategy for Wales</i></p>	
<p>This Strategy sets out our long-term policy direction in relation to water. The aim is to ensure we have a more integrated and sustainable approach to managing our water and associated services in Wales. This Strategy has been developed within this context and will contribute to the implementation of our wider natural resource management policy.</p> <p>A more integrated approach to the way water resources in Wales are managed will help to promote the coordinated management of water, land and related resources. This in turn will enable us to maximise economic and social benefits, including tackling poverty in an equitable way while protecting vital ecosystems and the environment. The Strategy aims ensure the long-term needs of a sustainable and resilient environment and that there are sufficient, reliable water resources and waste water services available in Wales. This approach will also drive green growth by providing an essential resource for businesses, as well as providing new opportunities for employment.</p>	<p>WRMPs are specifically mentioned in the Strategy in relation to the reduction of water leakage. The WRMP will have a key role in contributing to the wider objectives of the Strategy. The SEA should include objectives/guide questions relating to sustainable resource use.</p>
<p>Welsh Government (2013) <i>Partnership for Growth: The Welsh Government Strategy for Tourism 2013 – 2020</i></p>	
<p>The strategy identifies the priorities to deliver a prosperous and competitive tourism industry in Wales. It sets out how Welsh tourism will be promoted and communicated more effectively and how investment will be directed to improve quality and choice for the consumer.</p>	<p>The WRMP could take account of the benefits that tourism can bring to Wales. The SEA should include assessment criteria relating the importance of tourism and/or recreation.</p>
<p>Welsh Government (2015) <i>The Welsh National Marine Plan – Initial Draft</i></p>	
<p>This draft plan sets out how the Welsh Government will achieve sustainable development in the Welsh marine area through the sustainable management of marine natural resources. It covers both Welsh inshore and offshore waters and sets out the following vision, which will be achieved through the plan's objectives and policies:</p> <ul style="list-style-type: none"> • By 2036, Welsh seas are clean, healthy, safe, productive and biologically diverse: <ul style="list-style-type: none"> • Through an ecosystem based approach, our seas are healthy and resilient and support a sustainable and thriving economy. • Through access to and enjoyment of the marine environment, health and wellbeing are improving. • Blue growth is creating more jobs and wealth; and, is helping coastal communities become more resilient, prosperous and equitable with a vibrant culture. <p>The Welsh marine area is making a strong contribution to energy security and climate change emissions targets through the responsible deployment of low carbon technologies.</p>	<p>The WRMP should take into account its effects on coastal areas. The SEA assessment should take into account the effects of the actions on the coast/marine environment where relevant.</p>
<p>Welsh Government (2015) <i>Well-being of Future Generations (Wales) Act 2015</i></p>	
<p>The Act includes 7 goals that all public bodies should work towards:</p> <ul style="list-style-type: none"> • A prosperous Wales • A resilient Wales • A healthier Wales • A more equal Wales • A Wales of cohesive communities • A Wales of vibrant culture and thriving Welsh Language • A globally responsible Wales <p>The Act establishes a statutory Future Generations Commissioner for Wales, whose role is to act as a guardian for the interests of future generations in Wales, and to support the public bodies listed in the Act to work towards achieving the well-being goals.</p> <p>The Act also establishes Public Services Boards (PSBs) for each local authority area in Wales. Each PSB must improve the economic, social, environmental and cultural well-being of its area</p>	<p>The WRMP should consider how it can contribute to the seven well-being goals set out in the Act. The SEA Framework should reflect the seven well-being goals.</p>

by working to achieve the well-being goals.	
Welsh Government (2015) Nature Recovery Plan	
<p>The Nature Recovery Plan for Wales is aimed at addressing the underlying causes of biodiversity loss by:</p> <ul style="list-style-type: none"> • putting nature at the heart of decision-making in Wales; • increasing the resilience of the natural environment in Wales; and • taking specific action for habitats and species. <p>It sets out how Wales will deliver the commitments of the UN Convention on Biological Diversity and the EU Biodiversity Strategy to halt the decline in biodiversity by 2020 and then reverse that decline. It also sets out current and proposed actions, particularly through the Well-being of Future Generations (Wales) Act 2015, and emphasises the approach to natural resource management introduced in the 2016 Environment Act Wales.</p>	<p>The WRMP should support the protection and enhancement of biodiversity, and promote resilience in ecosystems.</p> <p>The SEA assessment should include criteria relating to the protection of species and habitats, and the enhancement of ecosystem resilience.</p>
Welsh Government (2016) The Environment (Wales) Act 2016	
<p>The overarching aims of the Act are to enable Wales' resources to be managed in a more proactive, sustainable and joined-up way and to establish the legislative framework necessary to tackle climate change.</p> <p>Some of the specific provisions in the Act include:</p> <ul style="list-style-type: none"> • Helping to plan and manage Wales' natural resources at a national and local level, through a State of Natural Resources Report, a National Natural Resources Policy and area statements. • Providing Natural Resources Wales (NRW) with a general purpose that aligns fully with the statutory principles for the sustainable management of natural resources. • Providing NRW with powers to undertake land management agreements and experimental schemes. • Providing public authorities with a reshaped requirement to seek to maintain and enhance biodiversity and promote resilience of ecosystems. • Placing statutory emission reduction targets and carbon budgeting to support their delivery. • Enabling improvements to the existing scheme for single use carrier bags. • Providing the Welsh Ministers with powers to take action to achieve higher levels of recycling for business waste, food waste treatment and energy recovery. • Clarifying the law for a number of existing environmental regulatory regimes including marine licensing, shellfisheries management, land drainage and flood risk management. <p>The Act requires all public authorities (including water/sewerage statutory undertakers), when carrying out their functions in Wales, to seek to "maintain and enhance biodiversity". In doing so, public authorities must also seek to "promote the resilience of ecosystems". This new duty under s6 also requires public authorities to prepare and publish a plan on how they intend to comply with the biodiversity and resilience of ecosystems obligations, and to report every three years on the actions they have taken.</p> <p>Under s7 of the Act, Welsh Ministers must prepare and publish a list of the organisms and habitat which are of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales, which will be kept under review with NRW. This list will inform the biodiversity duties under s6 above.</p>	<p>The WRMP should enhance biodiversity, promote resilience in ecosystems and maintain and enhance biodiversity</p> <p>The SEA framework should include consideration of resilience in ecosystems and the maintenance and enhancement of biodiversity and resource use.</p>
Welsh Government (2016) The State of Natural Resources Report (SoNaRR)	
<p>The report sets out the states of Wales' natural resources. It assesses the extent to which natural resources in Wales are being sustainably managed, and recommends a proactive approach to building resilience. The report identifies risks and threats and opportunities for integrated solutions that provide multiple benefits (social, cultural, environmental and economic).</p>	<p>The WRMP should have regard to opportunities to address risks and threats identified in the report and identify integrated solutions.</p> <p>The SEA should have regard to the risks, threats and opportunities identified in the report and the extent to which opportunities for integrated solutions can be incorporated in the WRMP.</p>
Environment Agency and Natural Resources Wales (2016) Final Water Resources Planning Guideline	
<p>The Guideline outlines the key stages associated with the preparation of WRMPs and the process and content of Plans. The process of developing a WRMP requires an estimation of baseline supply forecast and an estimation of baseline demand forecast. The uncertainties and target headroom required are then estimated. The calculation of the baseline supply demand balance for each year of the plan's period are then used to determine if there are any years or critical periods where there is likely to be a supply-demand balance deficit.</p>	<p>The WRMP process and outcomes will need to demonstrate compliance with the Guidelines.</p> <p>The SEA should draw on work undertaken as part of the WRMP process to assess options and</p>



<p>A long list of demand and supply options which could be used to manage the supply demand balance deficit is considered. Options are discounted based on their unfeasibility using economic, technological and environmental criteria until a feasible (constrained) list of options that could be used is presented. The capital, operating and social and environmental costs (including carbon costs) of each of the feasible options are assessed using industry standard methodologies. Investment modelling is then undertaken which takes account of the capital, operation and social and environmental costs of the options to determine a least-cost water resources strategy. Further scenario modelling and sensitivity testing is then applied to the strategy to determine the robustness of the proposals.</p> <p>The final planning solution for managing supply and demand to meet the required balance and target headroom is presented in the draft WRMP for formal consultation. The preferred options in the plan are presented with a justification of their inclusion and timing for implementation.</p>	<p>anticipated effects.</p>
<p>Welsh Government (2016) <i>Guiding Principles for Developing Water Resources Management Plans</i></p>	
<p>The Guiding Principles set out the Welsh Government's expectations in terms of the role and content of WRMPs. The link is also made with recent legislation (including the Environment (Wales) Act and the Well-being of Future Generations (Wales) Act 2015. The process for preparing WRMPs is also set out in the document.</p>	<p>The WRMP will need to have regard to the Guiding Principles as a key over-arching document.</p>

Regional/Sub-regional Plans and Programmes	
Bath and North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council (2016) The Joint Spatial Plan: Towards the Emerging Spatial Strategy	
<p>This a statutory Development Plan Document and will form the strategic policy for individual Local Plans prepared by the four authorities going forwards. The scope of the Plan, and its supporting evidence base, is focused on:</p> <ul style="list-style-type: none"> Identifying the number of new market and affordable homes and amount of employment land that is needed across the area between 2016 and 2036. Setting out the most appropriate spatial strategy and strategic locations for where this growth should be to meet the needs identified. The outcome of this process will be housing apportionments for each local authority. Identifying the transport and other infrastructure that needs to be provided in the right place and at the right time to support sustainable growth and to provide certainty for local communities and those that want to invest in the area. 	<p>The WRMP should have regards to the Development Plan Document</p> <p>The SEA framework should take into account future trends in household growth as well as other major developments that impact the health and well-being of the local population.</p>
Bristol Avon Catchment Partnership Catchment Plan (2016)	
<p>The Bristol Avon Catchment Plan is a multi-stakeholder plan based on an ethos of working together co-operatively to agree and implement actions that achieve multiple environmental improvements and deliver common goals in a cost-effective way. It is designed at the river catchment scale, thereby requiring partners to consider river processes both upstream and downstream of their own local or administrative boundaries for the benefit of the whole catchment. The Plan identifies the following key issues currently impacting on the quality of the Bristol Avon Catchment:</p> <ul style="list-style-type: none"> High phosphate levels associated with treated sewage discharges and sewage overflow, urban diffuse pollution including misconnections and agricultural/sediment run-off; High sediment loading associated with rapid run-off from agricultural land; Flooding associated with rapid run-off from compacted rural land and urban hard surfaces; Low river flows associated with abstraction for water supply, poor upstream water retention and aquifer recharge; Reduced natural habitat and wildlife associated with poor riparian habitat, highly modified channels, in-stream barriers preventing fish migration and increase of invasive non-native species; and Climate change <p>A number of goals have been set in the Plan in order to achieve by 2027 the shared vision "<i>The Bristol Avon Catchment is in good health, has Good Ecological Status and is recognised as a valuable asset to society and the local economy</i>". These are summarised below:</p> <ul style="list-style-type: none"> Improve public understanding about the value and services provided to society and the local economy by the river catchment and its wildlife; Improve water and flood risk management; Improve land management and sustainable agriculture; Improve wastewater management; Improve river management; Improve recreation management; and Improve investment opportunities for partnership led projects that deliver multiple benefits within the catchment. 	<p>The WRMP should have regard of the Bristol Avon Catchment Plan.</p> <p>The SEA framework should consider the effects of the WRMP on the achievement of the Plans' goals and the effects of options on the river and land environment.</p>
Bristol City Council (2013) Bristol Health and Wellbeing Policy 2013	
<p>The Bristol Health and Wellbeing Policy addresses our local health priorities based on evidence from the Joint Strategic Health Assessment, stakeholder and public feedback. This strategy is to make Bristol a healthy, living city. This will be achieved through: setting clear priorities for Bristol, identifying areas where the Health and Wellbeing Board can make improvements and adding value to existing services.</p> <p>The key themes of the strategy are to make Bristol a place:</p> <ul style="list-style-type: none"> filled with healthy, safe and sustainable communities and places. where health and wellbeing are improving. where health inequalities are reducing. where people get access to quality support when and where they need it. 	<p>The WRMP should be aligned to Bristol City Council's local health priorities.</p> <p>The SEA framework should take into account the strategic objectives of this local policy to improve the health and well-being of the local population.</p>
Bristol City Council (2014) Air Quality Progress Report	
<p>This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland,</p>	<p>The WRMP should take account of air quality objectives in the</p>

<p>Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether the air quality objectives are likely to be achieved. Where exceedances are considered likely; the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.</p>	<p>strategy. The SEA framework should take into account the local air quality objectives of Bristol City Council</p>
<p>Bristol City Council (2015) Our Resilient Future: A Framework For Climate And Energy Security</p>	
<p>This document defines the strategy and action plan for improving the resilience of the City of Bristol in addressing the threat of climate change through the sustainable use and generation of energy. It sets out the existing commitments; progress to date against these and what more must be done to meet them. Future actions which are to be led or enabled by Bristol City Council are defined as well as a broader range of initiatives which are in progress across the city</p>	<p>The WRMP should incorporate climate change mitigation and adaptation measures. The SEA should include a guide question relating to mitigation and adaptation to climate change taking into account the local Bristol City Council's strategy and action plan.</p>
<p>Cotswolds Area of Outstanding Natural Beauty (AONB) Management Plan 2014-2018</p>	
<p>This management plan contain actions to ensure the protection and enhancement of the landscape in the Cotswolds area.</p>	<p>WRMP options within the Cotswolds AONB should be consistent with the Management Plan. The SEA framework should consider the effects of options on landscapes, including designated landscapes.</p>
<p>Natural England Site Improvement Plans (SIPs): South West</p>	
<p>SIPs have been developed for each Natura 2000 site in England. They provide high level overviews of the issues affecting the condition of the Natura 2000 features on these sites and outlines the priority measures that are needed to improve the condition of the features. SIPs are live documents.</p>	<p>The WRMP should have regard to the relevant SIPs. The SEA framework should take into account the relevant SIPs in South West England that may be affected by the WRMP and take account of the need for conservation and enhancement of the designated sites.</p>
<p>Defra (2010) Eel Management Plans for the United Kingdom. Severn River Basin District</p>	
<p>A total of 15 Eel Management Plans have been prepared covering the UK's 15 river basin districts. The Plan for the Severn River Basin District describes the current status of eel populations, assesses compliance with the target set out in Council Regulation No 1100/2007, and details management measures to increase silver eel escapement. This will contribute to the recovery of the stock of European eel.</p>	<p>The WRMP should take account of Eel Management Plan actions. The SEA should take account of the need to maintain or enhance the quality of habitats and biodiversity, and take regard of protected species identified. This should include migratory fish species and their migratory passage.</p>
<p>Environment Agency (2009) Water Resources Strategy Regional Action Plan for South West Region</p>	
<p>This Plan seeks to help deliver the aims and objectives of the water resources strategy for England and Wales in the South West England sub-region. It identifies the following priorities for the sub-region:</p> <ul style="list-style-type: none"> • Ensure water supply and demand is resilient to the effects of climate change; • Reduce carbon emissions associated with the supply of water; • Manage catchments better to protect water resources, enhance biodiversity, reduce flood risk and reduce water treatment costs; • Improve the water efficiency of new housing and commercial developments. 	<p>The objectives for the WRMP should reflect the objectives of this Plan. The SEA should include objectives that reflect the priorities of the Plan and, importantly, seek to ensure that water supply and resources are maintained or enhanced.</p>
<p>Environment Agency and Defra, (2015) River Basin Management Plan Severn River Basin District Environment Agency and Defra, (2015) South West River Basin District River Basin Management Plan Environment Agency and Defra, (2015) River Basin Management Plan Thames River Basin District</p>	
<p>River Basin Management Plans (RBMPs) set out how the water environment will be managed and provides a framework for more detailed decisions to be made. RBMPs set out a more</p>	<p>The WRMP should reflect the broad targets set out in the</p>

<p>integrated approach to river basin management based on the following principles:</p> <ul style="list-style-type: none"> • Integrate and streamline plans and processes; • Set out a clear, transparent and accessible process of analysis and decision-making; • Focus at the river basin district level; • Work in partnership with other regulators; • Encourage active involvement of a broad cross-section of stakeholders; • Make use of the alternative objectives to deliver sustainable development; • Use Better Regulation principles and consider the cost-effectiveness of the full range of possible measures; • Seek to be even handed across different sectors of society and sectors of industry; • Seek to be even handed and transparent in the management of uncertainty; • Develop methodologies and refine analyses as more information becomes available. <p>RBMPs relevant to the Bristol Water supply area are the Severn RBMP, South West River Basin Districts RBMP and Thames River Basin District RBMP.</p>	<p>relevant RBMPs.</p> <p>The SEA objectives should reflect the need to manage water resources on a catchment basis in a sustainable manner to help improve the quality of water resources.</p>
<p>Environment Agency, Catchment Abstraction Management Strategy (various dates for relevant catchments)</p>	
<p>CAMS is the approach used by the Environment Agency to assess the amount of water available for further abstraction licensing taking account of the needs of the environment. The relevant Catchment Abstraction Management Strategies (CAMS) within the Bristol Water supply area:</p> <ul style="list-style-type: none"> • Severn Corridor CAMS • Bristol Avon, Little Avon, Axe and North Somerset Streams CAMS area, and the • Parrett, Brue and West Somerset Streams CAMS <p>The aims of the CAMS include:</p> <ul style="list-style-type: none"> • make information on water resource availability and the catchment licensing strategy more readily available • provide a consistent and structured approach to local water resource management • recognise both the abstractor's reasonable need for water and environmental needs • provide results which ensure the relevant Water Framework Directive objectives are met 	<p>The WRMP should be aligned with the CAMS.</p> <p>The SEA framework should reflect the need for an environmental, economic and social balance in the use of abstracted water.</p>
<p>Environment Agency (2012) Bristol Avon Catchment Flood Management Plan</p>	
<p>Bristol Avon Catchment Flood Management Plan (CFMP) provides an overview of the flood risk in the Bristol Avon catchment and sets out the EAs preferred plan for sustainable flood risk management over the next 50 to 100 years.</p> <p>The Bristol Avon CFMP is one of 77 CFMPs for England and Wales. In preparing the CFMP, the EA has assessed inland flood risk. The CFMP considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding), which is covered by Shoreline Management Plans (SMPs).</p> <p>The Bristol Avon catchment has a history of flood risk, and over the last 60 years numerous engineering schemes have been implemented to reduce flood risk in the catchment. At present 7,000 properties are at risk in the catchment in a 1% event. This is likely to increase to over 20,000 properties in the future.</p> <p>The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. This includes working in partnership with other organisations including, Bristol City Council, Natural England and Wessex Water.</p>	<p>The WRMP should take CFMP into account.</p> <p>The SEA should include a guide question relating to flood risk.</p>
<p>Environment Agency (2016) South West River Basin District, Flood Risk Management Plan 2015-2021</p>	
<p>Flood risk management plans (FRMP) explain the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs, and set out how risk management authorities will work with communities to manage flood risk over the next six years.</p> <p>The FRMP relevant to the Bristol Water supply area is the South West.</p>	<p>The WRMP should take FRMP into account.</p> <p>The SEA should include a guide question relating to flood risk.</p>
<p>Local Planning Authority (various) Local Plans/Local Development Plans</p>	
<p>The Bristol Water supply area covers the following Local Planning Authorities:</p> <ul style="list-style-type: none"> • South Gloucestershire • North Somerset • Bristol City Council • Bath & North East Somerset 	<p>The WRMP should have regard of the Local Plans and emerging Local Plans.</p> <p>The SEA assessment framework should consider the effects of the WRMP on the achievement of the Plans' visions and the effects of options on sustainable land use.</p>
<p>Local Geodiversity Action Plans (LGAPs)</p>	
<p>Local Geodiversity Action Plans (LGAPs) set out actions to conserve and enhance the</p>	<p>WRMP options should take into</p>

<p>geodiversity of a particular area. In general they aim to identify, conserve and enhance the best sites that represent the geological history of an area. They also aim to promote geological sites, provide a local geodiversity audit and influence local planning policy.</p> <p>Two LGAPs exist or are in development in Wales (Anglesey and Clwydian Range and Dee Valley AONB), in addition to Herefordshire in England (among others).</p>	<p>account the aims of the LGAPs.</p> <p>The SEA assessment should consider effects of options on geodiversity and outline enhancement and mitigation opportunities where these are identified.</p>
<p>Severn Estuary Coastal Group (2017) Severn Estuary Shoreline Management Plan 2 (SMP2)</p>	
<p>The Severn Estuary Shoreline Management Plan (SMP) is a high level non-statutory policy document designed to assist coastal flood and erosion risk management planning. It provides a large-scale assessment of the risks (to people, property, the natural and historic environment) associated with coastal erosion and flooding at the coast over the long-term. It also proposes policies to help manage these risks sustainably over the next hundred years.</p> <p>The SMP2 for the Severn Estuary updates an earlier SMP1 (2000) for the estuary. It aims to provide more certainty for landowners, residents and businesses; to know how the coast will be managed by regulators during the next 100 years, so that they can plan ahead and make decisions about investments, homes, development and the management of their resources.</p>	<p>The WRMP should take SMP into account.</p> <p>The SEA should include a guide question relating to flood risk.</p>
<p>South West Regional Biodiversity Partnership (2007) South West Biodiversity Implementation Plan</p>	
<p>The South West Biodiversity Implementation Plan sets out a framework of policy, priorities and actions to assist in a more joined up approach to biodiversity delivery. It updates those actions included in the South West Biodiversity Action Plan BAP and is a contribution to the 'Biodiversity Strategy for England' and seeks to contribute to regional plans and policies.</p> <p>The Plan identifies the following priorities:</p> <ul style="list-style-type: none"> • Maintain and enhance biodiversity by sensitively managing existing habitats, expanding and re-establishing links between fragmented sites and, where appropriate and managing at a larger, functional scale (landscape, ecosystem or catchment); • Develop integrated sustainable land management practices – that safeguard and enhance the region's biodiversity whilst also bringing benefits to society, the economy and environment; • Increase awareness and understanding of the importance of biodiversity to the region's health, quality of life and economic productivity, and develop wider support and active engagement; • Understand and manage the dynamic processes of change (e.g. climate change) and develop long-term sustainable approaches within the region that focus on the quality, extent and diversity of habitats. 	<p>The implementation of the WRMP will have an effect on the biodiversity of the area, particularly on the freshwater environment. The WRMP should pay regard to priority species and habitats.</p> <p>The SEA should seek to maintain or enhance biodiversity in the area and to avoid harm to protected areas.</p>
<p>Water Company (various) Drought Plans</p>	
<p>Drought Plans set out the steps that each water company will take through the stages of developing drought, drought, severe drought and recovery from drought to ensure their supply of water resources. Drought Plans must be produced by all water companies to fulfil their requirements under the Water Act 2003. Those Drought Plans relevant to the WRMP are:</p> <ul style="list-style-type: none"> • Bristol Water Drought Plan; • Severn Trent Water (2013) Drought Plan; • Thames Water (2013) Drought Plan; • Welsh Water Drought Plan. • Wessex Water (2013) Drought Plan 	<p>The WRMP should be in accordance with 2017 Bristol Waters' Drought Plan and Drought Plans of neighbouring water companies, taking into account those triggers and supply and demand side options which are relevant to the Bristol Water supply area.</p> <p>The SEA framework should include a guide question on the effects of the WRMP on water resources and commentary on whether they affect the water resource zones' ability to manage drought. The baseline should, where appropriate, take into account relevant information from neighbouring Drought Plans.</p>
<p>Water Company (various) Water Resources Management Plans (WRMP)</p>	
<p>Water companies in England and Wales, are required to prepare, maintain and publish a WRMP under the Water Industry Act 1991, updated by the provisions in section 37A-D of the Water Act 2003 and the Water Act 2014 and the Environment (Wales) Act 2016. The plan must set out how a water company intends to maintain the balance between supply and demand for water over a minimum of a 25 year period. This is complemented by a water company drought plan, which sets out the short-term operational steps a company will take as a drought progresses.</p> <p>The Bristol Water WRMP was published in 2014 and indicates that a deficit in supply will occur within the 25-year period up to 2040 as a result of the estimated increase in demand for water by 15% by 2045. Thirteen preferred water management options were identified to address this deficit.</p> <p>The neighbouring WRMPs relevant to the plan are:</p>	<p>The WRMP should take account of emerging neighbouring WRMPs where appropriate.</p> <p>The SEA should include an objective/guide question relating to water resources.</p>



- Wessex Water Final WRMP (2014);
- Welsh Water Final WRMP (2014);
- Severn Trent Water Final WRMP (2014).

Wessex Water supplies 1.3 million people in the southwest of England over an area predominantly rural but including also the urban areas of Bath, Chippenham, Dorchester, Bridgwater, Poole, Taunton, Salisbury and Yeovil. The key objectives of the plan are to reduce the demand for water, reduce leakage, reduce abstraction where it is required to improve river flows and identify whether there is scope to transfer water to neighbouring companies. The Plan forecasted that Wessex Water will have a surplus of supplies over demands for the next 25 years.

Welsh Water delivers water supply services to most of Wales and some parts of England, supplying water to around 1.3 million domestic and 110,000 business customers. The Welsh Water area is divided into 24 Water Resource Zones (WRZs). The ten WRZs in North Wales serve half a million people living mainly in Chester and Deeside, Anglesey, the Bangor and Caernarfon area and the north coastal strip from Llandudno to Prestatyn. These WRZs are closest to the United Utilities area. Deficits in the supply demand balance are forecast in the North Eryri/Ynys Mon and Tywyn/Aberdyfi zones. To maintain the supply demand balance in the North Eryri/Ynys Mon zone to 2040, Welsh Water will transfer water from Cwm Dulyn, actively pursue improved leakage levels, and carry out water efficiency work with customers. To address the Tywyn/Aberdyfi deficit, Welsh Water are proposing to transfer raw water from a new river abstraction at Afon Dysynni and transfer this water to Penybont WTW.

Severn Trent Water supplies 7.7 million people in the Midlands (England) and mid-Wales over an area covering 21,000 km². The key objective of the plan is to reduce the overall demand for water and to make the best use of the existing water resources through a more flexible and sustainable supply system. To achieve Severn Trent Water will:

- Reduce waste by driving leakage down;
- Reduce the demand for water, by working in partnership with our customers to help them become more water efficient;
- Improve our ability to deploy existing resources flexibly and efficiently;
- Use water trading to make more efficient use of our resources and improve resilience;
- Develop new sources of water when required, with a focus on expanding our existing sources first.
- Use proactive catchment management measures to protect our sustainable sources of drinking water supply from pollution risks.

The water companies are now in the process of developing the next WRMPs, covering the period 2020-2045. None of the current draft WRMPs have included preferred options to draw water supply from resources in the Bristol Water region.



Appendix C

Schedule of Consultation Responses

Bristol Water published a Strategic Environmental Assessment (SEA) Scoping Report as part of the initial stage of the SEA of the Draft WRMP for a consultation period of five weeks ending 7th May 2017. Responses were received to the consultation from the following organisations:

- ▶ Natural England;
- ▶ Environment Agency;
- ▶ Cadw.

In support of the consultation, a meeting attended by the Environment Agency, Natural England and Natural Resources Wales was also held on 27th April 2017. The purpose of this meeting was to seek initial feedback on the content of the SEA Scoping Report. Minutes of the meeting have been distributed to attendees.

Tables C.1 to C.3 show the comments received from the consultees and responses/actions that will be taken in the preparation of this Environmental Report.

The SEA Assessment Framework was amended as a result of this consultation. The final assessment framework is shown in Section 4.1 of this report.

Bristol Water published an Environmental Report alongside the Draft WRMP for consultation between 8th March and 31st May 2018, following submission to Defra in December 2017. Responses were received to the consultation from the following organisations:

- ▶ Environment Agency; and
- ▶ Natural England;

Tables C 4 and C5 provide a summary of the comments received from the consultees together with responses and actions taken in this updated Environmental Report.



