Bristol Water Drought Plan 2022

Water Framework Directive Compliance Assessment Report

Final report for Bristol Water

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1 Introduction

1.1 Purpose of Report

This report sets out the Water Framework Directive Regulations[1] (WFD) Compliance Assessment for the 2022 iteration of Bristol Water's (BW) Drought Plan.

1.2 The Water Framework Directive

The Water Framework Directive[2] is an EU Directive which, as of 31/12/2020, is no longer applicable to the United Kingdom. Therefore, the principle legal basis is the national legislation which currently mirrors the EU Directive. The Water Framework Directive has been translated into UK legislation as the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 in England and Wales. From this point forward "WFD" refers to the legislation applicable to England and Wales, not the EU Directive.

1.3 The WFD and Drought Planning

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, which set out the operational steps a company will take before, during and after a drought. The Water Industry Act 1991 (as amended) 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*". Water companies in England are required to produce a Drought Plan every five years and submit a draft plan to the Secretary of State in line with the timescales set out in the Drought Plan (England) Direction 2016.

With the drought plan being a statutory requirement, each option and the overall drought plan must be assessed for compliance with the WFD and a suite of other environmental legislation as outlined in the Water Company Drought Plan Guideline[3].

These Drought Plan Guideline requirements reflect Defra's Guiding Principles for Water Resources Planning[4] (May 2016) which state that companies should take account of the government's objectives for the environment "including the appropriate parts of the EU Water Framework Directive". Defra also expects that companies will:

- Have regard to River Basin Management Plans (RBMPs) and their objectives when making decisions that could affect the condition of the water environment
- Ensure that **current** abstractions and operations, as well as future plans, support the achievement of environmental objectives and measures set out in RBMPs.
- Ensure plans:
    - prevent deterioration in water body status;
    - support the achievement of protected area and species objectives;
    - support the achievement of water body status objectives.
- Continue working with the EA to take a proportionate and evidence based approach to identify the changes needed to current abstraction licences to meet environmental requirements.

[1] Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. SI 2017 No. 407
[2] European Union (2000) Directive 2000/60/EC of the European Parliament and of the Council
[3] EA (2020) Water Company Drought Plan guideline, December 2020, Version 1.2
[4] Defra (2016) Guiding Principles for Water Resources Planning. May 2016.

Both Drought Plan guideline and the Defra Guiding Principles refer to ensuring 'no deterioration' of water body status. A recent (2015) European Court of Justice (ECJ) ruling[5] clarified that 'no deterioration' means a deterioration **between** a whole 'status class' (e.g. 'good', 'moderate', etc.) of one or more of the relevant 'quality elements' (e.g. biological, physio-chemical, etc.). This definition applies equally to Artificial Water Bodies and Heavily Modified Water Bodies in respect of the relevant quality elements that relate to the defined uses of these water bodies. The ECJ ruling further states that if the quality element concerned is already in the lowest class, any deterioration of that element constitutes a deterioration of the status. References to 'no deterioration' in this WFD methodology align to this ECJ ruling.

1.4 Report structure

The following report follows the structure below:

- The approach to conducting the WFD assessment for BW's drought options in **Section 2**
- A summary of WFD compliance for each of BW's drought options will be set out in **Section 3**
- An appendix of the bespoke WFD assessments for the options that do not have an Environmental Assessment Report (EAR)
- An appendix of WFD Regulation 18 draft exemptions has been included for those options that are deemed as potentially non-compliant with the WFD objectives.

[5] ECJ Case C‑461/13: Bund für Umwelt und Naturschutz Deutschland v Bundesrepublik Deutschland http://curia.europa.eu/juris/document/document.jsf?docid=178918&mode=req&pageIndex=1&dir=&occ=first&part=1&text=&doclang=EN&cid=175124 [accessed 30.6.16]

2 WFD Assessment Approach

The WFD assessment of the Drought Plan has involved assessing all the options included in the plan. The purpose of this section is to set out the approach used when assessing the WFD compliance of BW's Drought Plan. **Section 2.1** identifies the WFD compliance objectives that have been used to test against throughout the drought planning process. **Section 2.2** describes the proportionate level of detail for the assessments.