Table C.1 Environment Agency

Consultation Question	Section	Consultee Response	Response/Action
Q1. Do you think that this Scoping Report sets out sufficient information to establish the context for the SEA of the draft WRMP in terms of the review of the plans and programmes and baseline evidence and analysis? If not, which areas do you think have been missed and where is information on these topics available?	Section 3: Baseline Analysis	The current state of the environment has been provided in Section 3 of the Scoping Report using a variety of sources and assesses the future baseline under a separate heading for each topic. The key sustainability issues relating to the WRMP have also been clearly set out. It would have been good to understand how the baseline characteristic differ from those in the 2014 SEA.	Comment noted. Given the relatively short time period between the publication of the 2013 SEA Environmental Report and the Scoping Report (circa four years) and the date (and collection frequency) of many of the information sources used in the Scoping Report (which in some cases pre-date the 2013 Environmental Report), the value to be gained in comparing baseline information over a relatively short time period is considered to be limited. Notwithstanding this, where possible, trend based information has been used in the Scoping Report. No change.
	Section 3: Baseline Analysis	Section 3.2 of the Scoping Report explains that the baseline information has been derived for areas within the Bristol Water supply area only. There are some limitations on data where this isn't available at this level. It would be better to title this as 'Spatial Scope' or similar so to fully understand what the scope of the SEA will be, not just the baseline information. Figure 1.2 should be referenced which shows the Bristol WRZ (called study area and supply area elsewhere). Please consider providing a clearer definition of the spatial scope / use consistent terminology. The scope should also be expanded if Bristol Water are considering options outside its supply area.	Agreed. As set out in Section 3.2 of the Scoping Report, where possible, baseline information has been provided for areas/sites only found within the supply area, such as designated sites, or for Bristol Water resource use. However, given the nature of the available data, this is not possible for all aspects of the baseline. In these cases, information has been presented for the four local authorities that comprise the West of England sub-region. Reflecting this response, Section 4 will be revised to include a definition of the spatial scope of the assessment whilst throughout the Environmental Report, the terminology will be reviewed to ensure consistency.
	Section 3: Baseline Analysis	The baseline information is sufficient to provide an understanding of the existing environment and its likely evolution within the study area (under separate future baseline headings). It provides a generic picture across the area but does not reference the 2014 report / changes since then. It would've been useful for this section to be more focused on those locations where impacts are likely to occur had an outline of the reasonable alternatives been included in the report. This would facilitate a greater understanding of the spatial distribution of environmental effects, rather than just their performance against the objectives. The report should consider whether the assessment methodology could be modified to provide greater clarity on the spatial distribution of the environmental effects of the plan rather than just the performance	Comment noted. As set out above, given the relatively short time period between the publication of the 2013 SEA Environmental Report and the Scoping Report and the date (and collection frequency) of many of the information sources used in the Scoping Report, the value to be gained in comparing baseline information over a relatively short time period is considered to be limited. Notwithstanding this, where possible, trend based information has been used in the Scoping Report. Indicative reasonable alternatives (in the form of example WRMP water supply, demand management and leakage



Consultation Question	Section	Consultee Response	Response/Action
		against objectives.	reduction) were outlined in section 1.4 of the Scoping Report; however, specific options could not be identified as they were not yet available at the point of the preparation of the Scoping Report. In consequence, it was not possible to provide baseline information for specific areas that are likely to be affected by the dWRMP options. However, where available, area/location-specific environmental data will be used alongside the baseline information presented in the Scoping Report to inform the assessment of dWRMP options. This in turn will help identify specific receptors/areas that may be affected by the implementation of the WRMP and therefore, it is not considered necessary to modify the assessment methodology in this regard. No change.
	Section 2: Review of Plans and Programmes	Further relevant plans are Severn Trent Water's Water Resources Management Plan (WRMP) and the Canal and River Trust's plans with regard to Sharpness and Gloucester Canal.	Comment noted. The Severn Trent Water 2014 WRMP will be included in the review of plans and programmes contained in the Environmental Report. From this response, it is unclear what specific plan regarding Sharpness and Gloucester Canal is being referred to.
Q2. Do you agree that the main economic, social and environmental issues identified are relevant to the SEA of the draft WRMP? If not, which issues do you think need to be included or excluded?	Section 3: Baseline Analysis	Yes.	Comment noted
Q3. Do you agree with the proposed approach to the SEA of the draft WRMP? Do the SEA objectives and guide questions that comprise the assessment framework cover a sufficient range of environmental, social and economic topics? If not, which objectives/ guide questions should be amended and which other objectives/ guide	Section 4: Approach to the Assessment	The proposed SEA water quality and quantity objectives are combined (SEA Objective 3). These are two quite different elements and should be separated, for example under WFD a scheme may cause water quantity deterioration but not water quality deterioration.	Agreed. The Assessment Framework will be amended to separate SEA Objective 3.



Consultation Question	Section	Consultee Response	Response/Action
questions do you believe should be included?			
	Section 4: Approach to the Assessment	Table 4.1 clearly indicates the scope of the assessment and highlights topics scoped out (Air Quality). It doesn't, however, include the key reasons for scoping in each topic. Was this based on the findings of the 2014 report? Whilst the report states the scoping is the same as the 2014 report it doesn't say whether this report was used for scoping. Ideally the report should include reasons for scoping in each topic and further explanation on how this was determined.	Disagree. In order to demonstrate consideration of all topics identified in Annex I of the SEA Directive, the SEA has the presumption that all topics are scoped in, unless reasoned justification is provided for their exclusion. Table 4.1 confirms the topics to be included in the assessment as well as the proposal to scope out air quality. The Scoping Report text states that this is 'consistent with the approach taken to SEA of the 2014 WRMP' and whilst informative, for the SEA of the WRMP19 each SEA topic has been reviewed for its relevance.
	Section 4: Approach to the Assessment	The statement for assessing cumulative effects does not explain the methodology to be used - for example there are no indicative matrices setting out how this will be done. Whilst the general approach to what will be considered is provided, there is no information regarding how the significance of cumulative effects is to be determined. Please provide a clearer explanation of how cumulative effects are to be assessed.	Agreed. Further explanation of the methodology for assessing cumulative effects will be provided in the Environmental Report.
	Section 4: Approach to the Assessment	The methodology section is generally clear and well laid out referencing the previous 2014 report methodology where appropriate and tabulating the SEA objectives. Note that the table referencing is incorrect from Table 4.1 onwards. It would be useful to understand better how the significance of effect is going to be determined i.e. through magnitude/sensitivity etc. This would support how the scoring of each objective is undertaken. A matrix would demonstrate this clearly.	Comment noted. Appendix C to the Scoping Report sets out 'definitions of significance' i.e. guidance for what constitutes a significant effect, a minor effect or a neutral effect for each of the SEA objectives. In consequence, no further change is considered to be necessary. The table numbering is incorrect and will be addressed in the Environmental Report.

Table C.2 Natural England

Consultation Question	Section	Consultee Response	Response/Action
Q1. Do you think that this Scoping Report sets out sufficient information to establish the context for the SEA of the draft WRMP in terms of the review of the plans and programmes and baseline evidence and analysis? If not, which areas do you think have been missed and where is information on these topics available?	General	<p>Whilst the report provides a detailed review of relevant contextual information, there are some areas where we suggest that clarifications and/or additions are required. These are as follows:</p> <p>In conducting the SEA of the dWRMP, consideration should be given to the document entitled 'Water Industry Strategic Environmental Requirements (WISER)' which has recently been sent to all water companies for consultations.</p>	Agreed. The requirements of WISER will be taken into account in the preparing the Environmental Report.
	Section 3: Baseline Analysis	The list of NNRs in section 3.3 appears to be incomplete. A full list can be found in 'Somerset's National Nature Reserves, 2008' which is available on www.gov.uk .	Comment noted. The list of National Nature Reserves (NNRs) provided in Section 3.3 of the Scoping Report is based on GIS based maps from the Natural England Spatial Data Catalogue [available at http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue] (accessed February 2017)]. This list will be reviewed against the 'Somerset's National Nature Reserves, 2008' document and updated if required in the Environmental Report.
	Section 3: Baseline Analysis	Whilst the report has identified priority species of relevance, no information has been provided on the distribution of priority habitats within the Bristol Water supply area. We are aware that Bristol Water have access to GIS-based maps of priority habitat distribution around the Bristol Lakes which were used to inform their PR14 catchment diffuse pollution reduction programme. We advise that these are used within the SEA of the WRMP.	Agreed. A figure showing priority habitat distribution around the Bristol Lakes will be included in Section 3.3 of the Environmental Report and used to inform the assessment of WRMP options.
	Section 3: Baseline Analysis	In addition to the information provided in Table 3.4, it should be noted that discussions are ongoing between the Environment Agency, Natural England and the Somerset IDB about the national process of assessing and licensing currently exempt water transfers. This issue may apply to the water sources feeding the Somerset Levels and Moors SPA/Ramsar, and should be considered in the assessment of any proposals to increase abstraction from these rivers.	Comment noted.
	Section 3: Baseline	In the baseline information on water quality we suggest that more detail	Agreed. Section 3.5 will be revised to refer to Blagdon Lake

Consultation Question	Section	Consultee Response	Response/Action
	Analysis	<p>is required on those water bodies associated with designated sites which could be affected by the proposed options. Probably of most relevance are Blagdon Lake SSSI and Chew Valley Lake SSSI. Both sites are showing signs of hyper-eutrophication which poses a significant threat to the current Favourable status of these SSSIs. Potential interactions between nutrient enrichment, risk of algal blooms and the impact of abstraction should be considered within the Environmental Report. The rivers feeding the Somerset Levels and Moors Ramsar are also already hyper-eutrophic and any increase in abstraction from these water bodies should be assessed in light of this. The information provided in Table 3.5 only provides high-level information on the percentage of water bodies at good or high status. It would be more useful to provide additional information on the water quality status of sites which are likely to be hydrologically linked to the proposed options in the WRMP, where known issues already exist.</p>	<p>SSSI and Chew Valley Lake SSSI. The information provided in this response will also be considered when undertaking the assessment of WRMP options where appropriate.</p>
	Section 3: Baseline Analysis	<p>In our advice to Bristol Water on the PR14 WRMP review, we highlighted the need to better understand the effects of drawdown on the SSSI interests of the reservoirs owned by Bristol Water, particularly in relation to the plant communities supporting the interest features. We appreciate that PR14 investigations are being conducted to help address this question. Within the SEA of the dWRMP it would seem appropriate to consider the findings of these investigations if they are sufficiently advanced.</p>	<p>Agreed. Where appropriate and available, the findings of the PR14 investigations will be considered in undertaking the assessment of WRMP options.</p>
<p>Q2. Do you agree that the main economic, social and environmental issues identified are relevant to the SEA of the draft WRMP? If not, which issues do you think need to be included or excluded?</p>	Section 3: Baseline Analysis	<p>Natural England agrees that the main environmental issues have been identified in the SEA Scoping Report. However, some will require more detailed consideration as the assessment process is conducted. Such issues have already been identified above.</p>	<p>Comment noted.</p>
<p>Q3. Do you agree with the proposed approach to the SEA of the draft WRMP? Do the SEA objectives and guide questions that comprise the assessment framework cover a sufficient range of environmental, social and economic topics? If</p>	Section4: Approach to the Assessment	<p>The proposed assessment matrix set out in Table 4.3 is a suitable way of summarising high-level assessment results, though further information on how the 'Uncertain' category is used would be helpful. It is our understanding that it will be used to highlight the level of confidence associated with the other possible 'scores' listed. For example, a judgement of significant negative effect that has been made with low confidence will be reported as 'significant negative effect – low confidence'. It would seem to be unhelpful in the assessment process to report an assessment as simply 'uncertain', and we assume that this approach will not be taken.</p>	<p>Comment noted. To confirm, where uncertainty has been identified with regard to the effects of an option, this will be noted in the commentary and indicated in the scoring through the use of '?'. In instances where the potential for a positive/negative effect has been identified but there remains uncertainty with regard to the probability of the effect occurring and/or the magnitude of the effect, this will be indicated through a mixed score (e.g. '--/?') as opposed to assessing the effect as just uncertain.</p> <p>No change.</p>

Consultation Question	Section	Consultee Response	Response/Action
not, which objectives/ guide questions should be amended and which other objectives/ guide questions do you believe should be included?			
	Section4: Approach to the Assessment	It is unclear how zones of vulnerability will be determined around designated sites, particularly in relation to potential hydrological impacts. We presume that any abstraction in the surface water catchment of a designated site will be deemed 'relevant' and will require further assessment. How the zones of influence of any groundwater abstractions will be determined is less clear; it would be helpful if this was clarified.	Agreed. Zones of vulnerability around European sites will take into account potential effects on water based features and will include consideration of hydrological connectivity. This will be more explicitly set out in the HRA to accompany the WRMP. Where relevant, the findings of the HRA will then be used to inform the assessment of WRMP options against the biodiversity assessment objective in the SEA and recorded in the Environmental Report.
		In our advice to Bristol Water regarding the SEA of the PR14 draft WRMP, we highlighted that there may be a need to obtain more detailed information from Natural England that underpins the Conservation Objectives for particular sites. As advised previously, Natural England would be happy to co-ordinate provision of this information where it is required.	Comment noted.

Table C.3 Cadw

Consultation Question	Section	Consultee Response	Response/Action
All	N/A	Due to the location of the area covered by this plan, we consider that it is unlikely that the proposed works will have an impact on the historic environment in Wales.	Comment noted.

Table C.4 Environment Agency (on the Environmental Report accompanying the Draft WRMP)

Consultation Question	Section	Consultee Response	Response/Action
Q1. Does the assessment set out in this SEA Environmental Report describe the likely significant environmental effects of the feasible and preferred options?		None received	N/A
Q2. Do you think that there are other likely significant environmental effects that should have been identified that would have affected the choice of preferred option included in the Draft Water Resources Management Plan?		The company has provided an estimation of carbon emissions for its baseline and final plan scenarios, however it has not described the greenhouse gas emissions that will occur as a result of each option required to maintain its supply demand balance, or stated where else this information is available.	<p>Comment noted.</p> <p>This comment was made in regard of the dWRMP; however, information is available in the Environmental Report which addresses the issue raised.</p> <p>Appendices E and F of the Environmental Report (for the SEA of the dWRMP) and of the revised Environmental Report (for the SEA of the revised draft WRMP) contains an estimate of the carbon emissions from construction and operation of each of the feasible and preferred options. The estimates include embodied carbon, using data derived from the Inventory of Carbon and Energy.</p> <p>The assessment of the significance of the carbon emissions is based on the definitions of significance provided in Appendix D of the Environmental Report.</p>
		The company has provided an estimation of the impacts of climate change on its future demand and supply forecasts. However, it has not described the impacts of climate change on each of its options in the final planning scenario.	<p>Comment noted.</p> <p>This comment was made in regard of the dWRMP; however, information is available in the Environmental Report which addresses the issue raised.</p> <p>Appendix F of the Environmental Report (for the SEA of the dWRMP) and of the revised Environmental Report (for the SEA of the revised draft WRMP) contains an assessment of each of the preferred options against the SEA objective 6 'To limit the causes and potential consequences of climate change and to adapt to future changes'.</p>
		The SEA report includes a useful summary in Figure 1.3 of the interlinkages between the SEA process and the development of the WRMP. The Assessment Methodology (section 4.4) outlines the two stage assessment approach to the options and Section 6.1 outlines in	<p>Comment noted.</p> <p>Section 6.1 and Section 6.3 of the revised Environmental Report provides information on the factors (and decision making</p>

Consultation Question	Section	Consultee Response	Response/Action
		<p>general terms how the results of the first stage were collated with other social and economic factors to identify the preferred options. There is no further explanation or evidence, however, of how specific environmental considerations identified as part of the SEA may have influenced the development of the plan.</p>	<p>processes) that informed the selection of the preferred options. In this regard, they are supplementary to the information outlined with the dWRMP with respect to the options appraisal, environmental appraisal and programme appraisal.</p> <p>The SEA Post Adoption Statement (PAS), consistent with regulation 16(4) of The Environmental Assessment of Plans and Programmes Regulations 2004, will include details of how environmental considerations have been integrated into the final WRMP and how the findings of the Environmental Report have been taken into account. The PAS will also present the reasons for choosing the options that make up the final WRMP, in the light of the others considered.</p>
<p>Q3. Do you agree with the proposed arrangements for monitoring the significant effects of the implementation of the WRMP? If not, what measures do you propose?</p>		<p>None received</p>	<p>N/A</p>
<p>Other</p>		<p>The SEA does not currently include reference to Catchment Flood Management Plans (although there is a footnote at page 72); any specific Shoreline Management Plans (SMP) - such as the Severn Estuary SMP2 (although the general Defra guidance 2011 is included); Salmon Action Plans and Water Level Action Plans.</p>	<p>Comment noted.</p> <p>Table 2.1 of the revised Environmental Report contains reference to the Bristol and Avon Catchment Flood Management Plan, the Severn Estuary Shoreline Management Plans (SMP2) and updates to other national plans (such as the National Planning Policy Framework), the details of which are summarised in the updated Appendix B.</p> <p>The scope of the SEA (including the plans and programmes identified in Section 2 and Appendix B) was subject to scoping consultation which ended in May 2017. Three responses were received (including one from the EA) which are summarised in Appendix C of the Environmental Report. As a result, the list of plans and programmes was revised and the information used to support the assessment of the dWRMP presented in the Environmental Report.</p> <p>At scoping stage, the EA proposed additional plans for inclusion, and these were used to inform the revised scope of the assessment. The identification of additional information to inform the scope and context of the SEA, post assessment, whilst useful, will not have the same influence on the scope of</p>



Consultation Question	Section	Consultee Response	Response/Action
			the assessment. In consequence, whilst the review of plans and programmes has been updated to reflect the further additional plans identified, they have not been reflected in the assessment framework or subsequent assessment of options.
		In the Baseline Analysis Section 3.2 (Bristol Water Supply Area) refers to the spatial scope of the assessment with reference to the Bristol Water Supply Area and cross-referencing to Figure 1.2 of the area. The baseline information is tailored to this area where available and where this is not possible the baseline data extends to the 4 main local authority areas. In this section there is improved cross-referencing to the illustrated figure and more consistent terminology. It would be useful, however, to clarify whether and how the spatial scope of the assessment has taken account of the potential impacts of options outside of the water supply area.	Comment noted. No action proposed. Section 6.3 presents that assessment of cumulative effects, arising from population change in the Bristol Water area, NSIPs, Bristol Water's Drought Plan 2017; and other water company WRMPs. At the point of completion of the Environmental Report, the other dWRMPs were not available. Now that they have been published, an assessment has been undertaken. No additional effects have been identified. Bristol Water will continue to monitor the potential effects on water resources as part of the five yearly review of the WRMP.
		Option 32 – end bulk transfer to Wessex Water and use existing resource for Bristol Water supply. It is stated that this solution would result in no change in environmental impact. Although, this statement is logical the report does not appear to have established the extent of any current impact.	Comment noted. Following consultation on the draft WRMP and the responses from the regulators and consultees, further changes were made to the WRMP, which led to revisions to the forecast supply deficit (0.2 MI/d at 2035 rising to 9.18 MI/d at 2045). This has meant that Option 32 (ending the bulk supply) has not been needed.
		The SEA has scored 'o' impact on many of the feasible schemes where increased production and construction is involved. These schemes will involve some increased abstraction that could impact on flow, fish entrainment and recreation and construction that may impact biodiversity.	Comment noted. The assessment of feasible options identify a full range of positive and negative minor and significant effects. The neutral effects have been reviewed and considered in light of the definitions of significance and considered appropriate, noting the assumptions outlined.

Table C.5 Natural England (on the Environmental Report accompanying the Draft WRMP)

Consultation Question	Section	Consultee Response	Response/Action
<p>Q1. Does the assessment set out in this SEA Environmental Report describe the likely significant environmental effects of the feasible and preferred options?</p>		<p>We broadly concur with the SEA conclusions in relation to Biodiversity. Whilst some negative outcomes are foreseeable we agree that mitigation should be possible. In addition, if implemented creatively we foresee that some of the Feasible Options have the potential for Biodiversity 'Net Gain'. Should these Feasible Options be taken forward we would encourage the company to develop them in the context of the Biodiversity Strategy scheme proposed in the PR19 WINEP and the company's Biodiversity Index. In addition we support the company's proposal to continue with catchment schemes around the Bristol Water reservoirs to improve raw water quality and we look forward to working with the company going forward to help secure all feasible benefits for biodiversity.</p>	<p>Comment noted.</p> <p>Natural England's comments that they broadly concur with the SEA conclusions in relation to biodiversity is welcome.</p>
<p>Q2. Do you think that there are other likely significant environmental effects that should have been identified that would have affected the choice of preferred option included in the Draft Water Resources Management Plan?</p>		<p>Section 28G of the Wildlife and Countryside Act 1981, places a duty on public authorities, including water companies, to take reasonable steps consistent with the proper exercise of their functions to further the conservation and enhancement of SSSIs. These duties are mirrored in the general recreational and environmental duties placed on relevant undertakers in the Water Industry Act (1991) as amended. The Water Industry Strategic Environmental Requirements³ (WISER, page 29) sets out the expectations for delivery of these obligations.</p> <p>Companies are expected "to contribute to maintaining or achieving SSSI favourable condition both on [companies'] own land and in the catchments [companies] manage or impact on".</p> <p>The issues raised have the potential to apply to SSSIs and should be reviewed in the existing dWRMP SEA.</p> <p>We understand that the company are proposing to conduct a much more thorough environmental assessment of the potential vulnerabilities of the Bristol lake SSSIs between now and the PR24 review, taking into account the findings of PR14 and PR19 investigations. We are happy to provide further advice to the company on the scope of this assessment as this work progresses.</p>	<p>Comment noted.</p> <p>Appendix E and F of the Environmental Report (for the SEA of the dWRMP) and of the revised Environmental Report (for the SEA of the revised draft WRMP) includes an assessment of the construction and operational effects of feasible and preferred options on biodiversity including internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs. Specific feasible options that include commentary include P01-02, P08, P10, R08-02, R08-03, R11, R23-01 and R24.</p> <p>The SEA of P08 and R24 has drawn on the findings of the revised WFD assessment and the conclusions are aligned.</p> <p>The offer of further advice from Natural England on any subsequent environmental assessments is welcome.</p>
		<p>There are options in Bristol Water's dWRMP suite of Feasible Options which have the potential to impact protected landscapes should they go forward. To safely conclude that these could be considered 'viable' in the final plan, cumulative landscape impacts should be assessed before the final plan is submitted to ensure mitigation is possible, and mitigation should not be left to a piecemeal approach at the project stage.</p>	<p>Comment noted.</p> <p>Appendix E and F of the Environmental Report for the SEA of the dWRMP) and of the revised Environmental Report (for the SEA of the revised draft WRMP) includes an assessment of the construction and operational effects of feasible and preferred options on landscape (SEA objective 12 'To conserve and</p>



Consultation Question	Section	Consultee Response	Response/Action
			enhance landscape character). A range of neutral, minor and significant effects on landscape have been identified for the feasible options whilst a range of neutral and minor effects on landscape have been identified for the preferred options. Section 6 of the Environmental Report includes an assessment of the combined effects of the preferred options on landscape, noting the potential for localised landscape and visual effects arising from temporary construction activities associated with P20.
Q3. Do you agree with the proposed arrangements for monitoring the significant effects of the implementation of the WRMP? If not, what measures do you propose?		None received	N/A



Appendix D

Definitions of Significance

Objective	Key Questions	Effect	Description	Illustrative Guidance
1. To protect and enhance biodiversity, key habitats and species, working within environmental capacities and limits.	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and link existing habitats as part of the development process?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p>	++	Significant Positive	<p>The option would result in a major enhancement of the quality of designated habitats due to changes in flow or groundwater levels or water quality.</p> <p>The option would result in a major increase in the population of a priority species.</p>
		+	Positive	<p>The option would result in a minor enhancement of the quality of designated and/or non-designated habitats due to changes in flow or groundwater levels or water quality.</p> <p>The option would result in a minor increase in the population of a priority species.</p>
		0	Neutral	The option would not result in any effects on European, national designated or non-designated sites and/or species.
		-	Negative	The option would result in minor, short term negative effects on non-designated sites (e.g. through decreases in flows/water quality, or some loss of habitat leading to a temporary loss of ecosystem structure and function).
		--	Significant Negative	<p>The option would have a negative effect on European or national designated sites and/or protected species (i.e. on the interest features and integrity of the site, by preventing any of the conservation objectives from being achieved or resulting in a long term decrease in the population of a priority species). These effects could not be reasonably mitigated.</p> <p>The option would result in major, long term negative effects on non-designated sites (e.g. through decreases in flows/water quality, or significant loss of habitat leading to a long term loss of ecosystem structure and function).</p>
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p>	++	Significant Positive	No option is expected to have a significant positive effect on achieving this objective.
		+	Positive	<p>The option would be located on a brownfield site and would have no effect on soils or existing land uses.</p> <p>The option would result in the remediation of contaminated land.</p>

Objective	Key Questions	Effect	Description	Illustrative Guidance
	<p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest and wider geodiversity?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	0	Neutral	The option would have no effect on soils or land use.
		-	Negative	The option would not be located on a brownfield site and/or would result in a minor loss of best and most versatile agricultural land, or would be in conflict with existing land uses. The option would result in land contamination.
		--	Significant Negative	The option would not be located on a brownfield site and would result in a major loss of best and most versatile agricultural land, or would be in conflict with existing land uses. The option would result in land contamination.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p>	++	Significant Positive	The option would result in a major increase in river flows. The option would result in a major increase in groundwater levels.
		+	Positive	The option would achieve water savings through demand management and does not require abstraction to achieve design capacity. The option would result in a minor increase in river flows or minor increase in groundwater levels.
		0	Neutral	The option would have no discernible effect on river flows or on groundwater levels.
		-	Negative	The option would result in minor decreases in river flows. The option would result in minor decreases in groundwater levels.
		--	Significant Negative	The option would result in major decreases in river flows. The option would result in major decreases in groundwater levels.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the</p>	++	Significant Positive	The option would address failure of WFD Good Ecological Status/Good Ecological Potential.
		+	Positive	The option would result in minor improvements in surface and ground water quality.
		0	Neutral	The option would have no discernible effect on surface/coastal water quality or on groundwater quality. The option would not lead to a change in WFD classification.
		-	Negative	The option would affect river and/or coastal water quality and lead to short term or intermittent effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not be avoided but could be mitigated. The option would result in minor decreases in groundwater quality.



Objective	Key Questions	Effect	Description	Illustrative Guidance
	<p>achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	--	Significant Negative	<p>The option would affect river and/or coastal water quality and lead to long term or continuous effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not reasonably be mitigated.</p> <p>The option would result in the deterioration of WFD classification.</p> <p>The option would result in major decreases in groundwater quality.</p>
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
5. To reduce the risk of flooding.	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p>	++	Significant Positive	No options are expected to have a significant positive effect on achieving this objective.
		+	Positive	The option has the potential to help alleviate flooding in the catchment.
		0	Neutral	The option would involve the construction of above-ground water supply infrastructure, but is located outside floodplain areas. It is anticipated that the option would neither cause nor exacerbate flooding in the catchment.
		-	Negative	The option would involve the construction of above-ground water supply infrastructure and be located within the 1 in 1000 year floodplain.
		--	Significant Negative	The option would involve the construction of above-ground water supply infrastructure and be located within the 1 in 100 year floodplain.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
6. To limit the causes and potential consequences of climate change.	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change?</p>	++	Significant Positive	No options are expected to result in a significant positive effect on achieving this objective.
		+	Positive	The option would result in a sustained decrease in greenhouse gas emissions (100-999 tonnes CO ₂ e/a) and would increase resilience/decrease vulnerability to climate change effects.
		0	Neutral	The option would have no discernible effect on greenhouse gas emissions, nor would the option increase resilience/decrease vulnerability to climate change effects.
		-	Negative	The option would result in a minor or temporary major increase in greenhouse gas emissions (100-999 tonnes CO ₂ e) or the option would not increase resilience/decrease vulnerability to climate change effects.
		--	Significant Negative	The option would result in major or long term increases in greenhouse gas emissions (>1000 tonnes CO ₂ e) and the option would not increase resilience/decrease vulnerability to climate change effects.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.

Objective	Key Questions	Effect	Description	Illustrative Guidance
7. To ensure the protection and enhancement of human health.	Will the option ensure the continuity of a safe and secure drinking water supply?	++	Significant Positive	The option would lead to a major increase in design capacity (>10 MI/d) of drinking water, would have a sustained positive effect on the health of local communities and would ensure that surface water and bathing water quality is maintained within statutory limits.
	Will the option affect opportunities for recreation and physical activity?	+	Positive	The option would lead to a minor increase in design capacity (1-10 MI/d) of drinking water, would have a temporary positive effect on the health of local communities and would ensure that surface water and bathing water quality is maintained within statutory limits.
	Will the option maintain surface water and bathing water quality within statutory standards?	0	Neutral	No option is expected to have a neutral effect on achieving this objective.
	Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?	-	Negative	The option would result in the deterioration of surface water or bathing water quality and would have a temporary effect on human health (e.g. noise).
		--	Significant Negative	The option would result in the deterioration of surface water or bathing water quality and have a long term effect on human health (e.g. noise).
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
8. To maintain and enhance the economic and social well-being of the local community.	Will the option ensure sufficient infrastructure is in place for predicted population increases?	++	Significant Positive	The option would result in a significant increase in construction jobs (capital spend of >£10m). The option would create new, and significantly enhance existing, recreational facilities within the operational area. The option would provide an additional design capacity of >10 MI/d.
	Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?	+	Positive	The option would result in an increase in construction jobs (capital spend £5-9.9m). The option would enhance existing recreational facilities within the operational area. The option would provide an additional design capacity of 1-10 MI/d.
	Will the option help to meet the employment needs of local people?	0	Neutral	The option would have no effect on local employment opportunities, the regional or local economy, or on recreational facilities. The option would provide an additional design capacity of <1 MI/d.
	Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?	-	Negative	The option would reduce the availability and quality of existing recreational facilities within the operational area. It is not expected that any options will have a negative effect on employment opportunities, the economy or design capacity.
	Will the option improve access to local services and facilities (e.g. sport and recreation)?	--	Significant Negative	The option would result in the removal of existing recreational facilities within the operational area. It is not expected that any options will have a negative effect on employment opportunities, the economy or design capacity.
	Will the option contribute to sustaining and growing the local and regional economy?	?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
9. To ensure the sustainable and	Will the option lead to reduced leakage from the supply	++	Significant Positive	The option would involve reducing leakage from the supply network or is a water efficiency option with a design capacity of >5 MI/d.



Objective	Key Questions	Effect	Description	Illustrative Guidance
efficient use of water resources.	network? Will the option improve efficiency in water consumption?	+	Positive	The option would involve reducing leakage from the supply network or is a water efficiency option with a design capacity of <5 MI/d.
		0	Neutral	The option is not a leakage reduction or water efficiency option.
		-	Negative	No options are expected to result in a negative effect on achieving this objective.
		--	Significant Negative	No options are expected to result in a significant negative effect on achieving this objective.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
10. To promote the efficient use of resources.	Will the option seek to minimise the demand for raw materials? Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill? Will the option encourage the use of sustainable design and materials? Will the option reduce or minimise energy use?	++	Significant Positive	No options are expected to result in a significant positive effect on achieving this objective.
		+	Positive	The option would re-use or recycle substantial quantities of waste materials and any new infrastructure would incorporate substantial sustainable design measures and materials. There would be no increase in energy consumption.
		0	Neutral	The option would largely rely on existing infrastructure and only require small quantities of additional materials to realise design capacity. No additional energy use required.
		-	Negative	The option would require new infrastructure with only limited opportunities for the re-use or recycling of waste materials. There are limited opportunities for sustainable design or the use of sustainable materials. The option would result in a minor increase in energy consumption.
		--	Significant Negative	The option would require significant new infrastructure that cannot be provided through the re-use or recycling of waste materials. There are no opportunities for sustainable design or the use of sustainable materials. The option would result in a major increase in energy consumption.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
11. To conserve and enhance cultural and historic assets.	Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings Will the option conserve or enhance archaeologically important sites and/or remains? Will the option avoid damage to important wetland areas with potential for paleoenvironmental	++	Significant Positive	The option would result in enhancements to designated heritage assets and/or their setting, fully realising the significance and value of the asset, such as: <ul style="list-style-type: none"> • Securing repairs or improvements to heritage assets, especially those identified in the Historic England Buildings/Monuments at Risk Register; • Improving interpretation and public access to important heritage assets. There would be no damage to known archaeological sites or remains or geologically important sites.
		+	Positive	The option would result in enhancements to heritage assets and/or their setting, whether designated or not. There would be no damage to known archaeological sites or remains or geologically important sites.
		0	Neutral	The option would have no effect on cultural heritage assets or archaeological sites/remains.



Objective	Key Questions	Effect	Description	Illustrative Guidance
	deposits? Will the option affect public access to, or enjoyment of, features of cultural heritage?	-	Negative	The option would result in the loss of significance of undesignated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected. There would be limited damage to known, undesignated archaeological sites/remains or geologically important sites with a consequent loss of significance only partly mitigated by archaeological investigation.
		--	Significant Negative	The option would diminish the significance of designated heritage assets and/or their setting such as: <ul style="list-style-type: none"> Demolition or further deterioration in the condition of designated heritage assets especially those identified in the Historic England Buildings/Monuments at Risk Register; Loss of public access to important heritage assets and lack of appropriate interpretation. There would be major damage to known, designated archaeological sites/remains or geologically important sites with a consequent loss of significance only partly mitigated by archaeological investigation.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.
12. To conserve and enhance landscape character	Will the option avoid adverse effects on, and enhance where possible, protected/designated landscapes (including woodlands) such as National Parks or AONBs? Will the option protect and enhance landscape character, townscape and seascape? Will the option affect public access to existing landscape features? Will the option minimise adverse visual impacts?	++	Significant Positive	The option would result in new, above ground infrastructure that significantly enhances the local landscape, townscape or seascape.
		+	Positive	The option would result in new, above ground infrastructure that has a minor positive effect on the local landscape, townscape or seascape.
		0	Neutral	The option would result in new, above ground infrastructure but is not located within or visible from a protected/designated landscape, townscape or seascape and would have no effect on the character or public amenity value of its setting.
		-	Negative	The option would result in new, above ground infrastructure that has a minor negative effect on the local landscape, townscape or seascape.
		--	Significant Negative	The option would have a negative effect on designated landscape or feature (i.e. significant visually intrusive infrastructure) whose effects could not be reasonably mitigated. The option would results in new, above ground infrastructure that has a major negative effect on the local landscape, townscape or seascape.
		?	Uncertain	From the level of information available, the effect that the option would have on this objective is uncertain.



Appendix E

Feasible Options Assessment Matrices



Assessment of Feasible Customer Demand Options

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C26-01: Enhanced water efficiency communications campaign (different messages for different seasons)	Construction	0	0	0	0	0	0	0	0	0	0	0	0
	Operation	0	0	+	0	0	0	0	0	+	0	0	0

Construction

This option includes enhanced water efficiency communication campaigns within the local community for different seasons, for example during the summer months and periods of peak demand. The concept of this option is to vary the message of water efficiency to reduce the risk of customers becoming desensitised to the message. It is assumed that all communications are via the internet, customer magazine and local events.

There is no construction of new infrastructure associated with this option and therefore no effects are predicted on Objectives 1 to 12.

Operation

There would be no operational effects associated with this option on biodiversity (Objective 1) and geology and soils (Objective 2).

This option is expected to result in a demand reduction of 0.08 MI/d, generating a minor positive operational effect on water quantity (Objective 3).

No changes in water quality are expected as a result of the operation of this option (Objective 4).

Operation of this option would neither cause nor exacerbate flooding (Objective 5).

Total carbon emissions from the operation of this option are estimated at 0.1 tonnes CO₂e/year, assuming four key seasonal campaigns would be run per year involving 1,000km of vehicle trips, 1,000 trips and carbon emissions of 100gCO₂e/km (in a modern van). This would have no discernible effect on greenhouse gas emissions (Objective 6).

Although the yield (0.08 MI/d) will help ensure continuity of supply of safe and secure drinking water, it is not of sufficient scale to have an effect on Objective 7. There will be an increase in vehicular movements associated with the water efficiency communication campaigns (1,000km of vehicle trips and 1,000 trips per year). However, noise and air quality impacts are likely to be small and therefore a neutral effect on human health (Objective 7) has been identified.



This option would involve 'low' operational expenditure (£1 million per year) which has been assessed as being of insufficient scale to have an effect on the local economy (through job creation) Objective 8. For those metered consumers who take action in response to the educational campaign, there will be a reduction in water consumption and associated water costs, which for low income families could be important.

It is anticipated that enhanced water efficiency communication campaigns would result in 0.08 MI/d yield benefit. A minor positive effect on water resources is therefore anticipated (Objective 9).

Operational energy savings associated with the reduced treatment and pumping of water are likely to be negligible due to relatively likely low yield of this (0.08 MI/d) (Objective 10).

No impacts on heritage assets or landscape are expected during operation of this option (Objectives 11 and 12).



Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C26-02: Water efficiency on different key stages (primary, secondary, further and higher education)	Construction	0	0	0	0	0	0	0	0	0	0	0	0
	Operation	0	0	+	0	0	0	0	0	+	0	0	0

Construction

This option involves working in partnership with schools to promote water efficiency, undertaken for the different key stages. The aim is that education regarding water efficiency starts at an early age and therefore will result in long term demand savings. It is assumed that 40 school visits would be made each year, reaching 30 students per visit. The work would be undertaken by three full time employees. The overall yield benefit has been estimated at 0.06 MI/d.

There is no construction of new infrastructure associated with this option and therefore no effects are predicted on Objectives 1 to 12.

Operation

There would be no operational effects associated with this option on biodiversity (Objective 1) or geology and soils (Objective 2).

This option is expected to result in a demand reduction of 0.06 MI/d which has been assessed as having a minor positive operational effect on water quantity (Objective 3). It should be noted that in addition to the potential to reduce demand by providing information and awareness raising to pupils who will take home the water efficiency message and devices, there is a potential long term benefit (not quantified) of influencing future water company customers' water use behaviours.

No changes in water quality are expected as a result of the operation of this option (Objective 4).

Operation of this option would neither cause nor exacerbate flooding (Objective 5).

Total carbon emissions associated with the operation of this option are estimated at 0.08 tonnes CO₂e/year, assuming four key seasonal campaigns would be run per year involving 40 school visits at 20km per visit and 100g CO₂e/km (in a modern van). This would have no discernible effect on greenhouse gas emissions (Objective 6).

Although the yield (0.06 MI/d) will help ensure continuity of supply of safe and secure drinking water, it is not of sufficient scale to have an effect on Objective 7. There will be an increase in vehicular movements associated with the water efficiency communication campaigns (total estimated distance of 800km and 40 trips per year). However, noise and air quality impacts are likely to be negligible and therefore a neutral effect on human health (Objective 7) has been identified.

This option would involve 'low' operational expenditure (£0.1 million per year) which has been assessed as being of insufficient scale to have an effect on the local economy (through job creation) (Objective



8). Bristol Water expects to utilise existing staff rather than employing new staff to deliver the programme. For those metered consumers who take action in response to the educational campaign, there will be a reduction in water consumption and associated water costs, which for low income families could be important.

It is anticipated that enhanced water efficiency communication campaigns would result in a 0.06 Ml/d yield benefit. A minor positive effect on water resources is therefore anticipated (Objective 9).

Operational energy savings associated with the reduced treatment and pumping of water are likely to be negligible due to relatively likely low yield (0.06 Ml/d) of this option (Objective 10).

No impacts on heritage assets or landscape are expected during operation of this option (Objectives 11 and 12).



Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C26-03: Household water efficiency devices installation programme	Construction	0	0	0	0	0	0	0	0	0	0	0	0
	Operation	0	0	+	0	0	0	0	0	+	0	0	0

Construction

This option involves household audits and a programme of installation of water efficiency devices such as fitting of showers, low flow shower heads, cistern displacement, low flush toilets, dual flush toilets, timing devices, water butts, flush controllers for urinals, trigger nozzles for hoses, timing devices, fitting people detectors, spray taps and water efficient taps. The activity associated with installation will be within a property and will not result in construction of new infrastructure outside of customer properties. It is assumed that 35,000 properties would be targeted with a 20% uptake up which equates to 7,000 properties and a yield of 0.27 Ml/d. The following construction effects are related to the installation of the devices.

As works would be undertaken within customer properties, no effects are predicted on biodiversity (Objective 1), geology and soils, (Objective 2), water quantity (Objective 3), water quality (Objective 4) or flood risk (Objective 5).

Emissions from embodied carbon associated with water saving devices are estimated at 5.25 tonnes CO₂e. Consistent with the definitions of significance, this has been assessed as having a neutral effect on greenhouse gas emissions (Objective 6).

Implementation of this option is not expected to affect human health (no noise or air quality effects are predicted) although there is the potential for minor disruption/nuisance arising from the installation of water efficiency measures. There will also be an increase in vehicular movements associated with the option; however, these are very low, estimated at 5km per day. Any noise and air quality impacts are likely to be minimal and would result in a negligible effect on human health (Objective 7).

This option would involve 'low' expenditure (£0.62 million per year) which has been assessed as being of insufficient scale to have an effect on the local economy (through job creation) (Objective 8).

No effects on water resources are expected (Objective 9).

Installation of the option will necessitate the use of new materials and additional waste may be generated through the replacement of water-using fixtures and fittings with water efficient versions (e.g. showerheads), although any effects in this regard are likely to be negligible (Objective 10).



The installation of efficiency devices is not expected to have any effects on cultural heritage or landscape.

Operation

The operation of this option would result in a reduction in demand for water of 0.27 Ml/d after 25 years.

There would be no operational effects on biodiversity (Objective 1), or geology and soils (Objective 2).

This option is expected to result in a demand reduction of 0.27 Ml/d which has been assessed as having a minor positive operational effect on water quantity (Objective 3).

No changes in water quality are expected as a result of the operation of this option (Objective 4).

The operation of this option would neither cause nor exacerbate flooding (Objective 5).

Total carbon emissions associated with the operation of this option are estimated at 3.5 tonnes CO₂e/year. Consistent with the definitions of significance, this has been assessed as having a neutral effect on greenhouse gas emissions (Objective 6).

Although the yield (0.27 Ml/d) will help ensure continuity of supply of safe and secure drinking water, it is not of sufficient scale to have an effect on Objective 7 or Objective 8. For those metered consumers who take action in response to the programme, there will be a reduction in water consumption and associated water costs, which for low income families could be important.

It is anticipated that the option would result in a 0.27 Ml/day yield benefit. A minor positive effect on water resources is therefore anticipated (Objective 9).

Operational energy savings associated with the reduced treatment and pumping of water (using operational carbon emissions (3.5 tonnes CO₂ as a proxy for energy use), are likely to be negligible due to the relatively likely low yield (0.27 Ml/d) of this option. The option would not result in significant changes in resource use (no significant waste generated or materials used during operation) (Objective 10).

No impacts on heritage assets or landscape are expected during operation of this option (Objectives 11 and 12).



Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C08: Selective metering of domestic customers based on (a) high consumption e.g. sprinkler use and/or (b) zones of high demand	Construction	0	0	0	0	0	-	0	0	0	-	0	0
	Operation	0	0	+	0	0	0/?	0	0	+	0/?	0	0

Construction

This option involves selective metering of all customers with a large water consumption, e.g. large gardens or swimming pools and/or areas of high demand, with the assumption that the largest users of water will be targeted first. It is estimated that up to 2,000 domestic properties would be targeted per annum over a 5 year period (up to 10,000 properties overall). On average, operation of this scheme would result in a 15% reduction in total demand (50 litres per property per day), equivalent to a yield of 0.57 Ml/d. It should be noted that this option has been assessed on the basis that the estimated averages will be met; however, effects would be smaller if a reduced volume of meters are installed.

It is assumed that because meters require direct access to water supply points, installation would occur within domestic properties or on external sites within the footprint of the targeted premises. External sites may encompass a combination of urban, semi-rural, and rural settings though it is unlikely that installation would have any significant environmental impacts as potential adverse effects would be managed through site-specific mitigation and established best practice. In this context, no effects are predicted on biodiversity (including designated nature conservation sites) (Objective 1), geology and soils (Objective 2), water quantity (Objective 3), water quality (Objective 4) or flood risk (Objective 5).

Emissions from the embodied carbon per meter installed have been calculated at 13.8kg CO₂e which over 5 years (up to 2,000 installations per annum) would equate to 138 tonnes CO₂e. This has been assessed as having a minor negative effect on climate change (Objective 6).

The scale of construction is expected to be minor / low-impact such that it is unlikely the installation of the new meters would result in the disruption of use or loss of amenity. The cumulative impacts of noise/vibration disturbance and nuisance resulting from installation and the transportation of equipment/material are not expected to result in any discernible effect on human health. Consequently, this option has been assessed as having a neutral effect on Objective 7.

This option would involve 'low' expenditure (£2.8 million per year) which is considered to be of insufficient scale to have a substantial effect on the local economy (through job creation). It is unlikely that the increased movements on local/major road networks related to the transportation of equipment/material would result in localised congestion and disruption/delays, as reflected in predicted vehicle movements (1km per metre installed). Overall, this option has been assessed as having a neutral effect on Objective 8.

No effects on water resources are expected from construction (Objective 9).

Overall, there would be an increase in resource use for meter installation and construction waste along with fuel usage for vehicles and plant. Consequently, a minor negative effect on waste and resource



use (Objective 10) has been identified for this option.

Meter installation is not expected to have any effects on cultural heritage or landscape.

Operation

There would be no operational effects on biodiversity (Objective 1) or geology and soils (Objective 2).

This option is expected to result in a demand reduction of 0.57 Ml/d resulting in a minor positive operational effect on water quantity (Objective 3).

No changes in water quality are expected as a result of the operation of this option (Objective 4).

Operation of this option would neither cause nor exacerbate flooding (Objective 5).

Total operational carbon emissions savings associated with the implementation of this option (related to energy savings from the reduced treatment and pumping of water) have not been quantified but are likely to be small. At this stage, this option has been assessed as having a neutral/uncertain effect on Objective 6.

Although the yield of this option (0.57 Ml/d) would help to ensure continuity of supply of safe and secure drinking water, it is not of sufficient scale to have an effect on Objective 7 or Objective 8.

This option would result in a yield of 0.57 Ml/d which has been assessed as having a minor positive effect on water resources (Objective 9).

As noted above, operational energy savings from the reduced treatment and pumping of water have not quantified but based on estimated yield are likely to be negligible. This has been assessed as having a neutral effect on Objective 10 with some uncertainty remaining due to the lack of quantification.

No impacts on heritage assets or landscape are expected during operation of this option (Objectives 11 and 12).



Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C12: Enhanced promotion of free water meters to unmeasured households beyond the promotion assumed in baseline demand forecast	Construction	0	0	0	0	0	-	0	0	0	-	0	0
	Operation	0	0	+	0	0	0/?	0	0	+	0/?	0	0

Construction

This option involves the enhanced promotion of free water meters to unmeasured households beyond the promotion assumed in the baseline demand forecast. The option should promote additional uptake of metering and therefore additional water savings.

Small scale works associated with the installation of circa 10,000 meters over a 5 year period (2,000 meters/year) are not expected to have effects on biodiversity (Objective 1), geology and soils (Objective 2), water quantity (Objective 3), water quality (Objective 4) or flood risk (Objective 5). Works would be on the existing network and it is assumed that because meters require direct access to water supply points, installation would occur within domestic infrastructure or on external sites within the footprint of the targeted premises. External sites may encompass a combination of urban, semi-rural, and rural settings although it is unlikely that meter installation would have any significant environmental impacts as potential adverse effects would be managed through site-specific mitigation and established best practice.

Emissions from the embodied carbon per meter installed have been calculated at 13.8kg CO₂e which over 5 years (up to 2,000 installations per annum) would equate to 138 tonnes CO₂e. This has been assessed as having a minor negative effect on climate change (Objective 6).

The scale of construction is expected to be minor / low-impact such that it is unlikely the installation of the new meters would result in the disruption of use or loss of amenity. The cumulative impacts of noise/vibration disturbance and nuisance resulting from installation and the transportation of equipment/material are not expected to result in any discernible effect on human health. Consequently, this option has been assessed as having a neutral effect on Objective 7.

This option would involve 'low' expenditure (£2.8 million per year) which is considered to be of insufficient scale to have a substantial effect on the local economy (through job creation). It is unlikely that the increased movements on local/major road networks related to the transportation of equipment/material would result in localised congestion and disruption/delays, as reflected in predicted vehicle movements (1km per metre installed). Overall, this option has been assessed as having a neutral effect on Objective 8.

No effects on water resources are expected from construction (Objective 9).

Overall, there would be an increase in resource use for meter installation and construction waste along with fuel usage for vehicles and plant. Consequently, a minor negative effect on waste and resource



use (Objective 10) has been identified for this option.

Meter installation is not expected to have any effects on cultural heritage or landscape.

Operation

There would be no operational effects on biodiversity (Objective 1) or geology and soils (Objective 2).

This option is expected to result in a demand reduction of 0.57 Ml/d resulting in a minor positive operational effect on water quantity (Objective 3).

No changes in water quality are expected as a result of the operation of this option (Objective 4).

Operation of this option would neither cause nor exacerbate flooding (Objective 5).

Total operational carbon emissions savings associated with the implementation of this option (related to energy savings from the reduced treatment and pumping of water) have not been quantified but are likely to be small. At this stage, this option has been assessed as having a neutral/uncertain effect on Objective 6.

Although the yield of this option (0.57 Ml/d) would help to ensure continuity of supply of safe and secure drinking water, it is not of sufficient scale to have an effect on Objective 7 or Objective 8.

Operation of metering will encourage customers to use water more wisely and will reduce the demand on water resources. The long term effectiveness of this measure is unknown and likely to result in diminishing returns. Metering is assumed to result in a 15% reduction in demand (Waterwise, Making the Case for Metering, 2011) equivalent to a yield of 0.57 Ml/d. A minor positive effect on water resources is anticipated (Objective 9).

As noted above, operational energy savings from the reduced treatment and pumping of water have not been quantified but based on estimated yield are likely to be negligible. This has been assessed as having a neutral effect on Objective 10 with some uncertainty remaining due to the lack of quantification.

No impacts on heritage assets or landscape are expected during operation of this option (Objectives 11 and 12).

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
C20: Installation of rainwater harvesting in new build households	Construction	0	0	0	0	0	-	0	0	0	-	0	0
	Operation	0	0	+	0	0	0/?	0	0	+	0/?	0	0

Construction

This option would involve the installation of rainwater harvesting systems in new build households (500 properties over AMP7) where installation activity would be within property development sites.

Small scale construction activity associated with the installation of rainwater harvesting systems is not expected to have effects on biodiversity (Objective 1), geology and soils (Objective 2), water quantity (Objective 3), water quality (Objective 4) or flood risk (Objective 5) as works would be on existing property development sites and would not result in construction of new infrastructure outside of customer properties.

Embodied carbon emissions per rainwater harvesting system installed have been calculated at 0.45 tonnes CO₂e. If water harvesting systems are implemented at 500 properties, this could lead to 225 tonnes of CO₂e which has been assessed as having a minor negative effect on climate change (Objective 6).

The scale of construction associated with this option is expected to be minor / low-impact and take place on existing development sites such that disruption of use or loss of amenity is unlikely. The cumulative impacts of noise/vibration disturbance and nuisance resulting from installation and the transportation of equipment/material are not expected to result in any discernible effect on human health. Overall, this option has been assessed as having a neutral effect on Objective 7.

This option would involve 'low' expenditure (£2.25 million over 5 years) which is considered to be of insufficient scale to have a substantial effect on the local economy (through job creation). It is unlikely that the increased movements on local/major road networks related to the transportation of equipment/material would result in localised congestion and disruption/delays. Overall, this option has been assessed as having a neutral effect on Objective 8.

No effects on water resources are expected from construction (Objective 9).

There would be an increase in resource use and waste along with fuel usage for vehicles and plant. Consequently, a minor negative effect on waste and resource use (Objective 10) has been identified for this option.



Installation is not expected to have any effects on cultural heritage (Objective 11) or landscape (Objective 12).

Operation

There would be no operational effects on biodiversity (Objective 1) or geology and soils (Objective 2).

This option is expected to result in a demand reduction of 0.03 Ml/d resulting in a minor positive operational effect on water quantity (Objective 3).

No changes in water quality are expected as a result of the operation of this option (Objective 4).

Operation of this option has the potential to reduce flooding through the greater retention of rainfall within the harvesting system; however, the overall impact of this is limited by the assumed levels of uptake (500 properties over AMP7). Overall, it is considered that the option would have a negligible effect on flooding (Objective 5).

Total operational carbon emissions savings associated with the implementation of this option (related to energy savings from the reduced treatment and pumping of water) have not been quantified but are likely to be small. At this stage, this option has been assessed as having a neutral/uncertain effect on Objective 6.

Although the yield of this option (0.03 Ml/d) would help to ensure continuity of supply of safe and secure drinking water, it is not of sufficient scale to have an effect on Objective 7 or Objective 8.

This option would result in a yield of 0.03 Ml/d which has been assessed as having a minor positive effect on water resources (Objective 9).

As noted above, operational energy savings from the reduced treatment and pumping of water have not quantified but based on estimated yield are likely to be negligible. This has been assessed as having a neutral effect on Objective 10 with some uncertainty remaining due to the lack of quantification.

No impacts on heritage assets or landscape are expected during operation of this option (Objectives 11 and 12).

Assessment of Feasible Production Options

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P01-01: Increase performance of existing sources (P01-01R) to increase deployable output to near licensed volume	Construction	0/?	+	0	0	0	-	0	+	0	-	0	-
	Operation	0	0	0/?	0/?	0	-	+	+	0	-	0	0

Construction

This option would maximise the yields from existing operational sources at P01-01R WTW which is currently constrained by the performance of the membrane plants. The existing pipeline would be utilised but upgrade and refurbishment of the existing WTW, as well as the decommissioning and removal of obsolete equipment including the pressurised membrane system, would be required. In addition, there would be a requirement for a building extension and to install building services (ventilation and insulation) at the site. The option has a yield of 1.7M/d.

The development site is not within any designated nature conservation sites. Immediately to the south of P01-01R is the northern tip of the Cheddar Complex SSSI which is designated for a variety of habitats, flora and fauna, and the North Somerset & Mendip Bats SAC. The HRA highlights uncertain effects on the North Somerset & Mendip Bats SAC, although it is likely that the use of site level mitigation and established best practice would be sufficient to ensure that there are no likely significant effects. Overall, the option has been assessed as having a neutral effect on biodiversity (Objective 1), although some uncertainty remains.

The modification of P01-01R WTW's treatment processes would be contained within the pre-existing operational site such that any new ancillary infrastructure should not impact on land use or soil quality but would utilise existing infrastructure. Overall, this option has been assessed as having a positive effect on Objective 2.

Construction would not impact river flows or result in changes to groundwater levels and the site is not located within an area at risk from flooding. A neutral effect has therefore been identified in respect of water quantity (Objective 3), water quality (Objective 4) and flood risk (Objective 5).

An increase in emissions is expected during construction (158.2 tonnes CO₂e) resulting in a minor negative effect on climate change (Objective 6). No figures are available for construction traffic emissions, although it is estimated that there would be an additional 2,288km of vehicle movements/year (which if assumed to be 100g/km, could generate a further 0.228 tonnes of CO₂e).



Some increase in disturbance and nuisance would take place during construction; however, this would be short-term and low impact with very few receptors likely to be affected. The option has therefore been assessed as having a neutral effect on health (Objective 7).

Capital expenditure associated with this option is estimated to be approximately £7.53m which could result in a minor positive effect on the local economy during the construction period. Although there would be some minor disruption to the local traffic network in the rural area as a result of construction activities, this would not be significant. Overall, this option has been assessed as having a minor positive effect on Objective 8.

The option would not affect water efficiency (Objective 9).

Works associated with the upgrade of the WTW would be contained within an existing site and would largely utilise existing infrastructure, although a new building extension would be required. Works would increase resource use, energy consumption and generate waste which will result in a minor negative effect on waste and resource use (Objective 10).

The WTW site does not contain any designated heritage assets. Gorseley Bigbury Earth Circle and Round Barrow near Longwood is located circa 320m west and 550m south west of P01-01R WTW. Circa 650m north is a World War II bombing decoy complex, anti-aircraft obstructions and Beacon Batch round Barrow cemetery on Black Down. As works would be contained within an existing site, no effects on the settings of these heritage features are anticipated, assuming that best practice construction techniques are employed. A neutral effect has therefore been identified in respect of Objective 11.

P01-01R WTW is located within the Mendip Hills AONB and there would be a short term impact on the landscape setting from the above ground building and the site works required to maximise abstractions. However, works would be within the context of an existing site and negative effects on Objective 12 have therefore been assessed as minor.

Operation

Although SSSIs are located in close proximity to the source, the licences have not been identified for reduction under the review of Consents or Restoration of Sustainable Abstraction programmes and therefore no impacts on biodiversity are expected (Objective 1).

There would be no operational effects on soils/land use (discounting land take during construction) (Objective 2).

Although the additional abstraction from this site would be within the existing licence and any such effects are likely to be neutral, further modelling on the impact of increasing baseline abstraction could be undertaken to confirm the anticipated impact. Overall, the option has been assessed as having a neutral effect on water quantity (Objective 3) and water quality (Objective 4) although some uncertainty remains.

No operational effects on flooding (Objective 5) are predicted.

Additional energy consumption for pumping and additional water treatment would generate increased CO₂ emissions of 485 tonnes CO₂e/year. This has been assessed as having a minor negative on climate change (Objective 6).

This option would not affect opportunities for recreation during operation but would provide an additional yield of 1.7Ml/d. This additional design capacity has been assessed as having a minor positive on Objective 7 and Objective 8.

The option would not affect water efficiency (Objective 9).

Upgrade of the water treatment works would result in increased energy consumption which has been assessed as having a minor negative on waste and resource use (Objective 10).

Once operational, the option is not expected to have any effects on cultural heritage (Objective 11) or landscape (Objective 12).

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P01-02: Increase performance of existing sources (P01-02R) to increase deployable output to near licensed volume	Construction	0	+	0	0	0	-	0	+	0	-	0	0
	Operation	0	0	0/?	0/?	0	-	+	+	0	-	0	0

Construction

This option would involve the maximisation of the yield to near licensed volume from an existing operational source at P01-02R (which is currently constrained by the performance of the membrane plants).