The approach used draws on guidance published in the Water Company Drought Planning Guideline produced by the EA in 2020[6], along with guidance from UK Water Industry Research (UKWIR, 2021)[7] on the application of the WFD in drought planning.

All assessments have been undertaken for the reporting unit of a WFD water body. The appropriate baseline information for water bodies status and targets is as set out using 2015 WFD status as published in the second cycle of RBMPs (RBMP2).

The approach to preparing a WFD Regulations Regulation 19 defence against breach of WFD objectives (notably Regulation 18 temporary deterioration), is set out in **Section 2.3** in line with Drought Plan Guideline requirements and following the UKWIR (2021) approach.

2.1 WFD Objectives for Testing Option Compliance

Principally, the WFD compliance assessment acts as an indicator of potential regulatory constraint and determines where the drought plan options within do not meet WFD objectives set out in Regulation 13 of the WFD Regulations. In line with UKWIR (2021) guidance the principle WFD Objectives have been tested against for potential regulatory constraint are as follows:

1. To prevent deterioration[8] of any WFD element of any water body - in line with Regulation 13(2)a and 13(5)a
2. To prevent the introduction of impediments to the attainment of 'Good' WFD status or potential for any water body. It is accepted that for some water bodies achievement of Good status or potential is currently technically infeasible or disproportionately costly. Where this is the case, the test is applied to the currently agreed objectives for that water body rather than against Good status/potential - in line with Regulation 13(2)b and 13(5)c.
3. To ensure that the legally binding planned programme of water body measures in RBMP2 to protect and enhance the status of water bodies are not compromised.

The three objectives above are the fundamental objectives that have been tested against.

Though not expected, where there is the possibility that a drought plan option could influence priority hazardous substance or priority substances in a water body, additional objectives have been tested against in line with Regulation 13(3) and 13(5)d.

In line with the Drought Plan Guideline, for any of the drought plan options that have the potential to cause temporary deterioration in any WFD status elements a Regulation 18 draft exemption form has been completed. These draft exemptions are reported in **Appendix 2**.

2.2 Proportionate Level of Detail for Assessments

Using the objectives set out above (**Section 2.1**), the compliance of the drought plan options within BW's Drought Plan with the WFD has been set out using two methods with varying levels of confidence based on existing information:

1. Options with an associated EAR – this level of assessment is confined to drought permit/order options that require an EAR to be set out. **Section 2.2.1** illustrates how an EAR meets the

[6] EA (2020) Water Company Drought Plan guideline, December 2020, Version 1.2
[7] Andrews R, Ashmole R, Fredenham E, Mant JM, Pitcher C, Sanders J, Twigg W, Wade TI and Westbrook M (2021) Environmental Assessments for Water Resources Planning. UK Water Industry Research Ltd Report 21/WR/02/15.
[8] As defined in Section 1.3

requirements of a WFD assessment. The associated EAR allows us to have high confidence around the compliance/non-compliance of an option. As the EARs are already available, these options have not undergone further assessment in this report, instead, this report reiterates the findings from these reports in the context of WFD compliance.

2. Options without an associated EAR - this level assessment is confined to those supply actions that do not require an amendment to the licensed abstraction rates. These are lower confidence assessments than those options with EARs. The method for testing these options is set out in **Section 2.2.2**.

2.2.1 Assessment approach for options with an associated EAR

Each of BW's EARs has included an aquatic study area. The corresponding WFD water bodies have been identified. Within the aquatic study area the impact on the physical environment, water quality and aquatic ecology has been assessed. This includes specific assessment of WFD biological status elements (fish; aquatic macroinvertebrates; plants and diatoms) and relevant supporting physico-chemical water quality status elements (e.g. dissolved oxygen, total ammonia, reactive phosphate). The assessment includes any mitigation measures specified by BW. These assessments identify where there is potential for temporary WFD status deterioration. These application ready assessments have been subject to regulatory review prior to preparation of the 2022 Drought Plan.

The WFD compliance assessments reported within the individual EARs have been summarised in **Section 3**.