The key works are likely to include:

- decommissioning and removal of obsolete equipment including the pressurised membrane system;
- building extension and building services (to include building ventilation and insulation);
- new Boll prefiltration (300 µm);
- installation of submerged membranes;
- refurbishment/modification of control and telemetry systems as required to integrate new works;
- condition survey of retained existing structures and repair/renovation as required; and
- replacement of gas chlorine with OSEC.

Other than the upgraded treatment processes at the site, no further infrastructure requirements are expected as the pipe network already exists. The option has a capacity of 2.6MI/d.

The P01-02R source is located at the site of an existing reservoir to the East of Windsor Hill Lane, approximately 1 km North of Shepton Mallet. The Windsor Hill Marsh SSSI and Windsor Hill Quarry SSSI lie approximately 500m north of the site whilst Hobbs Quarry SSSI (archived) and Viaduct Quarry SSSI are 250m and 750m to the south of the site respectively. These sites are unlikely to be affected by the works associated with this option provided that construction is undertaken in accordance with best practice (Objective 1).

The modification of P01-02R WTW's treatment processes would be contained within its pre-existing operational site such that any new ancillary infrastructure should not impact on land use or soils, and would be making best use of existing infrastructure. Overall, this option has been assessed as having a positive effect on Objective 2.

Construction would not impact river flows or result in changes to groundwater levels and the site is not located within an area at risk from flooding. A neutral effect has therefore been identified in respect of water quantity (Objective 3), water quality (Objective 4) and flood risk (Objective 5).

Estimated emissions of embodied carbon during construction are 156.3 tonnes CO₂e over a 1 year period which has been assessed as having a minor negative effect on climate change (Objective 6).

Some increase in disturbance and nuisance would take place during construction; however, this would be short-term and low impact with very few receptors likely to be affected. The option has therefore



been assessed as having a neutral effect on health (Objective 7).

Capital expenditure associated with this option is estimated to be approximately £7.44m which could result in a minor positive effect on the local economy during the construction period. Although there would be some minor disruption to the local traffic network in the rural area as a result of construction activities, this would not be significant. Overall, this option has been assessed as having a minor positive effect on Objective 8.

Construction of the option would not affect water efficiency (Objective 9).

Works associated with the upgrade of the WTW would be contained within an existing site and would largely utilise existing infrastructure, although a new building extension would be required. Works would increase resource use, energy consumption and generate waste which will result in a minor negative effect on waste and resource use (Objective 10).

The WTW site does not contain any designated heritage assets. There are assets in close proximity to the P01-02R including Downside House, Downside Inn and 24 Bath Road Grade II Listed Buildings 400m east. However, as works would be contained within an existing site, no effects on the settings of these heritage features are anticipated, assuming that best practice construction techniques are employed. A neutral effect has therefore been identified in respect of Objective 11.

The P01-02R source is not located within, or in close proximity to, protected/designated landscapes and works would be contained within an existing site. In consequence, any landscape/visual impacts are expected to be negligible and a neutral effect has been identified in respect of (Objective 12).

Operation

Although SSSIs are located in close proximity to the source, the licences have not been identified for reduction under the review of Consents or Restoration of Sustainable Abstraction programmes and therefore no impacts on biodiversity are expected (Objective 1).

There would be no operational effects on soils/land use (discounting land take during construction) (Objective 2).

Although the additional abstraction from this site would be within the existing licence and any such effects are likely to be neutral, further modelling on the impact of increasing baseline abstraction could be undertaken to confirm the anticipated impact. Overall, the option has been assessed as having a neutral effect on water quantity (Objective 3) and water quality (Objective 4) although some uncertainty remains.

No operational effects on flooding (Objective 5) are predicted.

Additional energy consumption for pumping and additional water treatment would generate increased CO₂ emissions of 329.5 tonnes CO₂e/year. This has been assessed as having a minor negative on climate change (Objective 6).

This option would not affect opportunities for recreation during operation but would provide an additional yield of 2.6Ml/d. This additional design capacity has been assessed as having a minor positive on Objective 7 and Objective 8.

The option would not affect water efficiency (Objective 9).

Upgrade of the water treatment works would result in increased energy consumption which has been assessed as having a minor negative on waste and resource use (Objective 10).

Once operational, the option is not expected to have any effects on cultural heritage (Objective 11) or landscape (Objective 12).

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P06-01: Catchment Management for Chew and Blagdon Reservoir to manage outage risk from algal blooms	Construction	0	0	0	0	0	-	0	0	0	-	0	0
	Operation	+	+	0	+	0	0	0	0	0	+	0	0

Construction

This option would improve outage risk of Blagdon and Chew Valley reservoirs which currently suffer from high algal counts, which at times affect production at P17R, P16R and P10R. Both reservoirs are part of catchment management schemes to reduce phosphorus levels, currently funded for AMP6 but not necessarily longer term; catchment schemes require long term funding in order to be effective. The option would include implementation of the catchment grant scheme to support farms investing in improved infrastructure to aid clean and dirty water separation, storage of slurry, effluent and manures. Also, advice and support towards management to reduce diffuse pollution risk, such as cultivation of over-wintering cover crops after maize, and use of an integrated manures and fertilizer management plan would be provided. A reduction in nutrients is expected to reduce algal blooms and therefore reduce the outage risk at P17R, P16R and P10R. The yield benefit has been assessed as 0.39 MI/d.

This option would be implemented across the catchment with a range of measures to reduce diffuse pollution from agricultural land run off. Interventions (construction of new slurry tanks, tank integrity checks, bunding, management plans) would not have any substantial effects on biodiversity (Objective 1), geology and soils (Objective 2), water quantity/quality (Objectives 3 and 4) or flood risk (Objective 5).

The embodied carbon associated with this option has been estimated at 371 tonnes CO₂e/year. This has been assessed as having a minor negative effect on climate change (Objective 6).

Some very minor increase in disturbance and nuisance could occur during construction; however, this would be short-term and low impact resulting in a neutral effect on human health (Objective 7).

Capital expenditure associated with this option would be very small and in consequence, effects on Objective 8 have been assessed as neutral.

The option is not a leakage reduction or water efficiency option and would have no impact on water efficiency (Objective 9).

Implementation would increase resource use, energy consumption and generate waste which has been assessed as having a minor negative effect on waste and resource use (Objective 10).

Implementation may involve works in the vicinity or grounds of designated heritage assets. In this situation, it is expected that any negative effects can be managed by following best practice and in consequence, effects on cultural heritage (Objective 11) have been assessed as neutral.

Construction activity would be of a very small scale and is not expected to have effects on landscape and other protected/designated features (Objective 12).



Operation

This option would be implemented across the catchment with a range of measures to reduce diffuse pollution from agricultural land run off. This could lead to improvements in water quality in rivers that feed Blagdon and Chew Valley reservoirs and which would have long term positive effects on river biota. This option has therefore been assessed as having a positive effect on biodiversity (Objective 1).

This option would reduce the sources and incidents of soil contamination, particularly from slurry spillage or slurry tank rupture and would have a positive (albeit localised and precautionary) effect on geology and soils (Objective 2).

The option would not affect river flow or levels (Objective 3).

The option would improve surface water quality and may help address underlying causes of poor progress against WFD Good Ecological Status/Good Ecological Potential. A positive effect has therefore been identified in respect of Objective 4.

The catchment area includes land in all flood zones; however, the specific interventions identified are not considered to have any effects on flood risk (Objective 5)

The operational carbon associated with this option has been estimated at 2.4 tonnes CO₂e/year and is assessed as having a neutral effect on climate change (Objective 6).

Although the yield (0.39 Ml/d) would help ensure continuity of supply of safe and secure drinking water, it is not of sufficient scale to have an effect on Objective 7 or Objective 8.

The option is not a leakage reduction or water efficiency option and would have no impact on water efficiency (Objective 9).

The option is not considered likely to substantially increase resource use, energy consumption or generate waste. However, the implementation of revised fertilizer and nutrient management plans may reduce the resource inputs into the catchment. Overall, the option has been assessed as having a minor positive effect on waste and resource use (Objective 10).

The operation of this option is not expected to have any effects on cultural heritage (Objective 11).

The operation of this option is not expected to have any effects on landscape and other protected/designated features (Objective 12).



Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P08: P08R WTW (increased production)	Construction	0	+	0	0	0	0	0	0	0	-	0	0
	Operation	0/?	0	-/?	0	0	0	+/?	+	0	0	0	0

Construction

This option would involve increasing the present production of P08R WTW (5 MI/d) in order to produce 7 MI/d of potable water. The proposed scheme would require the modification of P08R WTW's UV treatment process which would include the replacement of current filtration membranes. Overall, this scheme would result in a yield benefit of 2 MI/d.

P08R WTW is situated on a tributary of the Little Avon River which feeds into the Severn Estuary SAC/SPA/Ramsar/SSSI (c.16km). The development site is also within 5km of several SSSIs: Boxwell (4.3km); Upton Combe (3.9km); Lower Woods (3km); Midger (2.8km) Yarley Meadows (2.7km); and Coombe Hill (2.7km). However, it is assumed that the replacement of filtration membranes would only require internal modification to the WTW and therefore no effects on these sites or local ecology are predicted due to a lack of clear impact pathways in addition to relative distance. On balance, this option has been assessed as having a neutral effect on Objective 1.

The modification of P08R WTW's treatment processes would be contained within its pre-existing operational site such that any new ancillary infrastructure should not impact on land use/soil quality, and would be making best use of existing infrastructure. Overall, this option has been assessed as having a positive effect on Objective 2.

It is not expected that construction of this option would affect water quantity (Objective 3) or water quality (Objective 4), provided best practices are adhered to and mitigation implemented (such as dust suppression, soil containment and emergency response procedures).

P08R WTW is approximately 30m from Flood Zone 3 (originating from a tributary of the Little Avon River); consequently, internal modification to the WTW is not expected to be liable to an increased risk of flooding (though there is a minor risk depending on the timing of works). Overall, this option has been assessed as having a neutral effect on Objective 5.

It is not expected that there would be significant impacts on traffic congestion during the construction period (there would be c. 75km of additional vehicle movements over the 2 year implementation period) and the option would only generate 69 tonnes CO₂e. This has been assessed as having a neutral effect on Objective 6 and Objective 10.

Due to the significant woodland buffer along the WTW's periphery, the confined setting of the works is expected to prevent any significant effects on recreation and physical activity during the construction period, although external modification could result in a temporary loss of amenity to the Little Avon River tributary which may host fishing and recreational walking. There may be noise/vibration disturbance resulting construction which could affect proximate residential receptors, although woodland screening is expected to minimise any adverse effects in this regard. Overall, this option has been assessed as



having neutral effect on Objective 7.

Construction of the option would represent a relatively small (£1m) capital investment which is not expected to facilitate substantial job growth nor significantly affect the local economy in terms of supply chain benefits. It is also not expected that the required works would result in a significant intensification of movements on the local road network. On balance, the option has been assessed as having a neutral effect on Objective 8.

Construction of the option would not affect water resources (Objective 9).

Works associated with the upgrade of the WTW would be contained within an existing site and would largely utilise existing infrastructure, although would involve filter replacement and the creation of waste which will result in a minor negative effect on waste and resource use (Objective 10).

The P08R WTW site does not contain nor is proximate to any historic assets. The closest scheduled monument to the site, Blackquarries Hill long barrow, is approximately 1.7km whereas Grade II Listed Buildings such as Grange Cottage, the Gate House, and Elmtree Farm and ancillary infrastructure range from c. 568m to 600m. Due to the proposed scale of works, their location within an existing facility, distance (> 100m) and intervening woodland buffer, it is considered highly unlikely that construction would have a discernible impact on the settings of these historic assets.

P08R WTW is directly situated within the Cotswolds AONB; however, it is not expected that internal modification to the facility's treatment processes would have any adverse impact on the semi-rural setting or wider designated landscape character due to the confined nature of the proposed works within the existing WTW site. The transportation and presence of equipment/material may be perceived by residents/tourists as adversely impacting the amenity of the AONB; however, the proposed increases in construction activity to receptors would be minor, if not indiscernible, over a two year period. Overall, this option has been assessed as having a neutral effect on Objective 12.

Operation

It is considered unlikely that operation of the option would have any significant and/or adverse effects alone or in combination on the Severn Estuary SAC/SPA/Ramsar/SSSI due to the minor increase in abstraction volume. Furthermore, the EA has concluded that increased abstraction would be sustainable and could be distributed effectively into potable supply. Further investigation (modelling etc.) could be required to ensure greater clarity on operational effects should this scheme be considered as a preferred option. Overall, this option has been assessed as having a neutral effect on Objective 1 with some uncertainty remain that would be resolved by further modelling.

There would be no operational effects on geology and soils (Objective 2).

The option would result in the additional abstraction of up to 2 Ml/d which has been assessed as having a minor negative effect on Objective 3, although this remains uncertain until further investigation is conducted on the availability of water for use.

There would be no operational effects on water quality (Objective 4) or water resources (Objective 9).

As noted above, P08R WTW is located approximately 30m from Flood Zone 3 originating from a tributary of the Little Avon River; however, present operation of the facility suggests that site specific mitigation measures are already established. The overall operation of the scheme is not expected to cause or exacerbate flooding elsewhere. Consequently, this option has been assessed as having a neutral effect on Objective 5.

Operation of the scheme would generate an additional 6.9 tonnes CO₂e which has been assessed as having a neutral effect on Objective 6 and Objective 10.

The scheme would not adversely affect human health due to increased noise, nuisance, or disruption. It is unknown whether a decrease in water volume within the adjacent tributary for the Little Avon River could adversely impact recreational fishing. The increased abstraction of up to 2 Ml/d would help ensure a continual supply of clean drinking water, generating a minor positive effect on health (Objective 7) as well as supporting economic/population growth which could result in a minor positive effect on Objective 8.

There would be no operational effects on designated cultural heritage assets (Objective 11) or landscape (Objective 12).

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P10: P10R (increased production)	Construction	0	+	0	0	0	--	-	++/-	0	--	0	0
	Operation	0	0	-/?	0	0	0	+	+	0	0	0	0

Construction

This option would involve the upgrade of P10R to include Dissolved Air Flotation (DAF) and Rapid Gravity Filters (RGF) in the treatment process in order to achieve near design output. Production at P10R is currently constrained by the operational maintenance requirements for the Slow Sand Filters which generally occur during periods of high algal blooms. Overall, this scheme would result in a yield benefit of 4 ML/d.

P10R is located 560m southeast of Cheddar Reservoir SSSI. There are no other European/national nature conservation designations near the WTW. It is assumed that modification of the treatment process would be confined within the existing WTW site and best practices would be adhered to. On this basis, it is considered that construction work would not disturb or result in any detrimental impacts on these sites. Overall, the option has therefore been assessed as having a neutral effect on Objective 1.

The modification of P10R's treatment processes would be contained within its pre-existing operational site such that any new ancillary infrastructure should not impact on land use/soil quality, and would be making best use of existing infrastructure. Overall, this option has been assessed as having a positive effect on Objective 2.

It is not expected that construction activity would affect water quantity (Objective 3) or water quality (Objective 4), provided best practices are adhered to and mitigation implemented (e.g. dust suppression, soil containment and emergency response procedures).

P10R is entirely in Flood Zone 1 and on this basis, internal modification to the WTW is not expected to be liable to flooding or cause or exacerbate flooding elsewhere. Consequently, this option has been assessed as having a neutral effect on flood risk (Objective 5).

Embodied carbon during construction is estimated to be 58,533 tonnes CO₂e. This has been assessed as having a significant negative effect on climate change (Objective 6) and waste and resource use (Objective 10).

Construction activity would be undertaken over a 2 year period and result in increased traffic (18,250km of additional vehicle movements a year) which could have a negative impact on local air quality and noise levels. There may also be noise/vibration disturbance resulting construction which could affect nearby residential and recreational receptors. Overall, construction of this option has been assessed as having a minor negative effect on human health (Objective 7).

Construction of this option would represent a large capital expenditure (£26.53 million) with the potential to have a significant positive effect on the local economy through job creation, supply chain benefits



and spend by works and contractors. However, there is the potential for vehicle movements associated with the works to result in localised congestion including along the A371 and A38. Overall, this option has been assessed as having a mixed significant positive and minor negative effect on Objective 8.

The option is not a leakage reduction or water efficiency option and would have no impact on water efficiency (Objective 9).

Construction would increase resource use, energy consumption and generate waste which has been assessed as having a significant negative effect on waste and resource use (Objective 10).

P10R is not within or adjacent to cultural heritage assets. The closest sites are Cheddar War Memorial (Grade II Listed Building) and a Roman settlement site (Scheduled Monument) approximately 350m east and 230m southeast of the WTW respectively. As these are located over 200m from the WTW and works would be contained within an existing site, it is considered highly unlikely that construction would have a discernible impact on the settings of these assets. The option has therefore been assessed as having a neutral effect on Objective 11.

P10R is not within or adjacent to designated landscape sites. Construction may have negative effects on local landscape features and other receptors near the WTW; however, adverse effects would be over a short timescale. Overall, this option has been assessed as having a neutral effect on landscape (Objective 12).

Operation

It is considered unlikely that the operation of this option would have any significant and/or adverse effects due to the minor increase in abstraction volume in respect to the other various intervening tributaries feeding into the Cheddar Reservoir SSSI. The option has therefore been assessed as having neutral effect on biodiversity (Objective 1).

There would be no operational effects on geology and soils (Objective 2).

The option would result in the additional abstraction of up to 4 Ml/d which has been assessed as having a minor negative effect on Objective 3, although this remains uncertain until further investigations currently scheduled under the WINEP for AMP7, are conducted on the availability of water for use.

There would be no operational effects on water quality (Objective 4).

The WTW is located in Flood Zone 1. Operation of this option is not expected to cause or exacerbate flooding elsewhere and in consequence, it has been assessed as having a neutral effect on flood risk (Objective 5).

Energy consumption associated with pumping and additional water treatment would generate carbon emissions of 4.1 tonnes CO₂e per year which is considered to have no discernible effect on greenhouse gas emissions (Objective 6) or resource use (Objective 10).

The scheme would not adversely affect human health due to increased noise, nuisance, or disruption. The increased yield of 4 Ml/d would help ensure a continual supply of clean drinking water, generating a minor positive effect on health (Objective 7) as well as supporting economic/population growth which could result in a minor positive effect on Objective 8.

The option is not a leakage reduction or water efficiency option and would have no impact on water efficiency (Objective 9).

The operation of this option would not involve additional infrastructure but would result in a very minor additional power consumption (proxy of 4.1 tonnes CO₂e/year). Overall, the option has been assessed as having a neutral effect on waste and resource use (Objective 10).

There would be no operational effects on designated cultural heritage assets (Objective 11) or landscape (Objective 12).

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
P20: Reduced leakage from raw water mains (enhanced leakage detection / raw mains repairs/replacement)	Construction	0/?	0	0	0	0	--/?	-	+/-	0	--/?	0	-/?
	Operation	0	0	+	0	0	+/?	+	+	+	+	0	0

Construction

This option would address leakage from raw water mains. It is assumed that all raw water mains would be investigated for potential leakage; Bristol Water has 94 km of raw water mains spread throughout the supply area. The work would include detection of leakage via metering (24 sites in total) and replacement/repair of the mains network. It is assumed that 1% (0.94km) of the network would be replaced each year, over a 5 year period. Bristol Water indicated that a reduction in losses could result in ~3.9-5.5 MI/d.

Construction activity associated with replacing trunk mains is generally not expected to significantly affect biodiversity. It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. Overall, a neutral effect on biodiversity is identified at this stage although some uncertainty remains (Objective 1).

Construction activity would take place on existing infrastructure and thus would not require new land take; any soil displaced through excavation would be returned following the completion of works. Effects on geology and soils are therefore expected to be negligible (Objective 2).

Construction work associated with the replacement of mains is not expected to have any effect on river flows or groundwater levels, or on water quality provided best practices are adhered to (Objectives 3 and 4).

The exact location of mains to be replaced is not yet known and therefore it cannot be determined whether replacement work would be located in areas at risk of flooding. However, it is assumed that works could be scheduled to avoid periods of flooding and construction work is not expected to cause or exacerbate flooding elsewhere (Objective 5).

There would be carbon emissions as a result of trunk mains replacement, arising from embodied carbon associated with new pipeline and emissions from plant and vehicle movements to find and replace leaking mains. The carbon emissions associated with this option are estimated to be a maximum of 1,236 tCO₂ (depending on the length of pipeline replaced) which has been assessed as having a significant negative effect on climate change, although some uncertainty remains (Objective 6).

Vehicle movements and the operation of plant associated with mains replacement may affect local air quality and generate noise/vibration disturbance, although any impacts would be temporary. There may



also be disruption to water supply; however, such impacts would be temporary and are likely to be managed. Overall, a negative effect has therefore been identified in respect of health (Objective 7).

Capital expenditure associated with this option would be circa £5.25m which would generate positive economic effects such as jobs creation and supply chain benefits. However, during replacement works, there is the potential for localised disruption to traffic, particularly along any sections of pipeline requiring work along or across roads. Overall, this option is considered to have a mixed positive and negative effect with respect to Objective 8, although some uncertainty remains.

During construction, this option would not affect leakage or water efficiency (Objective 9).

Depending on the extent of pipeline replacement, there could be a substantial increase in resource use and waste. A significant negative effect on resource use and waste has therefore been identified (Objective 10) with uncertainty arising from the lack of clarity on the actual extent of repairs and replacement required.

Construction associated with replacement of trunk mains may involve carrying out works in the curtilage or grounds of heritage assets; however, this would be temporary and would only affect previously disturbed land. It is also assumed that any effects could be managed through appropriate mitigation. Overall, this option has been assessed as having a neutral effect on Objective 11.

Replacement works under this option could involve construction work across parts of the BWOA, which could be expected to give rise to localised landscape and visual effects. However, any impacts would be temporary with land likely to be returned to a pre-development state within a year (depending on the timing of works). Overall, a minor negative effect has been identified in respect of landscape (with some uncertainty) (Objective 12).

Operation

Once mains have been replaced, the option is not expected to have any effects on biodiversity or geology and soils (Objectives 1 and 2).

Operation of the option would result in water savings of up to 5.5 Ml/d as a result of reduced leakage which would lower demand for water abstraction. This has been assessed as having a minor positive effect on water quantity (Objective 3).

No operational effects on water quality or flood risk are anticipated (Objectives 4 and 5).

The operation of this option would result in a decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and to some extent, pumping of water. The reduction in greenhouse gas emissions associated with this option is, however, uncertain.

Water savings of up to 5.5 Ml/d would have a positive effect on human health by helping to secure drinking water supply (Objective 7) as well as Objective 8.

This option would result in reduced leakage from mains, which is assessed as having a positive effect on the sustainable use of water resources, as well as waste and resources (Objectives 9 and 10).

No effects on heritage assets or landscape are expected during the operation of this option (Objective 11 and 12).

Assessment of Feasible Resource Options

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R08-02: New water sources within Bristol Water CAMS area for the location R08-02R	Construction	-/?	-	0	0	-	--	-	++/-	0	--	-/?	-/?
	Operation	0	0	-/?	0	0	--	+	+	0	-	0/?	0/?

Construction

This option relates to the development of a new supply source on the middle River Avon. Abstraction would be from the R08-02R (a new pumping station of 2.5 MI/d, 93 metres head (mhd) would be adjacent). Water would be treated on site via a new membrane plant (capacity of 2.5 MI/d). Water would be then pumped to Tolldown Service Reservoir via a 12.7km (300mm diameter) pipeline. A booster pumping station would be located at Bannerdown (2.5 MI/d, 93 mhd). The option was developed based on the assessment in the Bristol Avon and North Somerset CAMS that water is available for abstraction in the middle River Avon. The option would result in a total water main length of 3.3km and would have a yield of 1.4MI/d.

This option could affect a SSSI for a length of 91m. Although mitigation measures could be included during and following construction, including programming of construction timing to avoid sensitive periods, it is likely that that construction activities would have a minor negative/uncertain effect on biodiversity (Objective 1).

Additional land would be required for this option and a pipeline of length 7.1km. Although any excavated land would be reinstated, construction would affect land classified as Grade 3 agricultural land. This is assessed as having a minor negative effect on geology and soils (Objective 2).

It is not expected that construction would affect water quantity (Objective 3) or water quality (Objective 4), provided best practices are adhered to and mitigation implemented (such as dust suppression, soil containment and emergency response procedures).

A very small section (11m) of pipeline is proposed to be located within Flood Zones 2 and 3 and works may therefore be liable to an increased risk of flooding (depending on timing of the works). Overall, this option has been assessed as having a negative effect on Objective 5.

The option would generate an estimated 4,560 tonnes CO₂e which, together with an anticipated high resource use and waste generation, has been assessed as having a significant negative effect on

climate change and waste and resource use (Objectives 6 and 10).

Construction activity and HGV movements associated with the development are likely to result in increased noise and disruption from construction traffic during this period along the length of the route, although effects are not expected to be significant. Overall, the option has been assessed as having a minor negative effect on health (Objective 7).

Capital expenditure associated with the construction of this option is expected to be large at £23.25m. This may generate positive effects on the local economy including employment opportunities and supply chain benefits. However, works are likely to result in increased congestion and disruption/driver delay during construction due to the close proximity of the pipeline to/on the local road network. On balance, the option has been assessed as having a mixed significant positive and minor negative effect on Objective 8.

The option would not affect water resources and is not a water efficiency or leakage control option (Objective 9).

Construction would increase resource use, energy consumption and generate waste which has been assessed as having a significant negative effective on waste and resource use (Objective 10).

The works would be within 50m of two listed buildings, the settings of which could be affected during construction. The option has therefore been assessed as having a negative effect on cultural heritage (Objective 11), although some uncertainty remains as the exact scale and location of the above ground infrastructure is unknown.

The option would result in new above ground infrastructure, would involve crossing of circa 11.3km of AONB and would affect an approximate 150m stretch of ancient woodland and 330m of woodland. The option has therefore been assessed as having a negative effect on landscape (Objective 12), although some uncertainty remains as the exact scale and location of the above ground infrastructure is unknown.

Operation

Once the scheme is operational, it is very unlikely that there would be any effect on European, national designated or non-designated sites and/or species. The River Avon at Bathford has a Q95 flow of 249 MI/d. This abstraction would constitute less than 1% of the river flow and in consequence, the impacts on riparian biodiversity or on river habitats and species are likely to be negligible (Objective 1).

It is not expected that operation would have an effect on geology and soils (Objective 2), water quality (Objective 4) and flood risk (Objective 5).

The option would result in an abstraction of 1.4 MI/d which is assessed as having a negative effect on water quantity (Objective 3) given the focus of the objective to 'protect and enhance surface and ground water levels and flows'. However, as mentioned above, a yield of 1.4 MI/d would constitute less than 1% of the Q95 river flow and therefore there is some uncertainty as to whether a negative effect would actually occur.

The operational carbon associated with this option is estimated to be 1,148 tonnes CO₂e/year. This has been assessed as having a significant negative effect on climate change (Objective 6) and waste and resource use (Objective 10).

The scheme would not adversely affect human health due to increased noise, nuisance or disruption. The increased capacity of 1.4 MI/d would help ensure a continual supply of clean drinking water, generating a positive effect on health (Objective 7) as well as supporting economic/population growth which could result in a positive effect on Objective 8.

The option would not affect water resources (Objective 9) as this is not a leakage control measure nor a water efficiency option.

Significant operational effects on designated heritage assets (Objective 11) and landscape (Objective 12) are not predicted, although some uncertainty remains.

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R08-03: New water sources within Bristol Water CAMS area for the location R08-03R	Construction	-	-	0	0	-	--	-	+/-	0	--	-	-
	Operation	0/?	0	-	0	-	0	+	+	0	0	0	-

Construction

This option would involve the provision of a new river abstraction and intake on the R08-03R together with a raw water transfer to Littleton Water Treatment Works via a 13.2km pipeline. The option would have a capacity of 1.1Ml/d.

The proposed abstraction point is not affected by any nature conservation designations with the nearest designated sites being Winterbourne Railway Cutting SSSIs circa 2km away. The pipeline route could be within/ in close proximity to Three Brooks LNR and Monks Hill & Bradley Brook LNR and construction activity may result in the loss of/disturbance to habitats and species; however, this could be avoided through the use of site level mitigation and established best practice. Overall, the option has been assessed as having a negative effect on biodiversity.

Development of the new abstraction infrastructure and pipeline would result in the loss of greenfield land which may include Grade 3 agricultural land. Excavated land associated with pipeline works would be reinstated following the completion of construction. Overall, this option has been assessed as having a minor negative effect on Objective 2.

It is not expected that construction of this option would affect water quantity (Objective 3) or water quality (Objective 4), provided best practices are adhered to and mitigation implemented (such as dust suppression, soil containment and emergency response procedures).

The abstraction point and sections of the proposed pipeline would be within Flood Zones 2/3 and works may therefore be liable to flooding (depending on timing). The option has therefore been assessed as having a negative effect on Objective 5.

The option would generate 3,911 tonnes CO₂e which, together with resource use and waste generation, has been assessed as having a significant negative effect on Objectives 6 and 10.

Construction activity and HGV movements associated could have short term, temporarily noise and air quality impacts on residential receptors, although effects are not expected to be significant. Overall, the option has been assessed as having a minor negative effect on Objective 7.

Capital costs of construction are expected to be in the order of £5.85m which may generate some local economic benefits. However, the works could temporarily result in increased congestion and



disruption/driver delay due to the close proximity of the pipeline to/on the local road network. On balance, the option has been assessed as having a mixed positive and negative effect on Objective 8.

The option would not affect water efficiency.

Construction would increase resource use, energy consumption and generate waste which has been assessed as having a significant negative effective on Objective 10.

The pipeline route could be in close proximity to cultural heritage assets or archaeological sites/remains and therefore during construction there could be a negative effect on Objective 11.

The option would result in new, above ground infrastructure that may a minor negative effect on the local landscape (Objective 12).

Operation

Once the scheme is operational, it is very unlikely that there would be any effect on European, national designated or non-designated sites and/or species. The River Frome at the proposed point of abstraction has a Q95 flow of 15.6 Ml/d and in consequence, the abstraction would constitute approximately 7% of the river flow. Although effects are likely to be negligible (Objective 1), this could have an effect on non-designated species and habitats further modelling of effects would be required if selected as a preferred option (and so an uncertainty is also assessed at the feasible option stage).

It is not expected that operation of the option would have an effect geology and soils (Objective 2) and water quality (Objective 4).

The option would result in the abstraction of approximately 1.1 Ml/d which would constitute approximately 7% of the river flow and which has been assessed as having negative effects on surface water quantity (Objective 3).

The abstraction point would be within Flood Zone 2 and may therefore be liable to an increased risk of flooding. The option has therefore been assessed as having a minor negative effect on Objective 5, although operation of the scheme is not expected to increase the risk of flooding elsewhere.

Operational carbon is estimated to be 66 tonnes CO₂e/year. This has been assessed as having a neutral effect on Objectives 6 and 10.

The scheme would not adversely affect human health due to increased noise, nuisance or disruption. The increased capacity of 1.1 Ml/d would help ensure a continual supply of clean drinking water, generating a positive effect on health (Objective 7) as well as supporting economic/population growth which could result in a positive effect on the local economy and social-wellbeing (Objective 8).

The option would not affect water resources (Objective 9) as this is not a leakage control measure or a water efficiency option.

No operational effects on designated cultural heritage assets are anticipated (Objective 11).

This option would result in new above ground infrastructure within rural and urban areas. A minor negative effect has therefore been identified in respect of Objective 12.

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R11: Resource Cheddar Reservoir Standard WRMP14 Design	Construction	--	--	0/?	-/?	--	--	-	++/-	0	--	-/?	--
	Operation	+/-/?	0	-/?	-/?	+/-	0	++	++	0	0	-	-

Construction

This option would involve the development of a new impounding/pumping storage reservoir with a capacity of 9,000 MI on land immediately south of Cheddar Reservoir. The infrastructural requirements associated with the option would include the construction of the reservoir, including an inflow weir and multi-level draw-off tower. The reservoir embankments would be constructed from earth bund (clay core) lined with a concrete wave wall. Additionally, the proposed reservoir would require the redesign of intake arrangements for the monitoring weir and to increase the intake capacity to the full 250 MI/d to capture storm inflows. This would require a 10m by 20m concrete intake chamber and automated valves and compensation control. The scheme would require 5km of 1,500mm diameter HDPE pipe. In contrast to the existing reservoir, the construction of the reservoir would include environmental enhancements such as reduction of bund gradient, screening and planting and naturalising of embankments. The option would have a yield of 16 MI/d.

The proposed reservoir site is not situated within any European designated nature conservation sites; however, there are three SACs within 5km: Mendip Woodlands (1.4km); North Somerset & Mendip Bats (1.5km); and Mendip Limestone Grasslands (2.8km). These sites support nationally/internationally designated habitats such as semi-natural dry grasslands/scrublands and forestland in addition to the European protected species of lesser horseshoe bats *Rhinolophus hipposideros* and greater horseshoe bats *Rhinolophus ferrumequinum*. Although it is considered unlikely that construction associated with this option would affect these sites, works may disturb or hinder the movement of bats within the area (although appropriate site specific mitigation and established best practice should prevent any significant effects occurring). Additionally, the proposed development site is immediately adjacent to the Cheddar Yeo, a tributary of the River Axe, which together feed into the Severn Estuary SAC/SPA/Ramsar/SSSI (c.16km). Construction may result in the indirect introduction of pollution/debris within the Cheddar Yeo/River Axe which could affect downstream ecological features. Notwithstanding this, project level mitigation should prevent significant effects in this regard.

The developmental site is within the general vicinity of several SSSIs: Cheddar Reservoir (<10m); the Perch (1.2km); Cheddar Wood/Cheddar Wood Edge Nature Reserve (1.4km); the Cheddar Complex (1.5km); Axbridge Hill and Fry's Hill (1.8km); Draycott Sleights (2.8km); and Crook Peak to Shute Shelve Hill (2.8km). The location of the development site on the periphery of Cheddar Reservoir SSSI in particular means that works could pose a significant risk to the Reservoir's avifauna interest features (for example, one of the largest wintering flocks of Pochard *Aythya ferina* in England/Wales in addition to a wide range of other local and migratory species use the reservoir as a feeding/roosting station). Although it is assumed that mitigation and established best practice (e.g. timing construction to avoid breeding/wintering seasons) would be implemented, adverse impacts resulting from noise disturbance, air quality impacts, and restriction of movement may still have a significant effect on Cheddar Reservoir, and subsequently, the interest features (wildfowl) of Somerset Levels & Moors SPA/Ramsar which utilise the site. A range of other avifauna species and bats supported by the Cheddar Complex, the Perch, and Axbridge Hill and Fry's Hill may also be vulnerable to adverse effects from construction, although to a lesser extent due to distance and the expected implementation of mitigation measures at the project level.



More broadly, construction of the reservoir would represent a considerable undertaking that would result in the significant loss of greenfield land which could result in adverse impacts on aquatic and terrestrial ecological features. Overall, this option has been assessed as having a significant negative effect on biodiversity (Objective 1) at this stage.

Construction would involve a significant loss of greenfield land including Grade 3 agricultural land that is currently used for grazing (it is assumed that land excavated for the 5km of HDPE piping would be reinstated following the completion of the works). This has been assessed as having a significant negative effect on Objective 2.

A number of wet rhynes pass through the site and there is generally poor drainage towards the northern part of the site. The construction works could result in significant changes to the topography of the site and local drainage patterns would be altered. Construction works could also affect water quality through construction derived pollutants escaping into the water, although it is assumed that these impacts could be mitigated by the implementation of best construction practices such as dust suppression, soil containment and emergency response procedures. Overall, this option has been assessed as having a neutral effect on water quantity (Objective 3) and a negative water quality (Objective 4), although some uncertainty remains.

The proposed reservoir and ancillary infrastructure/pipeline would be partly located within Flood Zone 3. In consequence, construction could be liable to an increased risk of flooding depending on the timing of works and the option has therefore been assessed as having a significant negative effect on Objective 5.

There would be significant emissions of carbon during construction (equivalent to 87,000 tonnes CO₂e) principally associated with the embodied carbon in construction materials as well as associated HGV movements. Together with resource use and waste generation, this has been assessed as having a significant negative effect on Objectives 6 and 10.

Construction, including associated HGV movements, could affect human health due to temporary noise disturbance and air quality impacts, particularly in respect of residential properties along the A38, A371, Lower New Road and Wedmore Road. Construction of the reservoir could also temporarily affect access to the existing Cheddar Reservoir for recreation (e.g. angling, sailing, walking and wind-surfing) and the amenity of recreational receptors. Overall, given the scale of development, duration of construction activity and the proximity of sensitive receptors, this option has been assessed as having a negative effect on Objective 7.

The construction of the option would represent a substantial capital investment that would be likely to have a significant positive effect on the local and regional economy associated with employment opportunities and supply chain benefits together with spend by construction workers and contractors. However, construction would generate a large number of HGV movements which may cause congestion and driver delay along access routes to the development site (such as the A371, A38 and B3151) and would result in the closure of Hellier's Lane. Furthermore, recreational impacts on the existing Cheddar Reservoir may affect the local visitor economy and it is noted that there would be views of the construction site from the top of the Cheddar Gorge. Overall, this option has been assessed as having a mixed significant positive and minor negative effect on Objective 8.

The option would not affect water efficiency (Objective 9).

Construction would increase resource use and generate waste which has been assessed as having a significant negative effect on Objective 10.

The development site does not contain any designated heritage assets; however, the Parson's Farm Duck Decoy Scheduled Monument is approximately 82m to the west of the site whilst Roman settlement site, Anglo-Saxon and Norman royal palace, and St Columbanus' Chapel is situated circa 500m to the east. It is assumed that works would not result in the loss of Parson's Farm Duck Decoy; however, there is potential for temporary adverse impacts on the settings of these assets. There are also several listed buildings clustered within Axbridge and Cheddar that are situated along potential HGV routes such that works and increased vehicle movements may temporarily affect their settings, although no significant effects are expected. Overall, this option has been assessed as having a negative effect on Objective 11, although some uncertainty remains.

The development site is circa 1.2km from the Mendip Hills AONB. As the AONB is on a higher elevation than the land surrounding the reservoir, the site would be visible from various locations and its setting, as well as the visual amenity of associated recreational users, could be affected by the development. More generally, construction would result in the loss of a large area of greenfield land that would affect local landscape/townscape character as well as the visual amenity of residential receptors and users of Cheddar Reservoir. Overall, the option has been assessed as having a significant negative effect on Objective 12.



Operation

The operation of the new reservoir would maximise the use of the current abstraction licence by enabling increased drawdown at higher flows in conjunctive use with the River Axe and the storage component of the reservoir. Consequently, it is assumed that the current licence would have been reviewed by the Environment Agency under the Habitats Regulations Review of Consents process thus operation is not expected to have any significant effects on any European designated nature conservation sites such as Severn Estuary SAC/SPA/Ramsar/SSSI. The new reservoir could create new habitat and promote habitat connectivity through the creation of open water habitat next to the existing Cheddar Reservoir. Compensatory habitat suitable as foraging areas and commuting routes for bats could be created around the reservoir margin. There may therefore be beneficial effects during the operation of the option; however, this will be dependent on the exact nature of finalised proposals and specific measures. Overall, the operation of this option has been assessed as having a mixed positive and negative effect on biodiversity (Objective 1), although some uncertainty remains.

There would be no operational effects on geology and soils (Objective 2) (discounting land take during construction).

The full utilisation of the current abstraction licence would capture more flow from an existing licensed abstraction at Cheddar springs. Whilst this would be within existing licensed volumes, negative effects on Objectives 3 and 4 have been identified. Investigation of the sustainability of abstraction from the Cheddar Yeo under the current (single) reservoirs arrangements is scheduled for AMP7 under the WINEP.

As noted above, the proposed reservoir and ancillary infrastructure/pipeline would be partly located within Flood Zone 3. The land take associated with this option would also result in a loss of an area of flood storage. However, the new reservoir could provide additional buffer storage to capture greater quantities of water at higher flows (e.g. storm inflows). Overall, this option has been assessed as having a mixed positive and negative effect on Objective 5.

The additional storage capacity of the new reservoir would allow Cheddar Reservoir to suspend storage optimisation via pumped water outflow; consequently, operation of this scheme would result in a decreased energy demand generating a carbon emission saving of approximately 94 tCO₂e/a. Whilst this does represent a reduction in emissions, consistent with the definitions of significance it has been assessed as having a neutral effect on Objectives 6 and 10.

The operation of the scheme would not be expected to adversely affect human health due to increased noise, nuisance or disruption. Once operational, the new reservoir could provide recreational opportunities (angling, sailing, etc.). The increased capacity of 16 Ml/d, meanwhile, would help to ensure a continual supply of clean drinking water and support population/economic growth. Overall, this option has been assessed as having a significant positive effect on Objectives 7 and 8.

The option would not affect water resources (Objective 9) as this is not a leakage control measure or a water efficiency option.

As noted above, Parson's Farm Duck Decoy Scheduled Monument is approximately 82m to the west of the proposed development site whilst Roman settlement site, Anglo-Saxon and Norman royal palace, and St Columbanus' Chapel is situated circa 500m to the east. There are also several listed buildings in close proximity to the site within Cheddar. The presence of the new reservoir would be likely to affect the settings of these assets and in consequence, the option has been assessed as having a negative effect on Objective 11.

Development of the reservoir would introduce significant new above ground infrastructure that would affect local landscape/townscape character and visual amenity. The presence of the reservoir could also affect views from the Mendip Hills AONB. However, the reservoir would be set within the context of the existing Cheddar Reservoir and it is noted that the scheme would include environmental enhancements such as reduction of bund gradient, screening and planting and naturalising of embankments that would be expected to help lessen landscape and visual impacts. On balance, this option has been assessed as having a negative effect on Objective 12.

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R23-01: Purchase Water from Third Parties from Water Companies	Construction	--/?	-	0	0	-	--	-	++/-	0	--	-	-
	Operation	0/?	0	0	0	0	-	+	+	+	-	0	0

Construction

This option would involve a supply being made available from Wessex Water’s infrastructure at Bridgwater, and transferred via a new 27.6 km main to Bristol Water’s Banwell treatment works. A 2.5km spur from this main would feed Brent Knoll service reservoir. A new pumping station would be required at Danesborough. The option would have a yield of 10MI/d.

The proposed pipeline route crosses or, is in close proximity to, several designated nature conservation sites including: Severn Estuary SAC/SPA/Ramsar site; Bridgewater Bay SSSI; Huntspill River SSSI; Crook Peak to Shute Shelve Hill SSSI; and Mendip Limestone Grasslands SAC. There is the potential for construction works to have both direct (.e.g. loss of habitats and species) and indirect (e.g. noise and air quality impacts) adverse effects on the interest features of these sites. In this context, the HRA identifies that there is potential for the pipeline works to affect interest features (horseshoe bats) from the Mendip Limestone Grasslands and North Somerset and Mendip Bats SAC. Whilst there is the potential for adverse impacts to be mitigated through, for example, routing to avoid designated sites, retention/protection of hedges and best practice construction techniques, this is currently uncertain. The new pumping station near Danesborough would require additional land which could result in the localised loss of/disturbance to habitats and species. Overall, this option has been assessed as having a significant negative effect on biodiversity (Objective 1) at this stage, although some uncertainty remains given the potential for mitigation to avoid adverse impacts on designated sites and their features.

Construction of the new pumping station at Danesborough would result in the loss of greenfield land which is classified as Grade 3 agricultural land. The proposed pipeline route would also cross predominantly Grade 3 agricultural land, although it is assumed that any soil displaced through excavation as part of the laying of the pipeline would be returned following the completion of works. Overall, this option has been assessed as having a minor negative effect on Objective 2.

It is not expected that construction of this option would affect water quantity (Objective 3) or water quality (Objective 4), provided best practices are adhered to and mitigation implemented (such as dust suppression, soil containment and emergency response procedures).

The proposed pipeline route crosses Flood Zones 2 and 3 and in consequence, construction activity could be liable to an increased risk of flooding (depending on the timing of works). The option has therefore been assessed as having a minor negative effect on Objective 5.

Construction of the scheme, including embodied carbon in materials, would generate 14,881 tonnes CO₂e which has been assessed as having a significant negative effect on Objective 6 (and Objective 10).



The proposed pumping station would be 380m from the nearest residential receptor such that significant impacts on health associated with this element of the scheme are not predicted. Pipeline works would also be expected to affect few residential receptors, although associated HGV movements could result in temporary noise and air quality impacts (there would be an estimated 1,000 HGV movements during the construction period). It is also noted that the proposed pipeline route crosses footpaths and in consequence, there is the potential for short term impacts on recreational receptors. Overall, this option has been assessed as having a minor negative effect on Objective 7.

The construction of the option would represent a relatively large capital investment that would be likely to have a significant positive effect on the local economy associated with employment opportunities and supply chain benefits together with spend by construction workers and contractors. However, construction would generate a large number of HGV movements which, together with pipeline works across roads including the M5, A38 and A39, may cause congestion and driver delay. Overall, this option has been assessed as having a mixed significant positive and minor negative effect on Objective 8.

The option would not affect water efficiency (Objective 9).

Construction would increase resource use and generate waste which has been assessed as having a significant negative effect on Objective 10.

Construction of the pumping station is not expected to affect any designated heritage assets. The proposed pipeline route is in close proximity to a number of assets; it would be adjacent to Roman settlement and associated industrial remains and field system north-east of Winthill Farm Scheduled Monument and be within 500m of a further two scheduled monuments (A Roman Camp in Banwell Woods and Motte with two baileys immediately east of Bristol Road, Down End) as well as a number of listed buildings. In consequence, there is the potential for construction activity to have a short term, temporary adverse effect on the settings of these assets (Objective 11).

Construction activity associated with the proposed pumping station is expected to be small in scale and taking into account its location adjacent to an existing service reservoir, this element of the scheme is not expected to have substantial landscape impacts. The proposed pipeline would cross the Mendip Hills AONB for approximately 5km; however, taking into account the type of development, its temporary nature and route that would follow existing linear features (roads) as well as the fact that planting and re-seeding would be likely to return land excavated as part of pipeline works to a pre-development state within a year (depending on the season in which works are undertaken), no significant landscape impacts are predicted. Overall, this option has been assessed as having a minor negative effect on Objective 12.

Operation

The operation of this option would involve the transfer of 'spare' resource within the capacity of Wessex Water's distribution system and would be within existing licence limits. Although effects are likely to be negligible (Objective 1), this could have an effect on non-designated species and habitats further modelling of effects would be required if selected as a preferred option (and so an uncertainty is also assessed at the feasible option stage).

There would be no operational effects on geology and soils (Objective 2) (discounting land take during construction).

As noted above, the option would be within existing licence limits and would not require any new license. The option is therefore not expected to have any effects on water quantity (Objective 3) and water quality (Objective 4).

The pumping station is not located in an area of flood risk and operation of the option is not expected to cause or exacerbate flooding elsewhere (Objective 5).

The option would generate an estimated 644 tonnes CO₂e/year during operation. This has been assessed as having a negative effect on Objectives 6 and 10.

The operation of the scheme would not be expected to adversely affect human health due to increased noise, nuisance or disruption. The increased yield of 10 Ml/d would help to ensure a continual supply of clean drinking water and could support population/economic growth. Overall, this option has been assessed as having a positive effect on Objectives 7 and 8.

The option would utilise excess water from Wessex Water supply network which would make more efficient use of water resources. This has been assessed as having a positive effect on Objective 9.

There would be no operational effects on designated cultural heritage assets (Objective 11).

As noted above, the proposed pumping station is expected to be small in scale and would be located in the vicinity of an existing service reservoir which is well screened. A neutral effect has therefore been identified in respect of landscape (Objective 12).

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R24: Bring R24R source back into supply	Construction	--/?	0	0	0	-	--	-	0	0	--	-	-
	Operation	0	0	?	?	-	-	+	+	0	-	0	0

Construction

R24R Well is currently out of service due to high turbidity and associated risk of cryptosporidium. To bring this well back into service, it is proposed to pump water from R24R to P10R. This option would involve the construction of a new pumping station at the R24R site and a new 4.2km 300mm diameter pipeline. The option would have a yield of 2.4 Ml/d.

R24R Well and the proposed pipeline route are not within/traverse any designated nature conservation sites. There are a number of designated sites nearby including Cheddar Reservoir SSSI (circa 600m northwest), Mendip Limestone Grasslands SAC, Somerset Levels and Moors SPA and Ramsar, (approximately 1km to the east), Mendip Woodlands SAC (approximately 1km to the east and 1.7 km to the north), R24Ra NNR/SSSI (approximately 1km to the east), North Somerset and Mendip Bats SAC and Cheddar Complex SSSI (1.3km northeast), The Perch SSSI (approximately 1.3 km north), Draycott Sleights SSSI (approximately 1.4 km east) and Cheddar Wood SSSI (approximately 1.7 km north) . The HRA identifies that there is the potential for pipeline works in particular to affect interest features (horseshoe bats) from the Mendip Limestone Grasslands and North Somerset and Mendip Bats SAC. However, the HRA also notes that with established mitigation and avoidance measures (most notably retaining all hedges crossed by the pipe by using moling techniques, or careful excavation and replacement of intact hedge sections), the pipeline could be accommodated without significant or adverse effects. More generally, development of the new pumping station and pipeline works could result in the localised loss of/disturbance to habitats and species. Overall, the option has been assessed as having a potentially significant negative effect on biodiversity (Objective 1) at this stage, although some uncertainty remains given the potential for mitigation to avoid adverse impacts on designated sites.

The pumping station would be located on an existing (disused) operational site. Whilst the proposed pipeline would cross greenfield land including that which is classified as best and most versatile, this would be reinstated following the completion of works. On balance, this option has been assessed as having a neutral effect on Objective 2.

It is not expected that construction of this option would affect water quality (Objective 3) or water quantity (Objectives 4), provided best practices are adhered to and mitigation implemented (such as dust suppression, soil containment and emergency response procedures).

Most of the proposed pipeline and pumping station are located within Flood Zones 2 and 3. In consequence, construction activity could be liable to an increased risk of flooding (depending on the timing of works). The option has therefore been assessed as having a minor negative effect on Objective 5.



Construction of the scheme, including embodied carbon in materials, would generate 1,583 tonnes CO₂e which has been assessed as having a significant negative effect on Objective 6 (and Objective 10).

The proposed pumping station would not be within close proximity of residential or other sensitive receptors. Pipeline works and associated HGV movements could, however, affect nearby residential receptors due to temporary noise and air quality impacts. Overall, this option has been assessed as having a minor negative effect on Objective 7.

The option would have a relatively low capital expenditure and associated effects on the local economy are expected to be negligible. Pipeline works and associated HGV movements could cause some short term congestion/driver delay; however, any effects would be very minor and temporary. Overall, this option has been assessed as having a neutral effect on Objective 8.

The option would not affect water efficiency (Objective 9).

Construction would increase resource use and generate waste which has been assessed as having a significant negative effect on Objective 10.

The proposed pumping station site is not affected by any designated heritage assets. There are no listed buildings within 450 m of the pumping station or pipeline. The route of the pipeline would be within 330m of a Scheduled Monument (roman settlement site, Anglo-Saxon and Norman royal place and St Columbanus' Chapel) and in consequence, there is the potential for temporary adverse effects on its setting. Overall, this option has been assessed as having a minor negative effect on Objective 11.

The pumping station site and pipeline route are not within designated landscapes. Whilst the pumping station site at R24R could be visible from Mendip Hills AONB located approximately 700 m east (elevated above the construction site), works would be small in scale and take place within an existing disused site such that significant effects on the AONB are not predicted. More broadly, construction activity including pipeline works could have adverse impacts on local landscape character and visual amenity, although any effects would be minor and temporary. Overall, this option has been assessed as having a minor negative effect on Objective 12.

Operation

The operation of this option is not expected to have any effects on sites that are important for biodiversity. The site is already licensed for abstraction and resumption of abstraction is not expected to impact on any downstream designated habitats (e.g. the Severn Estuary) (Objective 1).

There would be no operational effects on geology and soils (Objective 2) (discounting land take during construction).

The ALS indicates that water is not available at medium to high flows and is restricted at low flows. The abstraction may have an impact on SW/GW interactions and therefore the hydrological regime of the surface water body which could have an adverse impact on the River Axe and its WFD ecological status. However, the relatively small size of the abstraction, and the relatively low permeability of the bedrock in this area (primarily mudstones and siltstones), would indicate that the impacts are unlikely to be widespread or prolonged. However, the Honeyhurst source is identified for investigation in the WINEP2, indicating that there are concerns over the impact of the abstraction on the environment. As a result, the option has been assessed as having an uncertain effect on water quantity (Objective 3) and water quality (Objective 4).

During operation, the option would neither cause nor exacerbate flooding in the catchment, but the pumping station may remain at risk of flooding (Objective 5).

Operational carbon emissions are estimated to be 108 tonnes CO₂e/a and therefore, consistent with the definitions of significance, effects on Objectives 6 and 10 have been assessed as minor negative.

The operation of the scheme would not be expected to adversely affect human health due to increased noise, nuisance or disruption. The increased yield of 2.4 Ml/d would help to ensure a continual supply of clean drinking water and could support population/economic growth. Overall, this option has been assessed as having a positive effect on Objective 7 and 8.

The option would not affect water efficiency (Objective 9).

There would be no operational effects on designated cultural heritage assets (Objective 11).

New above ground infrastructure would be visible from the Mendip Hills AONB at R24R; however, the proposed pumping station is expected to be small in scale and would be located on a disused site. A neutral effect has therefore been identified in respect of landscape (Objective 12).



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Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
R32: Resource Reduction of bulk transfer agreement with Wessex Water	Construction	0	0	0	0	0	0	0	0	0	0	0	0
	Operation	0	0	0	0	0	++	++	++	+/?	++	0	0

Construction

This option would involve the termination of the existing bulk supply agreement to Wessex Water in order to recover up to 11.4 Ml/d to restore Bristol Water's supply demand balance. The water would be made available from the Purton source.

The option does not require any new infrastructure and no construction activity would be undertaken. In consequence, effects on all of the objectives have been assessed as neutral.

Operation

During operation, it is assumed that water would be sourced from existing Wessex Water abstractions, and be within the limits of their existing abstraction licences. In consequence, neutral operational effects on biodiversity, geology and soils, water quantity or water quality are predicted. There are however potential issues associated with cross-border trading and the need to ensure that the option which benefits Bristol Water customers does not cause a disproportionate impact on Wessex Water customers.

Operation of the option would not cause or exacerbate flooding, nor would the option be at risk of flooding (Objective 5).

The implementation of this option would result in water being transferred over a shorter distance than under current operation which would generate energy savings and a reduction in greenhouse gas emissions of 3,377 tonnes CO₂e. This has been assessed as a significant positive effect on Objectives 6 and 10.

The operation of the scheme would not be expected to adversely affect human health due to increased noise, nuisance or disruption. The increased capacity of 11.4 Ml/d would help to ensure a continual supply of clean drinking water and support population/economic growth. Overall, this option has been assessed as having a significant positive effect on Objectives 7 and 8.

The option is based on the premise that Wessex Water are in surplus due to the flexibility provide by their Grid system which would make more efficient use of water resources. There may be however a potential need for Wessex Water to obtain other sources of water. This has been assessed as having a positive effect on Objective 9 although some uncertainty remains.

There would be no operational effects on cultural heritage or landscape (Objectives 11 and 12).

Assessment of Feasible Distribution Options

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D21: Active Leakage Control	Construction	?	0	0	0	0	-/?	0	-	0	-	0	0/?
	Operation	0	0	+	0	0	+	+	0	+	0	0	0

Construction

This option covers the continuation of the current leakage detection find and fix policy. The methods of this form of leakage control include using leak noise detection equipment and zonal step tests to isolate areas of leakage and then repair. This will reduce the length of time that leaks run, which will reduce leakage. The option would have a yield of 4.5 MI/d.

It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. Overall, given that the location of leaks to be repaired is unknown, an uncertain effect on biodiversity is identified at this stage (Objective 1).

There would be no new land take associated with this option and therefore effects on soils/land use (Objective 2) are expected to be negligible with any soil displaced through excavation returned following the completion of works.

Water quantity and quality are unlikely to be affected by the process of leakage repair and in consequence there would be no effects Objectives 3 and 4.

The exact location of leakage repairs is not yet known and therefore it cannot be determined whether repair work would be located in areas at risk of flooding. However, it is assumed that works could be scheduled to avoid periods of flooding and construction work is not expected to cause or exacerbate flooding elsewhere (Objective 5).

The implementation of this option would result in an increase in greenhouse gas emissions arising from embodied carbon associated with new pipeline and emissions from plant and vehicle movements to find and repair leaking mains. Embodied and construction carbon emissions are estimated at 214 tonnes CO₂e over 5 years (depending on the length of pipeline repaired) which has been assessed as having a negative effect on climate change, although some uncertainty remains (Objective 6).



Vehicle movements and the operation of plant associated with leak detection and repair may affect local air quality and generate noise/vibration disturbance. There may also be disruption to supply. However, such impacts would be temporary and are likely to be managed such that effect on human health (Objective 7) has been assessed as neutral.

The costs to carry out additional leakage detection activities and reduce leakage by 4.52 Ml/d are estimated at £0.88m over the AMP7 period (years 1 to 5). This represents a relatively low capital investment which is not expected to facilitate substantial job growth nor significantly affect the local economy in terms of supply chain benefits. The repair of infrastructure may result in short term and temporary adverse impacts on the road network (e.g. as a result of increased vehicle movements, road closures/diversions etc.) although such impacts would be temporary. Overall, due to the localised disruption, the option has been assessed as having a minor negative effect on Objective 8.

During construction, this option would not affect leakage or water efficiency (Objective 9).

During construction there would be a minor increase in resource use and construction waste along with fuel usage for vehicles and plant (as indicated by the proxy of carbon). A negative effect on resource use and waste has therefore been identified (Objective 10).