2.2.2 Assessment approach for options without an associated EAR

Those options without an EAR have not been subject to high-level eco-hydrological assessment in **Appendix 1**. A proportionate approach to assessment is advocated by UKWIR, consistent with assessment of water resources management plan options. Where available, previous abstraction investigation assessments have been used as supporting evidence. In the absence of these, assessments are expert judgement by a hydroecologist, working with any other appropriate disciplines required. For groundwater bodies, a hydrogeologist has advised on the outcome of the four quantitative tests and the relevant linked surface water bodies (noting that no additional modelling has been conducted for these options for the Drought Plan).

Each assessment is documented using the following structure:

1. Scheme description – Here a brief outline of the scheme and its operation are included.
2. Key features of the option – Information on the key features of the option including yield, triggers, time to implement, sources and required permissions/consent.
3. Study area zone of influence – Here the study area and zone of influence are outlined, and the WFD water bodies included in the assessment are identified.
4. WFD water bodies and RBMP2 status – The RBMP2 status and target status for the relevant WFD elements for each of the water bodies identified are provided along with any RBMP2 mitigation measures. This information is used to test the compliance against for the three WFD Objectives.
5. Review of activities - a source-pathway-receptor approach has been utilised to identify any activities associated with the option that could impact the WFD status elements. This informs the WFD elements and activities to be included in the scoping level assessment.
6. Scoping level WFD assessment – the impacts of the option on the receptors screened into the scoping level assessment for each water body have been assessed here. The impacts have been tested against the WFD Objectives. Each assessment of the biological status elements has been assigned a confidence rating.
7. WFD Regulations compliance summary – A summary of the WFD compliance assessment is included here. This section states whether or not the option is WFD compliant.

For the review of activities, the UKWIR (2021) guidance identifies a range of option types and their potential impacts (**Table 2-1**).

Table 2-1 Potential effects to screen in to WFD assessment by option type

Option type	Impact type to test
Groundwater abstraction	• Change in groundwater quantity • Impact on groundwater dependent terrestrial ecosystems • Impact on connected surface waters (flow change effects on ecology and water quality dilution) • Likelihood of saline ingress into aquifer
Run-of river abstraction	• Flow change effects on ecology and water quality dilution
River regulation	• Flow change effects on ecology and water quality dilution in regulated reach

For any options that are sourced from groundwater a hydrogeologist has determined any local surface water bodies that are hydraulically connected to the groundwater source. The impact on both the groundwater water body and the surface water bodies have been assessed. Similarly, any links between lake water bodies and river water bodies have been taken into consideration when assessing options that impact on lake water bodies.

Impacts are not confined to the water body where the option is located as the impacts of an option can transverse multiple water bodies. In these instances, assessments have been conducted against each water body in the flow pathway until no WFD compliance risk is identified.

A source-pathway-receptor approach to identifying effects on the WFD status elements has been undertaken. Using that approach, the source of change is the construction or operational activity. The pathway includes the physical environment changes such as water level change, flow velocity change, morphological change. The receptor is the WFD status element or the WFD protected area.

For a proportionate assessment, WFD status elements are screened to those at risk of change from the option. These are used as the basis of the assessment for deterioration and target impediment objectives, with other elements included on a case-by-case basis. Where the pathway of option impact is physical environment changes only (e.g. not to water quality), the sensitive biological status elements (to flow and morphology) are as follows:

- River water bodies: macrophytes, invertebrates, fish
- Lake water bodies: macrophytes
- Transitional water bodies: fish, benthic invertebrate (extent), sea grass (extent)
- Coastal water bodies: benthic invertebrate (extent), sea grass (extent).

Further pathways depend on local conditions and local environmental quality pressures such as changes in dilution of point or diffuse pollution pressures, changes in fish passability at structures. Under these circumstances this assessment considers the WFD compliance impacts to physico-chemical water quality, particularly sanitary and nutrient quality which are the main supporting water quality elements to ecological quality, as well as the associated biological status elements to nutrient and water quality pressures. In exceptional circumstances, where there are known discharges of specific pollutants or substances regulated through WFD chemical status, the dilution change of these has been included in the assessment.