The repair of pipes may involve carrying out works in the curtilage or grounds of heritage assets but this would be temporary and managed through appropriate mitigation. Overall, this option has been assessed as having a neutral effect on Objective 11.

The repair of pipes could give rise to localised landscape and visual effects. However, given the short term nature of works under this option and focus on underground infrastructure, together with the assumption that appropriate mitigation would be adopted during construction, it is expected that effects on landscape (Objective 12) would be neutral (with some uncertainty).

Operation

Once a leak has been repaired, the option is not expected to have any effects on biodiversity or on soils and land use (Objectives 1 and 2).

Operation of this option will result in a reduction in demand for water (4.5 Ml/d) as a result of reduced leakage. This has been assessed as having a positive effect on water quantity (Objective 3).

There is the potential for the option to contribute to improvements in the WFD ecological potential/status of waterbodies (through reduced demand). However the yield (4.5 Ml/d) is relatively small across the Bristol Water supply area such that effect on water quality (Objective 4) has been assessed as neutral.

The operation of the option will not cause, exacerbate or mitigate flood risk (Objective 5).

The operation of this option would result in a decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and pumping of water. The reduction in greenhouse gas emissions associated with this option estimated at 368 tonnes CO₂e/a once fully implemented. This has been assessed as having a positive effect on climate change (Objective 6).

No noise, nuisance or disruption are expected during operation of the option. Water savings of up to 4.5 Ml/d would have a positive effect on human health by helping to secure drinking water supply (Objective 7).

This option would involve 'low' operational expenditure (£2.1m per year on maintenance) which has been assessed against the definitions of significance as being of insufficient scale to have an effect on the local economy (through job creation) and for this reason has been assessed as having a neutral effect on Objective 8.

The operation of the option would result in reduced leakage from mains (yield 4.5 Ml/d) and is assessed as having a positive effect on the sustainable use of water resources (Objective 9). The option would result in lower energy use during operation but would not result in significant changes in other resource use (no waste generated or materials used during operation) (Objective 10).

No effects on built or natural heritage assets are expected during the operation of this option (Objective 11).

No effect on landscape character is expected during the operation of this option as no above-ground additional infrastructure is required (Objective 12).

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D22: Pressure Management	Construction	0	0	0	0	0	0	0	0	0	0	0	0
	Operation	0	0	+	0	0	+	+	0	+	0	0	0

Construction

The planned activity for this option is to establish a programme of further pressure management and control within the current distribution network. This would enable greater control of pressure within the distribution system and reduce the amount of water lost through existing (undetected) leaks and also reduce the rate at which new leaks occur (due to reduced pressure within mains). This will be achieved by optimisation of areas currently controlled by PRVs (Pressure Reduction Valves) by use of flow modulating or other more sophisticated pressure control, and by the installation of new PRVs; this would include the construction of a new chamber to house new PRVs. The assumed number of number of pressure management schemes implemented is 45 over years 1 to 3 of AMP7.

Although it is likely that the installation would be undertaken beneath road surfaces or footpaths, the locations are not known and it is therefore possible that works would be undertaken within, or in close proximity to, locations important to biodiversity (and/or designated sites) which, may impact on priority habitats and protected species. However given the short-term and localised nature of the works, a neutral effect on biodiversity is predicted (Objective 1). Further, it would be expected that adverse effects would be mitigated where possible using best practice construction techniques.

There would be no new land take associated with this option and therefore effects on soils/land use (Objective 2) are expected to be negligible with any soil displaced through excavation returned following the completion of works.

Water quantity and quality are unlikely to be affected by the installation of new PRVs and in consequence there would be no effects Objectives 3 and 4.

The exact location of PRV installation is not yet known and therefore it cannot be determined whether work would be located in areas at risk of flooding. However, it is assumed that works could be scheduled to avoid periods of flooding and construction work is not expected to cause or exacerbate flooding elsewhere (Objective 5).

In line with the best practice guidelines, externalities for Pressure Management are assumed to have no carbon impact and is therefore assessed as neutral effect against climate change (Objective 6).

Vehicle movements and the operation of plant associated with construction activity may affect local air quality and generate noise/vibration disturbance. There may also be disruption to supply. However, such impacts would be temporary and are likely to be managed such that the effect on human health (Objective 7) has been assessed as neutral.

The costs to implement the pressure management schemes (15 per year over 3 years) are estimated at £1.9m over the 3 years. This represents a relatively low capital investment which is not expected to



facilitate substantial job growth nor significantly affect the local economy in terms of supply chain benefits. Overall, this option has been assessed as having a neutral effect on Objective 8.

During construction, this option would not affect leakage or water efficiency (Objective 9).

During construction activities there would be a minor increase in resource use and construction waste along with fuel usage for vehicles and plant. Given the small scale and short term nature of works of this is assessed as having a neutral effect on Objective 10.

The installation of PRVs may involve carrying out works in the curtilage or grounds of heritage assets but this would be temporary and managed through appropriate mitigation and in consequence would have a neutral effect on cultural heritage (Objective 11).

Given the small scale and short term nature of works under this option and focus on underground infrastructure, together with the assumption that appropriate mitigation would be adopted during construction, it is expected that effects on landscape would be neutral (Objective 12).

Operation

Once operational, the option will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise, and therefore the option has minimal effects across the majority of objectives.

The option will result in reduced leakage from the distribution network and will have no effects biodiversity (Objective 1) or on soils and land use (Objective 2).

Operation of this option will result in a reduction in demand for water (2.1 Ml/d) as a result of reduced leakage. This has been assessed as having a positive effect on water quantity (Objective 3).

There is the potential for the option to contribute to improvements in the WFD ecological potential/status of waterbodies (through reduced demand), although the yield (2.1 Ml/d) is relatively small across the Bristol Water supply area such that effect on water quality (Objective 4) has been assessed as neutral.

The operation of the option will not cause, exacerbate or mitigate flood risk (Objective 5).

The option will result in a decrease in energy use associated with the treatment and pumping of water, and this is estimated at 170 tonnes CO₂e/a once fully implemented, assessed as a minor positive against climate change (Objective 6).

The option will help ensure continuity of supply of safe and secure drinking water (yield 2.1 Ml/d), and will not result in adverse effects on health during operation (no noise, nuisance or disruption expected). Therefore the option is assessed as having a positive effect on human health (Objective 7).

The option is not anticipated to affect the regional or local economy, or create recreational facilities and for this reason has been assessed as having a neutral effect on Objective 8.

The operation of the option would result in reduced leakage from mains (yield 2.1 Ml/d) and is assessed as having a positive effect on the sustainable use of water resources (Objective 9).

The option would result in lower energy use during operation but would not result in significant changes in other resource use (no waste generated or materials used during operation) (Objective 10).

The option will lead to a reduction in energy use during operation (using operational carbon emissions noted above as a proxy for energy use) but would not result in significant changes in other resource use (no waste generated or materials used during operation) (Objective 10).

No effects on built or natural heritage assets are expected during the operation of this option (Objective 11).

No effect on landscape character is expected during the operation of this option as no above-ground additional infrastructure is required (Objective 12).



Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity	4. Water Quality	5. Flood Risk	6. Climate Change	7. Human Health	8. Economic and Social Wellbeing	9. Water Resources	10. Waste and Resource Use	11. Cultural Heritage	12. Landscape
D23: Asset Renewal	Construction	0/?	0	0	0	0	--/?	0/?	++	0	--/?	0	0
	Operation	0	0	+	0	0	0	0	0	+	0	0	0

Construction

This option would involve the replacement and renewal of trunk mains. This option excludes replacement of communication pipes and Customer Supply Pipes (CSP) (from the property boundary to inside the property).

Construction is generally not expected to significantly affect biodiversity. It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. Overall a neutral effect on biodiversity (Objective 1) is assumed likely, although some uncertainty remains.

Construction activity would take place on existing infrastructure and thus would not require new land. Any soil displaced through excavation works would be returned following the completion of works. Effects on geology and soils (Objective 2) are therefore expected to be negligible.

Construction work is not expected to have any effect on river flows or groundwater levels, or on water quality provided best practices are adhered to and so neutral effects on Objective 3 and 4 are identified.

The location of trunk mains to be replaced is not yet known and therefore it cannot be determined whether replacement work would be located in areas at risk of flooding. However, it is assumed that works could be scheduled to avoid periods of flooding and construction work is not expected to cause or exacerbate flooding elsewhere. In consequence a neutral effect on Objective 5 is assessed.

There would be embodied and construction carbon emissions as a result of pipeline replacement, arising from embodied carbon associated with new pipelines and emissions from plant and vehicle movements. At present the carbon emissions are unquantified but are likely to have a significant negative effect on climate change (Objective 6), although some uncertainty remains.

The replacement and renewal of trunk mains would require excavation and construction work. Vehicle movements and the operation of plant associated with pipeline replacement may affect local air quality and generate noise/vibration disturbance. There may also be disruption to water supply. As these impacts would be temporary and are likely to be managed it is considered unlikely that this option would result in any adverse effects on human health (Objective 7). However some uncertainty remains in the absence of information on the scale of the works.

Construction would have a significant expenditure of approximately £12m, which is considered likely to generate local employment opportunities during construction period and would have a significant



positive effect on the local economy. During replacement works, there is the potential for localised disruption to traffic, particularly along any sections of pipeline requiring work along or across roads. However, any adverse effects would be temporary and small in scale. Overall, this option is considered to have a significant positive effect with respect to wellbeing (Objective 8).

During construction, this option would not affect leakage or water efficiency (Objective 9).

Depending on the extent of pipeline replacement, there could be an increase in resource use and waste. A significant negative effect on resource use and waste (Objective 10) has therefore been identified although some uncertainty (due to the unknown scale of works) remains.

Construction may involve carrying out works in the curtilage or grounds of heritage assets; however, this would be temporary and would only affect previously disturbed land. It is also assumed that any effects could be managed through appropriate mitigation. A neutral effect on Objective 11 has been assessed.

Replacement works under this option could give rise to landscape and visual effects. However, any impacts would be temporary and small scale with land likely to be returned to a pre-development state within a year (depending on the timing of works). Overall, a neutral effect on Objective 12 has been identified in respect of landscape.

Operation

Once the trunk mains have been replaced, the option is not expected to have any effects on biodiversity or geology and soils (Objectives 1 and 2).

Operation of the option would result in water savings as a result of reduced leakage which would lower demand for water abstraction. This has been assessed as having a minor positive effect on water quantity (Objective 3).

No operational effects on water quality or flood risk are anticipated (Objectives 4 and 5).

Operation of this option would result in a small decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and pumping of water; however, the scale of reduction is estimated to be between 1-100 tCO₂e/a which would have a negligible effect on climate change (Objective 6).

Water savings up to 0.5 Ml/d would be too low to make a meaningful contribution to human health and the wellbeing of the local community (Objectives 7 and 8).

This option would result in reduced leakage from trunk mains which is assessed as having a minor positive effect on the sustainable use of water resources (Objective 9).

No additional resources or energy would be required once pipelines are replaced (Objective 10).

No effects on heritage assets or landscape are expected during operation of this option (Objectives 11 and 12).



Appendix F

Preferred Options Assessment Matrices

This appendix presents the findings of the detailed assessments of the preferred options.

A list of the preferred options is provided below:

Ref	Option	Yield (Ml/d)
Resource Options		
R32	Resource Reduction of bulk transfer agreement with Wessex Water	11.4
Distribution Options		
D21	Active Leakage Control	4.5
D22	Pressure Management	2.1
P20	Reduced leakage from raw water mains	3.9-5.5

The following matrices present the findings of the assessment.

Key to Assessments

Score	Description	Symbol
Significant Positive Effect	Significant positive effect of the Water Resources Management Plan option on this objective	++
Minor Positive Effect	Positive effect of the Water Resources Management Plan option on this objective	+
Neutral	Overall neutral effect of the Water Resources Management Plan option on this objective	0
Minor Negative Effect	Negative effect of the Water Resources Management Plan option on this objective	-
Significant Negative Effect	Significant negative effect of the Water Resources Management Plan option on this objective	--
No Relationship	There is no clear relationship between the Water Resources Management Plan option and the achievement of the objective or the relationship is negligible.	~
Uncertain	The Water Resources Management Plan option has an uncertain relationship to the objective or the relationship is dependent on the way in which the aspect is managed. In addition, insufficient information may be available to enable an assessment to be made.	?
Mixed Effect	Mixed positive and negative effect of the Water Resources Management Plan option on this objective	+/-



R32- Resource Reduction of bulk transfer agreement with Wessex Water

This option would involve the termination of the existing bulk supply agreement to Wessex Water in order to recover up to 11.4 MI/d to restore Bristol Water's supply demand balance. The water would be made available from the Purton source.

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p>	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and/or link existing habitats?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p> <p>Will the option maintain and enhance the green infrastructure network and the biodiversity it supports?</p> <p>Will the option contribute to the restoration of species that are currently not achieving management objectives?</p> <p>Will the option maintain and enhance ecosystem resilience?</p>	0	0/?	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>It is assumed that water would be sourced from existing Wessex Water abstractions, and be within the limits of their existing abstraction licences. There would be no operational effect on biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>It is assumed that the water would be made available from existing Wessex Water abstractions and that these abstractions are not having detrimental effects on biodiversity. Any potential effects of this option would be identified in the Wessex Water WRMP, depending on how the bulk supply is replaced (i.e. 'new water' may be required). Further assessment of this option would sit with Wessex Water.</p> <p>Uncertainty</p> <p>There is uncertainty over the source of the water that would be exported to Bristol Water.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.</p>	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p> <p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest (GCR sites, SSSI and RIGS) and features of wider geodiversity interest?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	0	0	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>There would be no land take during operation of this option and therefore no effects on the appropriate and efficient use of land and soils.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>None</p> <p>Uncertainty</p> <p>None</p>
<p>3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.</p>	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p>	0	0	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>It is assumed that the yield of this option would be obtained from within the limits of existing abstraction licences, minimising the demand for new water resources. A neutral effect has been determined against this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>It is assumed that the water would be made available from existing Wessex Water abstractions. In this regard, it is noted that Wessex Water has no projected supply deficit and, as such, its WRMP14 proposes no additional supply options.</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.</p>	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>It is assumed that water would be sourced from existing Wessex Water abstractions, and be within the limits of their existing abstraction licences. Therefore this option is considered unlikely to impact on the WFD status of any water bodies. A neutral effect has been determined against this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>It is assumed that the water would be made available from existing Wessex Water abstractions.</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>5. To reduce the risk of flooding, promote the use of sustainable drainage and identify opportunities for collaborative working with other risk management authorities.</p>	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p> <p>Will the option help to minimise flood risk by maintaining and improving the green infrastructure network?</p> <p>Will the option promote the use of sustainable drainage systems?</p> <p>Will the option promote opportunities for collaborative working with other risk management authorities?</p> <p>Will the option affect the risk of flooding to people and/or property?</p> <p>Will the option help to mitigate/reduce the risk of flooding to people and/or property?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>The option would not be at risk of flooding during operation and would not cause, exacerbate or alleviate the risk of flooding. A neutral effect has been determined against this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>None</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>6. To limit the causes and potential consequences of climate change and to adapt to future changes.</p>	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change including to impacts on flood risk and water quality?</p> <p>Will coastal erosion have consequences on the operation of this option now or in the future, taking account of expected climate change sea level rise?</p>	<p>0</p>	<p>++</p>	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>The implementation of this option would result in water being transferred over a shorter distance than under current operation which would generate energy savings and a reduction in annual greenhouse gas emissions of 3,377 tonnes CO₂e. This has been assessed as a significant positive effect on this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>It is assumed that energy will come from conventional sources.</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>7. To ensure the protection and enhancement of human health.</p>	<p>Will the option ensure the continuity of a safe and secure drinking water supply?</p> <p>Will the option impact on physical health and mental well-being by affecting opportunities for informal outdoor recreation?</p> <p>Will the option maintain surface water and bathing water quality within statutory standards?</p> <p>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</p> <p>Will the option maintain and improve public access to, and enjoyment of, green and blue infrastructure and in doing so help promote healthy lifestyles?</p>	<p>0</p>	<p>++</p>	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>Operation would provide an additional yield of 11.4 Ml/d, which would help to ensure a continual supply of clean drinking water.</p> <p>There would be no operational effect on recreational facilities.</p> <p>The option is not expected to have any effects on surface water or bathing water quality.</p> <p>The operation of the option would not be expected to adversely affect human health due to increased noise, nuisance or disruption.</p> <p>This has been assessed as a significant positive effect on this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>None</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>8. To maintain and enhance the economic and social well-being of the local community.</p>	<p>Will the option ensure sufficient infrastructure is in place for predicted population increases?</p> <p>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</p> <p>Will the option help to meet the employment needs of local people?</p> <p>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</p> <p>Will the option improve access to local services and facilities (e.g. sport and recreation)?</p> <p>Will the option contribute to sustaining and growing the local and regional economy?</p> <p>Will the option avoid disruption through effects on the transport network?</p> <p>Will the option be resilient to future changes in resources (both financial and human)?</p> <p>Will the option improve opportunities for social interaction and community cohesion?</p>	<p>0</p>	<p>++</p>	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>Operation would provide an additional yield of 11.4 Ml/d, which would help support economic growth in the area.</p> <p>This has been assessed as a significant positive effect on this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>None</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>9. To ensure the sustainable and efficient use of water resources.</p>	<p>Will the option lead to reduced leakage from the supply network?</p> <p>Will the option improve efficiency in water consumption?</p>	<p>0</p>	<p>+/?</p>	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>This option is based on the premise that Wessex Water are in surplus due to the flexibility provide by their Grid system which would make more efficient use of water resources. There may be however a potential need for Wessex Water to obtain other sources of water. This has been assessed as having a positive effect on this objective although some uncertainty remains.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>It is assumed that the water would be made available from existing Wessex Water abstractions. It is noted that Wessex Water has no projected supply deficit and, as such, its WRMP14 proposes no additional supply options.</p> <p>Uncertainty</p> <p>There is uncertainty on how the bulk supply would be replaced by Wessex Water, i.e. whether new sources of water would be required.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>10. To promote the efficient use of resources.</p>	<p>Will the option seek to minimise the demand for raw materials?</p> <p>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</p> <p>Will the option encourage the use of sustainable design and materials?</p> <p>Will the option reduce or minimise energy use?</p>	0	++	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>This option will lead to a decrease in energy use during operation (using operational carbon emissions noted above as a proxy for energy use). It would not result in significant changes in other resource use (no significant waste generated or materials used during operation) and has therefore been assessed as a significant positive effect against this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>None</p> <p>Uncertainty</p> <p>None</p>
<p>11. To conserve and enhance the cultural, historic and industrial heritage resource.</p>	<p>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings?</p> <p>Will the option avoid or minimise damage to archaeologically important sites?</p> <p>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</p> <p>Will the option affect public access to, or enjoyment of, features of cultural heritage?</p> <p>Will the option protect or enhance Welsh language and culture?</p>	0	0	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>The operation of this option will have a neutral effect on this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>None</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>12. To conserve and enhance landscape character.</p>	<p>Will the option avoid adverse effects on, and enhance where possible, the special qualities of protected/designated landscapes (including woodlands) such as National Parks or AONBs?</p> <p>Will the option protect and enhance landscape character, townscape, seascape and green infrastructure?</p> <p>Will the option affect public access to existing landscape features?</p> <p>Will the option minimise adverse visual impacts?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>No construction or new infrastructure is required to implement this option. For this reason, neutral effects have been assessed against this objective during construction.</p> <p>Effects of Operation</p> <p>The operation of this option will have a neutral effect on this objective.</p> <p>Mitigation</p> <p>None</p> <p>Assumptions</p> <p>None</p> <p>Uncertainty</p> <p>None</p>
<p>Summary</p>	<p>Effects of Construction</p> <p>Neutral effects have been assessed against all objectives during construction as this option does not require the construction of additional infrastructure.</p> <p>Effects of Operation</p> <p>This option would have neutral effects against seven of the twelve objectives during operation. This is because this option involves reducing an existing bulk supply export to Wessex Water and using this water (abstracted within existing licence conditions) to meet the demand from Bristol Water customers. This has been assessed as having a positive effect on the water resources objective although some uncertainty remains as there may be a potential need for Wessex Water to obtain other sources of water.</p> <p>Significant positive effects are assessed against the climate change and waste and resource use objectives, due to the reduction in energy use (and carbon emissions) from the reduced treatment and pumping of water. This option would provide an additional yield of 11.4 Ml/d, which would help to ensure a continual supply of clean drinking water and support economic growth in the area resulting in a significant positive effect against human health, economic and social wellbeing objectives.</p> <p>Mitigation</p> <p>None</p>			

D21- Active Leakage Control

This option covers the continuation of the current leakage detection find and repair scheme which include using leak noise detection equipment and zonal step tests to isolate areas of leakage. The option would have a yield of 4.5 Ml/d.

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p>	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and/or link existing habitats?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p> <p>Will the option maintain and enhance the green infrastructure network and the biodiversity it supports?</p> <p>Will the option contribute to the restoration of species that are currently not achieving management objectives?</p> <p>Will the option maintain and enhance ecosystem resilience?</p>	<p>0/?</p>	<p>0</p>	<p>Effects of Construction</p> <p>It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. This option would have a neutral impact on the biodiversity objective but some uncertainty remains as the location of leaks to be repaired is unknown.</p> <p>Effects of Operation</p> <p>Once a leak has been repaired, this option is not expected to have any effects on the biodiversity objective.</p> <p>Mitigation</p> <p>If required, depending on the location of the repair works, adverse effects would be reduced where possible using best practice construction techniques</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The location of leaks to be repaired is unknown.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.</p>	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p> <p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest (GCR sites, SSSI and RIGS) and features of wider geodiversity interest?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	0	0	<p>Effects of Construction</p> <p>There would be no new land take associated with the option and therefore effects on this objective are expected to be negligible with any soil displaced through excavation returned following the completion of works.</p> <p>Effects of Operation</p> <p>Once a leak has been repaired, the option is not expected to have any effects on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.</p>	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p>	0	+	<p>Effects of Construction</p> <p>Water quantity is unlikely to be affected by the process of leakage repair and in consequence there would be no effects against this objective.</p> <p>Effects of Operation</p> <p>The option would result in a reduction in demand for water (4.5 MI/d) as a result of reduced leakage. This has been assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.</p>	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Water quantity is unlikely to be affected by the process of leakage repair and in consequence there would be no effects against this objective.</p> <p>Effects of Operation</p> <p>There is the potential for the option to contribute to improvements in the WFD ecological potential/status of waterbodies (through reduced demand). However the yield (4.5 Ml/d) is relatively small across the Bristol Water supply area such that effect on this objective has been assessed as neutral.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>5. To reduce the risk of flooding, promote the use of sustainable drainage and identify opportunities for collaborative working with other risk management authorities.</p>	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p> <p>Will the option help to minimise flood risk by maintaining and improving the green infrastructure network?</p> <p>Will the option promote the use of sustainable drainage systems?</p> <p>Will the option promote opportunities for collaborative working with other risk management authorities?</p> <p>Will the option affect the risk of flooding to people and/or property?</p> <p>Will the option help to mitigate/reduce the risk of flooding to people and/or property?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The exact location of leakage repairs is not yet known and therefore it cannot be determined whether repair work would be located in areas at risk of flooding. However, it is anticipated that repair works could be scheduled to avoid periods of flooding and would follow appropriate mitigation measures. The repair works are not expected to cause or exacerbate flooding elsewhere.</p> <p>Effects of Operation</p> <p>The option would not cause, exacerbate or alleviate the risk of flooding. A neutral effect has been determined against this objective.</p> <p>Mitigation</p> <p>Depending on the location of leakage repairs, appropriate mitigation measures would be adopted if required to manage the risk of flooding.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>6. To limit the causes and potential consequences of climate change and to adapt to future changes.</p>	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change including to impacts on flood risk and water quality?</p> <p>Will coastal erosion have consequences on the operation of this option now or in the future, taking account of expected climate change sea level rise?</p>	-/?	+	<p>Effects of Construction</p> <p>Construction work would result in an increase in greenhouse gas emissions arising from embodied carbon associated with new pipeline and emissions from plant and vehicle movements to find and repair leaking mains. Embodied and construction carbon emissions are estimated at 214 tonnes CO₂e over 5 years (depending on the length of pipeline repaired) which has been assessed as having a negative effect on this objective, although some uncertainty remains.</p> <p>Effects of Operation</p> <p>The operation of this option would result in a decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and pumping of water. The reduction in greenhouse gas emissions associated with this option is estimated at 368 tonnes CO₂e/a once fully implemented. This has been assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>Length of pipeline repaired is unknown.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>7. To ensure the protection and enhancement of human health.</p>	<p>Will the option ensure the continuity of a safe and secure drinking water supply?</p> <p>Will the option impact on physical health and mental well-being by affecting opportunities for informal outdoor recreation?</p> <p>Will the option maintain surface water and bathing water quality within statutory standards?</p> <p>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</p> <p>Will the option maintain and improve public access to, and enjoyment of, green and blue infrastructure and in doing so help promote healthy lifestyles?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>Vehicle movements and the operation of plant associated with leak detection and repair may affect local air quality and generate noise/vibration disturbance. There may also be disruption to supply. However, such impacts would be temporary and are likely to be managed such that effect on this objective has been assessed as neutral.</p> <p>Effects of Operation</p> <p>No noise, nuisance or disruption are expected during operation of the option. Water savings of up to 4.5 Ml/d would have a positive effect on human health by helping to secure drinking water supply.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>8. To maintain and enhance the economic and social well-being of the local community.</p>	<p>Will the option ensure sufficient infrastructure is in place for predicted population increases?</p> <p>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</p> <p>Will the option help to meet the employment needs of local people?</p> <p>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</p> <p>Will the option improve access to local services and facilities (e.g. sport and recreation)?</p> <p>Will the option contribute to sustaining and growing the local and regional economy?</p> <p>Will the option avoid disruption through effects on the transport network?</p> <p>Will the option be resilient to future changes in resources (both financial and human)?</p> <p>Will the option improve opportunities for social interaction and community cohesion?</p>	-	0	<p>Effects of Construction</p> <p>The costs to carry out additional leakage detection activities and reduce leakage by 4.52 MI/d are estimated at £0.88m over the AMP7 period (years 1 to 5). This represents a relatively low capital investment which is not expected to facilitate substantial job growth nor significantly affect the local economy in terms of supply chain benefits. The repair of infrastructure may result in short term and temporary adverse impacts on the road network (e.g. as a result of increased vehicle movements, road closures/diversions etc.) although such impacts would be temporary. Overall, due to the localised disruption, the option has been assessed as having a negative effect on this objective.</p> <p>Effects of Operation</p> <p>This option would involve 'low' operational expenditure (£2.1m per year on maintenance) which has been assessed against the definitions of significance as being of insufficient scale to have an effect on the local economy (through job creation) and for this reason has been assessed as having a neutral effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>9. To ensure the sustainable and efficient use of water resources.</p>	<p>Will the option lead to reduced leakage from the supply network?</p> <p>Will the option improve efficiency in water consumption?</p>	0	+	<p>Effects of Construction</p> <p>During construction, this option would not affect leakage or water efficiency.</p> <p>Effects of Operation</p> <p>The operation of the option would result in reduced leakage from mains (yield 4.5 Ml/d) and is assessed as having a positive effect on the sustainable use of water resources.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>10. To promote the efficient use of resources.</p>	<p>Will the option seek to minimise the demand for raw materials?</p> <p>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</p> <p>Will the option encourage the use of sustainable design and materials?</p> <p>Will the option reduce or minimise energy use?</p>	-	0	<p>Effects of Construction</p> <p>During construction there would be a minor increase in resource use and construction waste along with fuel usage for vehicles and plant (as indicated by the proxy of carbon). A negative effect on this objective has therefore been identified.</p> <p>Effects of Operation</p> <p>The option would result in lower energy use during operation but would not result in significant changes in other resource use (no waste generated or materials used during operation).</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>11. To conserve and enhance the cultural, historic and industrial heritage resource.</p>	<p>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings?</p> <p>Will the option avoid or minimise damage to archaeologically important sites?</p> <p>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</p> <p>Will the option affect public access to, or enjoyment of, features of cultural heritage?</p> <p>Will the option protect or enhance Welsh language and culture?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>It is possible that the leakage repair works would be located in the curtilage or grounds of heritage assets but this would be temporary and managed through appropriate mitigation and in consequence would have a neutral effect on this objective.</p> <p>Effects of Operation</p> <p>No effects on this objective are expected during the operation of the option.</p> <p>Mitigation</p> <p>Depending on the location of the leakage repair works, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on heritage assets.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>12. To conserve and enhance landscape character.</p>	<p>Will the option avoid adverse effects on, and enhance where possible, the special qualities of protected/designated landscapes (including woodlands) such as National Parks or AONBs?</p> <p>Will the option protect and enhance landscape character, townscape, seascape and green infrastructure?</p> <p>Will the option affect public access to existing landscape features?</p> <p>Will the option minimise adverse visual impacts?</p>	<p>0/?</p>	<p>0</p>	<p>Effects of Construction</p> <p>The repair of pipes could give rise to localised landscape and visual effects. However, given the short term nature of works under this option and focus on underground infrastructure, together with the assumption that appropriate mitigation would be adopted during construction, it is expected that effects on this objective would be neutral (with some uncertainty).</p> <p>Effects of Operation</p> <p>No effect on landscape character is expected during the operation of this option as no above-ground additional infrastructure is required.</p> <p>Mitigation</p> <p>If required, appropriate mitigation would be adopted during construction.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>Summary</p>	<p>Effects of Construction</p> <p>This option would have neutral effects against nine of the twelve objectives during construction although some uncertainty remains against the biodiversity and landscape objectives as the location of leaks to be repaired is unknown. Negative effects are assessed against climate change (due to embodied carbon emissions associated with new pipeline and emissions from plant and vehicle movements to find and repair leaking mains), economic and social wellbeing (repair of infrastructure may result in temporary and localised disruption) and waste and resource use (due to minor increase in resource use and construction waste along with fuel usage for vehicles and plant).</p> <p>Effects of Operation</p> <p>Once operational, the option will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise, and therefore the option has neutral operational effects across the majority (eight out of twelve) of objectives. Positive effects are assessed against water quantity, water resources and climate change objectives (by lowering demand for water abstraction and decreasing the energy use associated with the treatment and pumping of water) and on human health by helping to secure drinking water supply.</p> <p>Mitigation</p> <p>Depending on the location of the leakage repair works appropriate mitigation measures would be adopted during construction to manage the risk of flooding and minimise any potential impacts on sites important to biodiversity, heritage assets and designated landscape sites.</p>			



D22- Pressure Management

This option would establish a programme of further pressure management and control within the current distribution network which aims to reduce the amount of water lost through existing (undetected) leaks and also reduce the rate at which new leaks occur (due to reduced pressure within mains). This will be achieved by optimisation of areas currently controlled by PRVs by use of flow modulating or other more sophisticated pressure control, and by the installation of new PRVs. The assumed number of number of pressure management schemes implemented is 45 over years 1 to 3 of AMP7.

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p>	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and/or link existing habitats?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p> <p>Will the option maintain and enhance the green infrastructure network and the biodiversity it supports?</p> <p>Will the option contribute to the restoration of species that are currently not achieving management objectives?</p> <p>Will the option maintain and enhance ecosystem resilience?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Although it is likely that PRV installation would be undertaken beneath road surfaces or footpaths, the locations are not known and it is therefore possible that works would be undertaken within, or in close proximity to, locations important to biodiversity (and/or designated sites) which, may impact on priority habitats and protected species. However given the short-term and localised nature of the works, a neutral effect on biodiversity is predicted.</p> <p>Effects of Operation</p> <p>Operation of this option would result in reduced leakage from the distribution network and would have no effects biodiversity.</p> <p>Mitigation</p> <p>If required, depending on the location of the construction activity, adverse effects would be reduced where possible using best practice construction techniques.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of PRV installation is not yet known.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.</p>	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p> <p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest (GCR sites, SSSI and RIGS) and features of wider geodiversity interest?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	0	0	<p>Effects of Construction</p> <p>There would be no new land take associated with this option and therefore effects on this objective are expected to be negligible with any soil displaced through excavation returned following the completion of works.</p> <p>Effects of Operation</p> <p>Operation of this option would result in reduced leakage from the distribution network and would have no effects on the appropriate and efficient use of land and soils.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.</p>	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p>	0	+	<p>Effects of Construction</p> <p>Water quantity is unlikely to be affected by the installation of new PRVs and in consequence there would be no effects on this objective.</p> <p>Effects of Operation</p> <p>Operation of this option will result in a reduction in demand for water (2.1 Ml/d) as a result of reduced leakage. This has been assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.</p>	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Water quality is unlikely to be affected by the installation of new PRVs and in consequence there would be no effects on this objective.</p> <p>Effects of Operation</p> <p>Operation of this option will result in a reduction in demand for water (2.1 MI/d) as a result of reduced leakage. This may contribute to improvements in the WFD ecological potential/status of waterbodies, although the yield (2.1 MI/d) is relatively small across the Bristol Water supply area such that the effect on this objective has been assessed as neutral.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>5. To reduce the risk of flooding, promote the use of sustainable drainage and identify opportunities for collaborative working with other risk management authorities.</p>	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p> <p>Will the option help to minimise flood risk by maintaining and improving the green infrastructure network?</p> <p>Will the option promote the use of sustainable drainage systems?</p> <p>Will the option promote opportunities for collaborative working with other risk management authorities?</p> <p>Will the option affect the risk of flooding to people and/or property?</p> <p>Will the option help to mitigate/reduce the risk of flooding to people and/or property?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The exact location of PRV installation is not yet known and therefore it cannot be determined whether work would be located in areas at risk of flooding. However, it is anticipated that works could be scheduled to avoid periods of flooding and construction work is not expected to cause or exacerbate flooding elsewhere.</p> <p>Effects of Operation</p> <p>The option would not be at risk of flooding during operation and would not cause, exacerbate or alleviate the risk of flooding. A neutral effect has been determined against this objective.</p> <p>Mitigation</p> <p>Depending on the location of PRV installation, appropriate mitigation measures would be adopted if required to manage the risk of flooding.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of PRV installation is not yet known.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>6. To limit the causes and potential consequences of climate change and to adapt to future changes.</p>	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change including to impacts on flood risk and water quality?</p> <p>Will coastal erosion have consequences on the operation of this option now or in the future, taking account of expected climate change sea level rise?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>In line with the best practice guidelines, externalities for Pressure Management are assumed to have no carbon impact and is therefore assessed as neutral effect against climate change.</p> <p>Effects of Operation</p> <p>The option will result in a decrease in energy use associated with the treatment and pumping of water, and this is estimated at 170 tonnes CO₂e/a once fully implemented. This is assessed as a positive effect against this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>7. To ensure the protection and enhancement of human health.</p>	<p>Will the option ensure the continuity of a safe and secure drinking water supply?</p> <p>Will the option impact on physical health and mental well-being by affecting opportunities for informal outdoor recreation?</p> <p>Will the option maintain surface water and bathing water quality within statutory standards?</p> <p>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</p> <p>Will the option maintain and improve public access to, and enjoyment of, green and blue infrastructure and in doing so help promote healthy lifestyles?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>Construction activity associated with this option may affect local air quality from vehicle movements, generate noise/vibration disturbance, and cause disruption to water supply. However, such impacts would be temporary and are likely to be managed such that the effect this objective has been assessed as neutral.</p> <p>Effects of Operation</p> <p>This option would help ensure continuity of supply of safe and secure drinking water (yield 2.1 Ml/d), and would not result in adverse effects on human health during operation (no noise, nuisance or disruption expected). Therefore this option is assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>8. To maintain and enhance the economic and social well-being of the local community.</p>	<p>Will the option ensure sufficient infrastructure is in place for predicted population increases?</p> <p>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</p> <p>Will the option help to meet the employment needs of local people?</p> <p>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</p> <p>Will the option improve access to local services and facilities (e.g. sport and recreation)?</p> <p>Will the option contribute to sustaining and growing the local and regional economy?</p> <p>Will the option avoid disruption through effects on the transport network?</p> <p>Will the option be resilient to future changes in resources (both financial and human)?</p> <p>Will the option improve opportunities for social interaction and community cohesion?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The costs to implement the pressure management schemes represents a relatively low capital investment (£1.9m over the 3 years) which is not expected to facilitate substantial job growth nor significantly affect the local economy in terms of supply chain benefits. This option has been assessed as having a neutral effect on this objective.</p> <p>Effects of Operation</p> <p>The option is not anticipated to affect the regional or local economy, or create recreational facilities and for this reason has been assessed as having a neutral effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>9. To ensure the sustainable and efficient use of water resources.</p>	<p>Will the option lead to reduced leakage from the supply network?</p> <p>Will the option improve efficiency in water consumption?</p>	0	+	<p>Effects of Construction</p> <p>During construction, this option would not affect leakage or water efficiency.</p> <p>Effects of Operation</p> <p>The operation of the option would result in reduced leakage from mains (yield 2.1 MI/d) and is assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>10. To promote the efficient use of resources.</p>	<p>Will the option seek to minimise the demand for raw materials?</p> <p>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</p> <p>Will the option encourage the use of sustainable design and materials?</p> <p>Will the option reduce or minimise energy use?</p>	0	0	<p>Effects of Construction</p> <p>During construction activities there would be a minor increase in resource use and construction waste along with fuel usage for vehicles and plant. Given the small scale and short term nature of works of this is assessed as having a neutral effect on this objective.</p> <p>Effects of Operation</p> <p>This option would lead to a reduction in energy use during operation (using operational carbon emissions noted above as a proxy for energy use) but would not result in significant changes in other resource use (no waste generated or materials used during operation).</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>11. To conserve and enhance the cultural, historic and industrial heritage resource.</p>	<p>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings?</p> <p>Will the option avoid or minimise damage to archaeologically important sites?</p> <p>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</p> <p>Will the option affect public access to, or enjoyment of, features of cultural heritage?</p> <p>Will the option protect or enhance Welsh language and culture?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The installation of PRVs may involve carrying out works in the curtilage or grounds of heritage assets but this would be temporary and managed through appropriate mitigation and in consequence would have a neutral effect on this objective.</p> <p>Effects of Operation</p> <p>No effects on built or natural heritage assets are expected during the operation of this option.</p> <p>Mitigation</p> <p>Depending on the location of PRV installation, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on heritage assets.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of PRV installation is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>12. To conserve and enhance landscape character.</p>	<p>Will the option avoid adverse effects on, and enhance where possible, the special qualities of protected/designated landscapes (including woodlands) such as National Parks or AONBs?</p> <p>Will the option protect and enhance landscape character, townscape, seascape and green infrastructure?</p> <p>Will the option affect public access to existing landscape features?</p> <p>Will the option minimise adverse visual impacts?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Given the small scale and short term nature of works under this option and focus on underground infrastructure, together with the assumption that appropriate mitigation would be adopted during construction, it is expected that effects on this objective would be neutral.</p> <p>Effects of Operation</p> <p>No additional above-ground infrastructure is required for the operation of this option. This is assessed as having neutral effect on this objective.</p> <p>Mitigation</p> <p>Depending on the location of PRV installation, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on designated landscape sites.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of PRV installation is not yet known.</p>
<p>Summary</p>	<p>Effects of Construction</p> <p>Neutral effects have been assessed against all objectives during construction due to the small scale and short term nature of works.</p> <p>Effects of Operation</p> <p>Once operational, the option will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise, and therefore the option has neutral operational effects across the majority (eight out of twelve) of objectives. Positive effects are assessed against water quantity, water resources and climate change objectives (by lowering demand for water abstraction and decreasing the energy use associated with the treatment and pumping of water) and on human health by helping to secure drinking water supply.</p> <p>Mitigation</p> <p>Depending on the location of the construction activity appropriate mitigation measures would be adopted during construction to manage the risk of flooding and minimise any potential impacts on sites important to biodiversity, heritage assets and designated landscape sites.</p>			

P20 – Reduced leakage from raw water mains

This option would address leakage from raw water mains. It is assumed that all raw water mains within the Bristol Water supply area (94 km) would be investigated for potential leakage. The work would include detection of leakage via metering (24 sites in total) and replacement/repair of the mains network. It is assumed that 1% (0.94km) of the network would be replaced each year, over a 5 year period.

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p>	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and/or link existing habitats?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p> <p>Will the option maintain and enhance the green infrastructure network and the biodiversity it supports?</p> <p>Will the option contribute to the restoration of species that are currently not achieving management objectives?</p> <p>Will the option maintain and enhance ecosystem resilience?</p>	<p>0/?</p>	<p>0</p>	<p>Effects of Construction</p> <p>Construction activity associated with replacing trunk mains is generally not expected to significantly affect biodiversity. It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. Overall a neutral effect on biodiversity is identified although some uncertainty remains at this stage.</p> <p>Effects of Operation</p> <p>Once mains have been replaced, the option is not expected to have any effects on biodiversity</p> <p>Mitigation</p> <p>If required, depending on the location of the construction activity, adverse effects would be avoided using best practice construction techniques.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of the replacement of trunk mains is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.</p>	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p> <p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest (GCR sites, SSSI and RIGS) and features of wider geodiversity interest?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	0	0	<p>Effects of Construction</p> <p>There would be no new land take associated with this option and therefore effects on this objective are expected to be negligible with any soil displaced through excavation returned following the completion of works.</p> <p>Effects of Operation</p> <p>Operation of this option would result in reduced leakage from the distribution network and would have no effects on the appropriate and efficient use of land and soils.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.</p>	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p>	0	+	<p>Effects of Construction</p> <p>River flows and groundwater levels are unlikely to be affected by the process of replacing and repairing trunk mains, thus there would be no effect on water quantity.</p> <p>Effects of Operation</p> <p>Operation of this option would result in less water being lost due to leakage (yield 3.9-5.5 Ml/d) and therefore lower demand for water abstraction. This has been assessed as a positive effect on water quantity.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.</p>	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Water quality is unlikely to be affected by the replacement and repair of trunk mains and in consequence there would be no effects on this objective.</p> <p>Effects of Operation</p> <p>Operation of this option will result in a reduction in demand for water (3.9-5.5 MI/d) as a result of reduced leakage. This may contribute to improvements in the WFD ecological potential/status of waterbodies, although the yield (up to 5.5 MI/d) is relatively small across the Bristol Water supply area such that the effect on this objective has been assessed as neutral.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>5. To reduce the risk of flooding, promote the use of sustainable drainage and identify opportunities for collaborative working with other risk management authorities.</p>	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p> <p>Will the option help to minimise flood risk by maintaining and improving the green infrastructure network?</p> <p>Will the option promote the use of sustainable drainage systems?</p> <p>Will the option promote opportunities for collaborative working with other risk management authorities?</p> <p>Will the option affect the risk of flooding to people and/or property?</p> <p>Will the option help to mitigate/reduce the risk of flooding to people and/or property?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The location of trunk mains to be replaced or repaired is not yet known and therefore it cannot be determined whether replacement work would be located in areas at risk of flooding. However, it is assumed that works could be scheduled to avoid periods of flooding and construction work is not expected to cause or exacerbate flooding</p> <p>Effects of Operation</p> <p>There would be no operational effect on the risk of flooding as the trunk mains are buried.</p> <p>Mitigation</p> <p>Depending on the location of trunk mains to be replaced or repaired, appropriate mitigation measures would be adopted if required to manage the risk of flooding.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of trunk mains to be replaced or repaired is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>6. To limit the causes and potential consequences of climate change and to adapt to future changes.</p>	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change including to impacts on flood risk and water quality?</p> <p>Will coastal erosion have consequences on the operation of this option now or in the future, taking account of expected climate change sea level rise?</p>	<p>--/?</p>	<p>+/?</p>	<p>Effects of Construction</p> <p>There would be embodied and construction carbon emissions as a result of trunk mains replacement and repair, arising from embodied carbon associated with new mains and emissions from plant and vehicle movements. The carbon emissions associated with this option are estimated to be a maximum of 1,236 tCO₂ (depending on the length of pipeline replaced) which has been assessed as having a significant negative effect on climate change, although some uncertainty remains (as the figure may be lower depending on the nature and extent of the works undertaken).</p> <p>Effects of Operation</p> <p>The operation of this option would result in a decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and to some extent, pumping of water. The reduction in greenhouse gas emissions associated with this option is, however, uncertain.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The reduction in greenhouse gas emissions associated with this option is unknown.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>7. To ensure the protection and enhancement of human health.</p>	<p>Will the option ensure the continuity of a safe and secure drinking water supply?</p> <p>Will the option impact on physical health and mental well-being by affecting opportunities for informal outdoor recreation?</p> <p>Will the option maintain surface water and bathing water quality within statutory standards?</p> <p>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</p> <p>Will the option maintain and improve public access to, and enjoyment of, green and blue infrastructure and in doing so help promote healthy lifestyles?</p>	-/?	+	<p>Effects of Construction</p> <p>The replacement and repair of trunk mains would require excavation and construction work. Vehicle movements and the operation of plant associated with pipeline replacement may affect local air quality and generate noise/vibration disturbance. There may also be disruption to water supply. However these impacts would be temporary and are likely to be managed. Overall, a negative effect has been identified in respect of this objective, as the scale and location of such effects is uncertain at this stage.</p> <p>Effects of Operation</p> <p>This option would help ensure continuity of supply of safe and secure drinking water, and would not result in adverse effects on human health during operation (no noise, nuisance or disruption expected). However water savings up to 5.5 Ml/d would have a positive effect on human health and the wellbeing of the local community.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>8. To maintain and enhance the economic and social well-being of the local community.</p>	<p>Will the option ensure sufficient infrastructure is in place for predicted population increases?</p> <p>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</p> <p>Will the option help to meet the employment needs of local people?</p> <p>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</p> <p>Will the option improve access to local services and facilities (e.g. sport and recreation)?</p> <p>Will the option contribute to sustaining and growing the local and regional economy?</p> <p>Will the option avoid disruption through effects on the transport network?</p> <p>Will the option be resilient to future changes in resources (both financial and human)?</p> <p>Will the option improve opportunities for social interaction and community cohesion?</p>	<p style="text-align: center;">+/-</p>	<p style="text-align: center;">+</p>	<p>Effects of Construction</p> <p>Capital expenditure associated with this option would be circa £5.25m which would generate positive economic effects such as jobs creation and supply chain benefits. However, during replacement works, there is the potential for localised disruption to traffic, particularly along any sections of pipeline requiring work along or across roads. Overall, this option is considered to have a mixed positive and negative effect with respect to Objective 8, although some uncertainty remains.</p> <p>Effects of Operation</p> <p>The option would help ensure continuity of supply of safe and secure drinking water and would provide a yield of 3.9-5.5 MI/d. This is assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>9. To ensure the sustainable and efficient use of water resources.</p>	<p>Will the option lead to reduced leakage from the supply network?</p> <p>Will the option improve efficiency in water consumption?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>During construction, this option would not affect leakage or water efficiency.</p> <p>Effects of Operation</p> <p>This option would result in reduced leakage from trunk mains which is assessed as having a positive effect on the sustainable use of water resources.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>10. To promote the efficient use of resources.</p>	<p>Will the option seek to minimise the demand for raw materials?</p> <p>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</p> <p>Will the option encourage the use of sustainable design and materials?</p> <p>Will the option reduce or minimise energy use?</p>	<p>--/?</p>	<p>+</p>	<p>Effects of Construction</p> <p>Depending on the extent of pipeline replacement, there could be an increase in resource use and waste. As noted against Objective 6, Carbon emissions are estimated to be a maximum of 1,236 tCO₂ (depending on the length of pipeline replaced) and have been assessed as having a significant negative effect on climate change (with some residual uncertainty, given actual emissions will depend on the actual works that take place). Using this as an indication of scale, a significant negative effect on in resource use and waste has therefore been identified although some uncertainty remains.</p> <p>Effects of Operation</p> <p>This option would result in reduced leakage from mains, which is assessed as having a positive effect on waste and resource use.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The extent of the trunks repair and replacement works is unknown.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>11. To conserve and enhance the cultural, historic and industrial heritage resource.</p>	<p>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings?</p> <p>Will the option avoid or minimise damage to archaeologically important sites?</p> <p>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</p> <p>Will the option affect public access to, or enjoyment of, features of cultural heritage?</p> <p>Will the option protect or enhance Welsh language and culture?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The replacement and repair of trunk mains may involve carrying out works in the curtilage or grounds of heritage assets; however, this would be temporary and would only affect previously disturbed land. It is also assumed that any effects could be managed through appropriate mitigation. A neutral effect on this objective has been assessed.</p> <p>Effects of Operation</p> <p>No effects on built or natural heritage assets are expected during the operation of this option.</p> <p>Mitigation</p> <p>Depending on the location of the trunk mains to be replaced and repaired, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on heritage assets.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of trunk mains to be replaced and repaired is not yet known.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>12. To conserve and enhance landscape character.</p>	<p>Will the option avoid adverse effects on, and enhance where possible, the special qualities of protected/designated landscapes (including woodlands) such as National Parks or AONBs?</p> <p>Will the option protect and enhance landscape character, townscape, seascape and green infrastructure?</p> <p>Will the option affect public access to existing landscape features?</p> <p>Will the option minimise adverse visual impacts?</p>	-/?	0	<p>Effects of Construction</p> <p>Replacement and repair works under this option could involve construction work which gives rise to localised landscape and visual effects. However, any impacts would be temporary with land likely to be returned to a pre-development state within a year (depending on the timing of works). Overall, a minor negative effect has been identified in respect of landscape (with some uncertainty).</p> <p>Effects of Operation</p> <p>No additional above-ground infrastructure is required for the operation of this option. This is assessed as having neutral effect on this objective.</p> <p>Mitigation</p> <p>Depending on the location of mains replacement and repair works, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on designated landscape sites.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of trunk mains to be replaced and repaired is not yet known.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>Summary</p>	<p>Effects of Construction</p> <p>This option would have neutral effects against seven of the twelve objectives during construction. Some uncertainty remains against the biodiversity objective as the location of mains replacement/repair work is unknown.</p> <p>Significant negative effects are assessed against climate change (due to embodied carbon emissions associated with new mains and emissions from plant and vehicle movements to replace and repair leaking mains), and waste and resource use (due to increase in resource use and construction waste along with fuel usage for vehicles and plant). Minor negative effects are assessed against human health (due to impact local air quality and generation of noise/vibration disturbance by vehicle movements and the operation of plant) and landscape (due to potential for localised landscape and visual effects). Mixed minor positive and minor negative effects are assessed against economic and social wellbeing as the option would generate positive effects such as jobs creation and supply chain benefits but would also generate negative effects from potential for localised disruption to traffic.</p> <p>Effects of Operation</p> <p>Once operational, the option will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise. Positive effects are assessed against six (water quantity, climate change, human health, economic and social wellbeing, water resources and waste and resource use) of the twelve objectives by lowering demand for water abstraction. Neutral operational effects are assessed against the remaining six objectives.</p> <p>Mitigation</p> <p>Depending on the location of the trunk mains replacement and repair works appropriate mitigation measures would be adopted during construction to manage the risk of flooding and minimise any potential impacts on sites important to biodiversity, heritage assets and designated landscape sites.</p>			



Appendix G Revised Preferred Options Assessment Matrices

This appendix presents the findings of the detailed assessments of the revised preferred options.

A list of the preferred options is provided below:

Ref	Option	Yield (Ml/d)
Distribution Options		
D21.1	Active Leakage Control	2.83
D21.2	Active Leakage Control	1.5
P20	Reduced leakage from raw water mains	5.5

The following matrices present the findings of the assessment.

Key to Assessments

Score	Description	Symbol
Significant Positive Effect	Significant positive effect of the Water Resources Management Plan option on this objective	++
Minor Positive Effect	Positive effect of the Water Resources Management Plan option on this objective	+
Neutral	Overall neutral effect of the Water Resources Management Plan option on this objective	0
Minor Negative Effect	Negative effect of the Water Resources Management Plan option on this objective	-
Significant Negative Effect	Significant negative effect of the Water Resources Management Plan option on this objective	--
No Relationship	There is no clear relationship between the Water Resources Management Plan option and the achievement of the objective or the relationship is negligible.	~
Uncertain	The Water Resources Management Plan option has an uncertain relationship to the objective or the relationship is dependent on the way in which the aspect is managed. In addition, insufficient information may be available to enable an assessment to be made.	?
Mixed Effect	Mixed positive and negative effect of the Water Resources Management Plan option on this objective	+/-



D21.1 - Active Leakage Control

This option covers the continuation of the current leakage detection find and fix policy during AMP7. The methods of this form of leakage control include using leak noise detection equipment and zonal step tests to isolate areas of leakage and then repair. This will reduce the length of time that leaks run, which will reduce leakage. The option would have a yield of 2.83 MI/d.

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p>	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and/or link existing habitats?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p> <p>Will the option maintain and enhance the green infrastructure network and the biodiversity it supports?</p> <p>Will the option contribute to the restoration of species that are currently not achieving management objectives?</p> <p>Will the option maintain and enhance ecosystem resilience?</p>	0/?	0	<p>Effects of Construction</p> <p>It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. This option would have a neutral impact on the biodiversity objective but some uncertainty remains as the location of leaks to be repaired is unknown.</p> <p>Effects of Operation</p> <p>Once a leak has been repaired, this option is not expected to have any effects on the biodiversity objective.</p> <p>Mitigation</p> <p>If required, depending on the location of the repair works, adverse effects would be reduced where possible using best practice construction techniques</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The location of leaks to be repaired is unknown.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.</p>	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p> <p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest (GCR sites, SSSI and RIGS) and features of wider geodiversity interest?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	0	0	<p>Effects of Construction</p> <p>There would be no new land take associated with the option and therefore effects on this objective are expected to be negligible with any soil displaced through excavation returned following the completion of works.</p> <p>Effects of Operation</p> <p>Once a leak has been repaired, the option is not expected to have any effects on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.</p>	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p>	0	+	<p>Effects of Construction</p> <p>Water quantity is unlikely to be affected by the process of leakage repair and in consequence there would be no effects against this objective.</p> <p>Effects of Operation</p> <p>The option would result in a reduction in demand for water (2.83 Ml/d) as a result of reduced leakage. This has been assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.</p>	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Water quantity is unlikely to be affected by the process of leakage repair and in consequence there would be no effects against this objective.</p> <p>Effects of Operation</p> <p>There is the potential for the option to contribute to improvements in the WFD ecological potential/status of waterbodies (through reduced demand). However the yield (2.83 Ml/d) is relatively small across the Bristol Water supply area such that effect on this objective has been assessed as neutral.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>5. To reduce the risk of flooding, promote the use of sustainable drainage and identify opportunities for collaborative working with other risk management authorities.</p>	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p> <p>Will the option help to minimise flood risk by maintaining and improving the green infrastructure network?</p> <p>Will the option promote the use of sustainable drainage systems?</p> <p>Will the option promote opportunities for collaborative working with other risk management authorities?</p> <p>Will the option affect the risk of flooding to people and/or property?</p> <p>Will the option help to mitigate/reduce the risk of flooding to people and/or property?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The exact location of leakage repairs is not yet known and therefore it cannot be determined whether repair work would be located in areas at risk of flooding. However, it is anticipated that repair works could be scheduled to avoid periods of flooding and would follow appropriate mitigation measures. The repair works are not expected to cause or exacerbate flooding elsewhere.</p> <p>Effects of Operation</p> <p>The option would not cause, exacerbate or alleviate the risk of flooding. A neutral effect has been determined against this objective.</p> <p>Mitigation</p> <p>Depending on the location of leakage repairs, appropriate mitigation measures would be adopted if required to manage the risk of flooding.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>6. To limit the causes and potential consequences of climate change and to adapt to future changes.</p>	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change including to impacts on flood risk and water quality?</p> <p>Will coastal erosion have consequences on the operation of this option now or in the future, taking account of expected climate change sea level rise?</p>	-/?	+	<p>Effects of Construction</p> <p>Construction work would result in an increase in greenhouse gas emissions arising from embodied carbon associated with new pipeline and emissions from plant and vehicle movements to find and repair leaking mains. Embodied and construction carbon emissions are estimated at 134 tonnes CO₂e over 5 years (depending on the length of pipeline repaired) which has been assessed as having a negative effect on this objective, although some uncertainty remains.</p> <p>Effects of Operation</p> <p>The operation of this option would result in a decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and pumping of water. The reduction in greenhouse gas emissions associated with this option is estimated at 234.5 tonnes CO₂e/a once fully implemented. This has been assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>Length of pipeline repaired is unknown.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>7. To ensure the protection and enhancement of human health.</p>	<p>Will the option ensure the continuity of a safe and secure drinking water supply?</p> <p>Will the option impact on physical health and mental well-being by affecting opportunities for informal outdoor recreation?</p> <p>Will the option maintain surface water and bathing water quality within statutory standards?</p> <p>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</p> <p>Will the option maintain and improve public access to, and enjoyment of, green and blue infrastructure and in doing so help promote healthy lifestyles?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>Vehicle movements and the operation of plant associated with leak detection and repair may affect local air quality and generate noise/vibration disturbance. There may also be disruption to supply. However, such impacts would be temporary and are likely to be managed such that effect on this objective has been assessed as neutral.</p> <p>Effects of Operation</p> <p>No noise, nuisance or disruption are expected during operation of the option. Water savings of up to 2.83 Ml/d would have a positive effect on human health by helping to secure drinking water supply.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>8. To maintain and enhance the economic and social well-being of the local community.</p>	<p>Will the option ensure sufficient infrastructure is in place for predicted population increases?</p> <p>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</p> <p>Will the option help to meet the employment needs of local people?</p> <p>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</p> <p>Will the option improve access to local services and facilities (e.g. sport and recreation)?</p> <p>Will the option contribute to sustaining and growing the local and regional economy?</p> <p>Will the option avoid disruption through effects on the transport network?</p> <p>Will the option be resilient to future changes in resources (both financial and human)?</p> <p>Will the option improve opportunities for social interaction and community cohesion?</p>	-	0	<p>Effects of Construction</p> <p>The costs to carry out additional leakage detection activities and reduce leakage by 2.83 Ml/d are estimated at £0.3m over the AMP7 period (years 1 to 5). This represents a very low capital investment which is not expected to facilitate substantial job growth nor significantly affect the local economy in terms of supply chain benefits. The repair of infrastructure may result in short term and temporary adverse impacts on the road network (e.g. as a result of increased vehicle movements, road closures/diversions etc.) although such impacts would be temporary. Overall, due to the localised disruption, the option has been assessed as having a negative effect on this objective.</p> <p>Effects of Operation</p> <p>This option would involve 'low' operational expenditure (£0.7m on maintenance over years 1 - 5) which has been assessed against the definitions of significance as being of insufficient scale to have an effect on the local economy (through job creation) and for this reason has been assessed as having a neutral effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>



Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>9. To ensure the sustainable and efficient use of water resources.</p>	<p>Will the option lead to reduced leakage from the supply network?</p> <p>Will the option improve efficiency in water consumption?</p>	0	+	<p>Effects of Construction</p> <p>During construction, this option would not affect leakage or water efficiency.</p> <p>Effects of Operation</p> <p>The operation of the option would result in reduced leakage from mains (yield 2.83 MI/d) and is assessed as having a positive effect on the sustainable use of water resources.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>10. To promote the efficient use of resources.</p>	<p>Will the option seek to minimise the demand for raw materials?</p> <p>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</p> <p>Will the option encourage the use of sustainable design and materials?</p> <p>Will the option reduce or minimise energy use?</p>	-	0	<p>Effects of Construction</p> <p>During construction there would be a minor increase in resource use and construction waste along with fuel usage for vehicles and plant (as indicated by the proxy of carbon). A negative effect on this objective has therefore been identified.</p> <p>Effects of Operation</p> <p>The option would result in lower energy use during operation but would not result in significant changes in other resource use (no waste generated or materials used during operation).</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>11. To conserve and enhance the cultural, historic and industrial heritage resource.</p>	<p>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings?</p> <p>Will the option avoid or minimise damage to archaeologically important sites?</p> <p>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</p> <p>Will the option affect public access to, or enjoyment of, features of cultural heritage?</p> <p>Will the option protect or enhance Welsh language and culture?</p>	0	0	<p>Effects of Construction</p> <p>It is possible that the leakage repair works would be located in the curtilage or grounds of heritage assets but this would be temporary and managed through appropriate mitigation and in consequence would have a neutral effect on this objective.</p> <p>Effects of Operation</p> <p>No effects on this objective are expected during the operation of the option.</p> <p>Mitigation</p> <p>Depending on the location of the leakage repair works, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on heritage assets.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>
<p>12. To conserve and enhance landscape character.</p>	<p>Will the option avoid adverse effects on, and enhance where possible, the special qualities of protected/designated landscapes (including woodlands) such as National Parks or AONBs?</p> <p>Will the option protect and enhance landscape character, townscape, seascape and green infrastructure?</p> <p>Will the option affect public access to existing landscape features?</p> <p>Will the option minimise adverse visual impacts?</p>	0/?	0	<p>Effects of Construction</p> <p>The repair of pipes could give rise to localised landscape and visual effects. However, given the short term nature of works under this option and focus on underground infrastructure, together with the assumption that appropriate mitigation would be adopted during construction, it is expected that effects on this objective would be neutral (with some uncertainty).</p> <p>Effects of Operation</p> <p>No effect on landscape character is expected during the operation of this option as no above-ground additional infrastructure is required.</p> <p>Mitigation</p> <p>If required, appropriate mitigation would be adopted during construction.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
Summary	<p>Effects of Construction</p> <p>This option would have neutral effects against nine of the twelve objectives during construction although some uncertainty remains against the biodiversity and landscape objectives as the location of leaks to be repaired is unknown. Negative effects are assessed against climate change (due to embodied carbon emissions associated with new pipeline and emissions from plant and vehicle movements to find and repair leaking mains), economic and social wellbeing (repair of infrastructure may result in temporary and localised disruption) and waste and resource use (due to minor increase in resource use and construction waste along with fuel usage for vehicles and plant).</p> <p>Effects of Operation</p> <p>Once operational, the option will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise, and therefore the option has neutral operational effects across the majority (eight out of twelve) of objectives. Positive effects are assessed against water quantity, water resources and climate change objectives (by lowering demand for water abstraction and decreasing the energy use associated with the treatment and pumping of water) and on human health by helping to secure drinking water supply.</p> <p>Mitigation</p> <p>Depending on the location of the leakage repair works appropriate mitigation measures would be adopted during construction to manage the risk of flooding and minimise any potential impacts on sites important to biodiversity, heritage assets and designated landscape sites.</p>			

D21- Active Leakage Control

This option covers the continuation of further leakage detection from 2029/30 onwards. The option would have a yield of an additional 0.5MI/d (and so cumulatively, in conjunction with D21.1, will be 3.33 MI/d). It then includes further leakage detection from 2034/35 onwards. The option would have a yield of an additional 1MI/d (and so cumulatively, in conjunction with D21.1, will be 4.33 MI/d).

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p>	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and/or link existing habitats?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p> <p>Will the option maintain and enhance the green infrastructure network and the biodiversity it supports?</p> <p>Will the option contribute to the restoration of species that are currently not achieving management objectives?</p> <p>Will the option maintain and enhance ecosystem resilience?</p>	0/?	0	<p>Effects of Construction</p> <p>It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. This option would have a neutral impact on the biodiversity objective but some uncertainty remains as the location of leaks to be repaired is unknown.</p> <p>Effects of Operation</p> <p>Once a leak has been repaired, this option is not expected to have any effects on the biodiversity objective.</p> <p>Mitigation</p> <p>If required, depending on the location of the repair works, adverse effects would be reduced where possible using best practice construction techniques</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The location of leaks to be repaired is unknown.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.</p>	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p> <p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest (GCR sites, SSSI and RIGS) and features of wider geodiversity interest?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>There would be no new land take associated with the option and therefore effects on this objective are expected to be negligible with any soil displaced through excavation returned following the completion of works.</p> <p>Effects of Operation</p> <p>Once a leak has been repaired, the option is not expected to have any effects on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.</p>	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>Water quantity is unlikely to be affected by the process of leakage repair and in consequence there would be no effects against this objective.</p> <p>Effects of Operation</p> <p>The option would result in a reduction in demand for water (1.5 MI/d) as a result of reduced leakage. This has been assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.</p>	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Water quantity is unlikely to be affected by the process of leakage repair and in consequence there would be no effects against this objective.</p> <p>Effects of Operation</p> <p>There is the potential for the option to contribute to improvements in the WFD ecological potential/status of waterbodies (through reduced demand). However the yield (1.5 MI/d) is relatively small across the Bristol Water supply area such that effect on this objective has been assessed as neutral.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>5. To reduce the risk of flooding, promote the use of sustainable drainage and identify opportunities for collaborative working with other risk management authorities.</p>	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p> <p>Will the option help to minimise flood risk by maintaining and improving the green infrastructure network?</p> <p>Will the option promote the use of sustainable drainage systems?</p> <p>Will the option promote opportunities for collaborative working with other risk management authorities?</p> <p>Will the option affect the risk of flooding to people and/or property?</p> <p>Will the option help to mitigate/reduce the risk of flooding to people and/or property?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The exact location of leakage repairs is not yet known and therefore it cannot be determined whether repair work would be located in areas at risk of flooding. However, it is anticipated that repair works could be scheduled to avoid periods of flooding and would follow appropriate mitigation measures. The repair works are not expected to cause or exacerbate flooding elsewhere.</p> <p>Effects of Operation</p> <p>The option would not cause, exacerbate or alleviate the risk of flooding. A neutral effect has been determined against this objective.</p> <p>Mitigation</p> <p>Depending on the location of leakage repairs, appropriate mitigation measures would be adopted if required to manage the risk of flooding.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>6. To limit the causes and potential consequences of climate change and to adapt to future changes.</p>	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change including to impacts on flood risk and water quality?</p> <p>Will coastal erosion have consequences on the operation of this option now or in the future, taking account of expected climate change sea level rise?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>Construction work would result in an increase in greenhouse gas emissions arising from embodied carbon associated with new pipeline and emissions from plant and vehicle movements to find and repair leaking mains. Embodied and construction carbon emissions are estimated at 71 tonnes CO₂e over 5 years (depending on the length of pipeline repaired) which has been assessed as being too low to have an effect (consistent with the definitions of significance).</p> <p>Effects of Operation</p> <p>The operation of this option would result in a decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and pumping of water. The reduction in greenhouse gas emissions associated with this option is estimated at 122.5 tonnes CO₂e/a once fully implemented. This has been assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>Length of pipeline repaired is unknown.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>7. To ensure the protection and enhancement of human health.</p>	<p>Will the option ensure the continuity of a safe and secure drinking water supply?</p> <p>Will the option impact on physical health and mental well-being by affecting opportunities for informal outdoor recreation?</p> <p>Will the option maintain surface water and bathing water quality within statutory standards?</p> <p>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</p> <p>Will the option maintain and improve public access to, and enjoyment of, green and blue infrastructure and in doing so help promote healthy lifestyles?</p>	0	+	<p>Effects of Construction</p> <p>Vehicle movements and the operation of plant associated with leak detection and repair may affect local air quality and generate noise/vibration disturbance. There may also be disruption to supply. However, such impacts would be temporary and are likely to be managed such that effect on this objective has been assessed as neutral.</p> <p>Effects of Operation</p> <p>No noise, nuisance or disruption are expected during operation of the option. Water savings of up to 1.5 Ml/d would have a positive effect on human health by helping to secure drinking water supply.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>8. To maintain and enhance the economic and social well-being of the local community.</p>	<p>Will the option ensure sufficient infrastructure is in place for predicted population increases?</p> <p>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</p> <p>Will the option help to meet the employment needs of local people?</p> <p>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</p> <p>Will the option improve access to local services and facilities (e.g. sport and recreation)?</p> <p>Will the option contribute to sustaining and growing the local and regional economy?</p> <p>Will the option avoid disruption through effects on the transport network?</p> <p>Will the option be resilient to future changes in resources (both financial and human)?</p> <p>Will the option improve opportunities for social interaction and community cohesion?</p>	-	0	<p>Effects of Construction</p> <p>The costs to carry out additional leakage detection activities and reduce leakage by 1.5 Ml/d are estimated at £0.2m over the AMP8 and AMP9 periods. This represents a low capital investment which is not expected to facilitate substantial job growth nor significantly affect the local economy in terms of supply chain benefits. The repair of infrastructure may result in short term and temporary adverse impacts on the road network (e.g. as a result of increased vehicle movements, road closures/diversions etc.) although such impacts would be temporary. Overall, due to the localised disruption, the option has been assessed as having a negative effect on this objective.</p> <p>Effects of Operation</p> <p>This option would involve 'low' operational expenditure (£0.4m during AMP8 and £0.5m during AMP9 on maintenance) which has been assessed against the definitions of significance as being of insufficient scale to have an effect on the local economy (through job creation) and for this reason has been assessed as having a neutral effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>9. To ensure the sustainable and efficient use of water resources.</p>	<p>Will the option lead to reduced leakage from the supply network?</p> <p>Will the option improve efficiency in water consumption?</p>	0	+	<p>Effects of Construction</p> <p>During construction, this option would not affect leakage or water efficiency.</p> <p>Effects of Operation</p> <p>The operation of the option would result in reduced leakage from mains (yield 4.5 MI/d) and is assessed as having a positive effect on the sustainable use of water resources.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>10. To promote the efficient use of resources.</p>	<p>Will the option seek to minimise the demand for raw materials?</p> <p>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</p> <p>Will the option encourage the use of sustainable design and materials?</p> <p>Will the option reduce or minimise energy use?</p>	0	0	<p>Effects of Construction</p> <p>During construction there would be a very minor increase in resource use and construction waste along with fuel usage for vehicles and plant; however, as indicated by the proxy of carbon, is considered insufficient to have an effect. A neutral effect on this objective has therefore been identified.</p> <p>Effects of Operation</p> <p>The option would result in lower energy use during operation but would not result in significant changes in other resource use (no waste generated or materials used during operation).</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>11. To conserve and enhance the cultural, historic and industrial heritage resource.</p>	<p>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings?</p> <p>Will the option avoid or minimise damage to archaeologically important sites?</p> <p>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</p> <p>Will the option affect public access to, or enjoyment of, features of cultural heritage?</p> <p>Will the option protect or enhance Welsh language and culture?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>It is possible that the leakage repair works would be located in the curtilage or grounds of heritage assets but this would be temporary and managed through appropriate mitigation and in consequence would have a neutral effect on this objective.</p> <p>Effects of Operation</p> <p>No effects on this objective are expected during the operation of the option.</p> <p>Mitigation</p> <p>Depending on the location of the leakage repair works, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on heritage assets.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>
<p>12. To conserve and enhance landscape character.</p>	<p>Will the option avoid adverse effects on, and enhance where possible, the special qualities of protected/designated landscapes (including woodlands) such as National Parks or AONBs?</p> <p>Will the option protect and enhance landscape character, townscape, seascape and green infrastructure?</p> <p>Will the option affect public access to existing landscape features?</p> <p>Will the option minimise adverse visual impacts?</p>	<p>0/?</p>	<p>0</p>	<p>Effects of Construction</p> <p>The repair of pipes could give rise to localised landscape and visual effects. However, given the short term nature of works under this option and focus on underground infrastructure, together with the assumption that appropriate mitigation would be adopted during construction, it is expected that effects on this objective would be neutral (with some uncertainty).</p> <p>Effects of Operation</p> <p>No effect on landscape character is expected during the operation of this option as no above-ground additional infrastructure is required.</p> <p>Mitigation</p> <p>If required, appropriate mitigation would be adopted during construction.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of leakage repairs is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>Summary</p>	<p>Effects of Construction</p> <p>This option would have neutral effects against nine of the twelve objectives during construction although some uncertainty remains against the biodiversity and landscape objectives as the location of leaks to be repaired is unknown. Negative effects are assessed against economic and social wellbeing (repair of infrastructure may result in temporary and localised disruption) and waste and resource use (due to minor increase in resource use and construction waste along with fuel usage for vehicles and plant).</p> <p>Effects of Operation</p> <p>Once operational, the option will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise, and therefore the option has neutral operational effects across the majority (eight out of twelve) of objectives. Positive effects are assessed against water quantity, water resources and climate change objectives (by lowering demand for water abstraction and decreasing the energy use associated with the treatment and pumping of water) and on human health by helping to secure drinking water supply.</p> <p>Mitigation</p> <p>Depending on the location of the leakage repair works appropriate mitigation measures would be adopted during construction to manage the risk of flooding and minimise any potential impacts on sites important to biodiversity, heritage assets and designated landscape sites.</p>			

P20 – Reduced leakage from raw water mains

This option would address leakage from raw water mains. It is assumed that all raw water mains within the Bristol Water supply area (94 km) would be investigated for potential leakage. The work would include detection of leakage via metering (24 sites in total) and replacement/repair of the mains network. It is assumed that 1% (0.94km) of the network would be replaced each year, over a 5 year period.

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>1. To protect and enhance biodiversity, key habitats and species ecological functions, capacity and habitat connectivity.</p>	<p>Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)?</p> <p>Will the option protect and enhance non-designated sites and local biodiversity?</p> <p>Will the option provide opportunities for new habitat creation or restoration and/or link existing habitats?</p> <p>Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity?</p> <p>Will the option protect, and enhance where appropriate, coastal and marine habitats and species?</p> <p>Will the option prevent the spread/introduction of invasive non-native species?</p> <p>Will the option maintain and enhance the green infrastructure network and the biodiversity it supports?</p> <p>Will the option contribute to the restoration of species that are currently not achieving management objectives?</p> <p>Will the option maintain and enhance ecosystem resilience?</p>	<p>0/?</p>	<p>0</p>	<p>Effects of Construction</p> <p>Construction activity associated with replacing trunk mains is generally not expected to significantly affect biodiversity. It is possible that works would be undertaken within or in close proximity to locations important for biodiversity (including designated sites) which may impact on priority habitats and protected species (through short term, temporary disturbance caused by excavation) in these instances. However, areas affected will have been previously disturbed and it would be expected that adverse effects would be reduced where possible using best practice construction techniques. Overall a neutral effect on biodiversity is identified although some uncertainty remains at this stage.</p> <p>Effects of Operation</p> <p>Once mains have been replaced, the option is not expected to have any effects on biodiversity</p> <p>Mitigation</p> <p>If required, depending on the location of the construction activity, adverse effects would be avoided using best practice construction techniques.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of the replacement of trunk mains is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>2. To ensure the appropriate and efficient use of land and protect and enhance soil quality and geodiversity.</p>	<p>Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation?</p> <p>Will the option utilise previously developed land?</p> <p>Will the option protect and enhance protected sites designated for their geological interest (GCR sites, SSSI and RIGS) and features of wider geodiversity interest?</p> <p>Will the option minimise the loss of best and most versatile agricultural land?</p> <p>Will the option minimise conflict with existing land use patterns?</p> <p>Will the option minimise land contamination?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>There would be no new land take associated with this option and therefore effects on this objective are expected to be negligible with any soil displaced through excavation returned following the completion of works.</p> <p>Effects of Operation</p> <p>Operation of this option would result in reduced leakage from the distribution network and would have no effects on the appropriate and efficient use of land and soils.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>3. To protect and enhance surface and ground water levels and flows and ensure sustainable water resource management.</p>	<p>Will the option minimise the demand for water resources?</p> <p>Will the option result in changes to river flows?</p> <p>Will the option result in changes to groundwater levels?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>River flows and groundwater levels are unlikely to be affected by the process of replacing and repairing trunk mains, thus there would be no effect on water quantity.</p> <p>Effects of Operation</p> <p>Operation of this option would result in less water being lost due to leakage (yield 5.5 Ml/d) and therefore lower demand for water abstraction. This has been assessed as a positive effect on water quantity.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>4. To protect and enhance the quality of surface and groundwater resources and the ecological status of water bodies.</p>	<p>Will the option protect and improve surface, groundwater, estuarine and coastal water quality?</p> <p>Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)?</p> <p>Will the option support the achievement of protected area objectives?</p> <p>Will the option support the achievement of environmental objectives set out in River Basin Management Plans?</p> <p>Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>Water quality is unlikely to be affected by the replacement and repair of trunk mains and in consequence there would be no effects on this objective.</p> <p>Effects of Operation</p> <p>Operation of this option will result in a reduction in demand for water (5.5 Ml/d) as a result of reduced leakage. This may contribute to improvements in the WFD ecological potential/status of waterbodies, although the yield (5.5 Ml/d) is relatively small across the Bristol Water supply area such that the effect on this objective has been assessed as neutral.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>5. To reduce the risk of flooding, promote the use of sustainable drainage and identify opportunities for collaborative working with other risk management authorities.</p>	<p>Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future?</p> <p>Will the option have the potential to help alleviate flooding in the catchment area now or in the future?</p> <p>Will the option be at risk of flooding now or in the future?</p> <p>Will the option help to minimise flood risk by maintaining and improving the green infrastructure network?</p> <p>Will the option promote the use of sustainable drainage systems?</p> <p>Will the option promote opportunities for collaborative working with other risk management authorities?</p> <p>Will the option affect the risk of flooding to people and/or property?</p> <p>Will the option help to mitigate/reduce the risk of flooding to people and/or property?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The location of trunk mains to be replaced or repaired is not yet known and therefore it cannot be determined whether replacement work would be located in areas at risk of flooding. However, it is assumed that works could be scheduled to avoid periods of flooding and construction work is not expected to cause or exacerbate flooding</p> <p>Effects of Operation</p> <p>There would be no operational effect on the risk of flooding as the trunk mains are buried.</p> <p>Mitigation</p> <p>Depending on the location of trunk mains to be replaced or repaired, appropriate mitigation measures would be adopted if required to manage the risk of flooding.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of trunk mains to be replaced or repaired is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>6. To limit the causes and potential consequences of climate change and to adapt to future changes.</p>	<p>Will the option reduce or minimise greenhouse gas emissions?</p> <p>Will the option have new infrastructure that is energy efficient or make use of renewable energy sources?</p> <p>Will the option reduce vulnerability to the effects of climate change by appropriate adaptation?</p> <p>Will the option increase environmental resilience to the effects of climate change including to impacts on flood risk and water quality?</p> <p>Will coastal erosion have consequences on the operation of this option now or in the future, taking account of expected climate change sea level rise?</p>	<p>--/?</p>	<p>+/?</p>	<p>Effects of Construction</p> <p>There would be embodied and construction carbon emissions as a result of trunk mains replacement and repair, arising from embodied carbon associated with new mains and emissions from plant and vehicle movements. The carbon emissions associated with this option are estimated to be a maximum of 1,236 tCO₂ (depending on the length of pipeline replaced) which has been assessed as having a significant negative effect on climate change, although some uncertainty remains (as the figure may be lower depending on the nature and extent of the works undertaken).</p> <p>Effects of Operation</p> <p>The operation of this option would result in a decrease in demand for water abstraction and may therefore help reduce greenhouse gas emissions associated with reduced treatment and to some extent, pumping of water. The reduction in greenhouse gas emissions associated with this option is, however, uncertain.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The reduction in greenhouse gas emissions associated with this option is unknown.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>7. To ensure the protection and enhancement of human health.</p>	<p>Will the option ensure the continuity of a safe and secure drinking water supply?</p> <p>Will the option impact on physical health and mental well-being by affecting opportunities for informal outdoor recreation?</p> <p>Will the option maintain surface water and bathing water quality within statutory standards?</p> <p>Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?</p> <p>Will the option maintain and improve public access to, and enjoyment of, green and blue infrastructure and in doing so help promote healthy lifestyles?</p>	-/?	+	<p>Effects of Construction</p> <p>The replacement and repair of trunk mains would require excavation and construction work. Vehicle movements and the operation of plant associated with pipeline replacement may affect local air quality and generate noise/vibration disturbance. There may also be disruption to water supply. However these impacts would be temporary and are likely to be managed. Overall, a negative effect has been identified in respect of this objective, as the scale and location of such effects is uncertain at this stage.</p> <p>Effects of Operation</p> <p>This option would help ensure continuity of supply of safe and secure drinking water, and would not result in adverse effects on human health during operation (no noise, nuisance or disruption expected). However water savings of 5.5 Ml/d would have a positive effect on human health and the wellbeing of the local community.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>8. To maintain and enhance the economic and social well-being of the local community.</p>	<p>Will the option ensure sufficient infrastructure is in place for predicted population increases?</p> <p>Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists?</p> <p>Will the option help to meet the employment needs of local people?</p> <p>Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected?</p> <p>Will the option improve access to local services and facilities (e.g. sport and recreation)?</p> <p>Will the option contribute to sustaining and growing the local and regional economy?</p> <p>Will the option avoid disruption through effects on the transport network?</p> <p>Will the option be resilient to future changes in resources (both financial and human)?</p> <p>Will the option improve opportunities for social interaction and community cohesion?</p>	<p>+/-</p>	<p>+</p>	<p>Effects of Construction</p> <p>Capital expenditure associated with this option would be circa £5.25m which would generate positive economic effects such as jobs creation and supply chain benefits. However, during replacement works, there is the potential for localised disruption to traffic, particularly along any sections of pipeline requiring work along or across roads. Overall, this option is considered to have a mixed positive and negative effect with respect to Objective 8, although some uncertainty remains.</p> <p>Effects of Operation</p> <p>The option would help ensure continuity of supply of safe and secure drinking water and would provide a yield of 5.5 Ml/d. This is assessed as having a positive effect on this objective.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>
<p>9. To ensure the sustainable and efficient use of water resources.</p>	<p>Will the option lead to reduced leakage from the supply network?</p> <p>Will the option improve efficiency in water consumption?</p>	<p>0</p>	<p>+</p>	<p>Effects of Construction</p> <p>During construction, this option would not affect leakage or water efficiency.</p> <p>Effects of Operation</p> <p>This option would result in reduced leakage from trunk mains which is assessed as having a positive effect on the sustainable use of water resources.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>None.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>10. To promote the efficient use of resources.</p>	<p>Will the option seek to minimise the demand for raw materials?</p> <p>Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill?</p> <p>Will the option encourage the use of sustainable design and materials?</p> <p>Will the option reduce or minimise energy use?</p>	<p>--/?</p>	<p>+</p>	<p>Effects of Construction</p> <p>Depending on the extent of pipeline replacement, there could be an increase in resource use and waste. As noted against Objective 6, Carbon emissions are estimated to be a maximum of 1,236 tCO₂ (depending on the length of pipeline replaced) and have been assessed as having a significant negative effect on climate change (with some residual uncertainty, given actual emissions will depend on the actual works that take place). Using this as an indication of scale, a significant negative effect on in resource use and waste has therefore been identified although some uncertainty remains.</p> <p>Effects of Operation</p> <p>This option would result in reduced leakage from mains, which is assessed as having a positive effect on waste and resource use.</p> <p>Mitigation</p> <p>None.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The extent of the trunks repair and replacement works is unknown.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>11. To conserve and enhance the cultural, historic and industrial heritage resource.</p>	<p>Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings?</p> <p>Will the option avoid or minimise damage to archaeologically important sites?</p> <p>Will the option avoid damage to important wetland areas with potential for paleoenvironmental deposits?</p> <p>Will the option affect public access to, or enjoyment of, features of cultural heritage?</p> <p>Will the option protect or enhance Welsh language and culture?</p>	<p>0</p>	<p>0</p>	<p>Effects of Construction</p> <p>The replacement and repair of trunk mains may involve carrying out works in the curtilage or grounds of heritage assets; however, this would be temporary and would only affect previously disturbed land. It is also assumed that any effects could be managed through appropriate mitigation. A neutral effect on this objective has been assessed.</p> <p>Effects of Operation</p> <p>No effects on built or natural heritage assets are expected during the operation of this option.</p> <p>Mitigation</p> <p>Depending on the location of the trunk mains to be replaced and repaired, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on heritage assets.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of trunk mains to be replaced and repaired is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
<p>12. To conserve and enhance landscape character.</p>	<p>Will the option avoid adverse effects on, and enhance where possible, the special qualities of protected/designated landscapes (including woodlands) such as National Parks or AONBs?</p> <p>Will the option protect and enhance landscape character, townscape, seascape and green infrastructure?</p> <p>Will the option affect public access to existing landscape features?</p> <p>Will the option minimise adverse visual impacts?</p>	-/?	0	<p>Effects of Construction</p> <p>Replacement and repair works under this option could involve construction work which gives rise to localised landscape and visual effects. However, any impacts would be temporary with land likely to be returned to a pre-development state within a year (depending on the timing of works). Overall, a minor negative effect has been identified in respect of landscape (with some uncertainty).</p> <p>Effects of Operation</p> <p>No additional above-ground infrastructure is required for the operation of this option. This is assessed as having neutral effect on this objective.</p> <p>Mitigation</p> <p>Depending on the location of mains replacement and repair works, appropriate mitigation measures would be adopted during construction if required to reduce any potential impacts on designated landscape sites.</p> <p>Assumptions</p> <p>None.</p> <p>Uncertainty</p> <p>The exact location of trunk mains to be replaced and repaired is not yet known.</p>

Objective	Key Questions	Relationship		Commentary
		Construction	Operation	
Summary	<p>Effects of Construction</p> <p>This option would have neutral effects against seven of the twelve objectives during construction. Some uncertainty remains against the biodiversity objective as the location of mains replacement/repair work is unknown.</p> <p>Significant negative effects are assessed against climate change (due to embodied carbon emissions associated with new mains and emissions from plant and vehicle movements to replace and repair leaking mains), and waste and resource use (due to increase in resource use and construction waste along with fuel usage for vehicles and plant). Minor negative effects are assessed against human health (due to impact local air quality and generation of noise/vibration disturbance by vehicle movements and the operation of plant) and landscape (due to potential for localised landscape and visual effects). Mixed minor positive and minor negative effects are assessed against economic and social wellbeing as the option would generate positive effects such as jobs creation and supply chain benefits but would also generate negative effects from potential for localised disruption to traffic.</p> <p>Effects of Operation</p> <p>Once operational, the option will help to reduce the rate of leakage from the network and reduce the rate at which new leaks arise. Positive effects are assessed against six (water quantity, climate change, human health, economic and social wellbeing, water resources and waste and resource use) of the twelve objectives by lowering demand for water abstraction. Neutral operational effects are assessed against the remaining six objectives.</p> <p>Mitigation</p> <p>Depending on the location of the trunk mains replacement and repair works appropriate mitigation measures would be adopted during construction to manage the risk of flooding and minimise any potential impacts on sites important to biodiversity, heritage assets and designated landscape sites.</p>			