Water quality changes are often associated with river flow reductions as a result of the change of dilution of water quality pressures. Existing known pressures are listed by the EA/NRW's Reasons for Not Achieving Good (RNAG) datasets and these have been reviewed for their level of influence.

2.2.3 Cumulative impact assessment of drought options

The potential for cumulative impacts of different combinations of options both within the BW Drought Plan and also with other external party drought measures are highlighted in this report. This has been informed through the assessment of the individual options. Where there are overlapping impacts in a water body, a cumulative assessment of the impacts on this water body as a result of the drought options being in operation at the same time has been undertaken, testing the cumulative impact against the WFD Objectives. This may require revision of the high level hydrological and/or hydrogeological

assessment which underpins the testing of objectives. Where the cumulative impact extends further than the current water bodies screened into the individual options assessment, the impact into the additional water bodies has been assessed.

2.3 WFD Regulation 18 temporary deterioration exemptions

In England, Section 6 and Appendix 2 of the Drought Plan Guideline environmental supplement sets out the cases for a Regulation 18 Temporary deterioration in status and the requirements of a Regulation 19 defence against breach of WFD objectives. Regulation 18 can only be invoked to allow temporary deterioration to water body status if all the conditions of the article have been met. To enable the conditions of the article to be met and justify use of such actions the DP should:

- Clearly identify all actions that could cause temporary deterioration using appropriate assessment methods;
- Clearly describe why the circumstances are exceptional using hydrological data and any other relevant indicators;
- Clearly justify why an action that causes temporary deterioration is preferable to the alternatives;
- Include details of planned mitigation to minimise the impacts of such actions before during and after;
- Set out what action you will take to restore the water body following the drought.

The Drought Plan Guideline puts the responsibility on the water company to prepare the supporting information required by regulators for a valid exemption, should it be required to be submitted alongside the consequent RBMP. Where **Section 0** identifies that this supporting information is required, it has been provided in **Appendix 2** using the UKWIR (2021) proforma.

3 Assessment of WFD compliance of Bristol Water's drought plan options

3.1 Introduction

A range of drought options make up BW's 2022 Drought Plan. These have been assessed below:

- Demand-side measures (**Section 3.2**)
- Supply-side measures (**Section 3.3**):
  - Supply-side options **(Section 3.3.1**.)
  - Emergency measures (**Section 3.3.2**.)

3.2 Demand-side measures

The Drought Plan 2022 has a range of demand-side measures which are summarised in Table **3-1**.

Table 3-1 Drought Plan 2022 demand-side drought options

Option name	Option description
Water efficiency campaign and appeals for restraint	Campaigns promoting water efficiency to domestic customers including information on toilet flushing, gardening and frost protection best practices. Educational campaigns via the media, literature, advertising, face to face contact, telephone contact and social media.
Enhanced leakage management	Ensure that all maintenance programmes are up-to-date and undertake additional leakage control, leading to demonstrable water savings.
Temporary Water Use Bans (TUBs)	Restrictions on the use of hosepipes for a range of uses, including the washing of vehicles and boats, watering gardens and sports grounds and filling of paddling pools in line with the TUB regulations.
Non-essential use bans (NEUBs)	Drought order to restrict non-essential water uses to be applied for when reservoir stocks fall below the Drought Control Line.
Emergency Drought Orders	Prohibit or limit the use of water for such purposes as (they) see fit and to supply water by means of stand-pipes or water tanks.

These demand-side measures have not been explicitly assessed within this WFD assessment as they are compliant with WFD objectives. They are not considered further in this report.

3.3 Supply-side measures

BW has identified a range of supply-side measures for the Drought Plan 2022. These include:

- 4 supply-side options (**Section 3.3.1**), comprising one supply augmentation measure and three drought permit measures.
- Extreme drought management actions (**Section 3.3.2**)

This section sets out the WFD compliance assessment for these options in the BW Drought Plan 2022.

3.3.1 Supply-side options

This section sets out the summary of the WFD compliance assessments for the four supply-side drought options in BW's Drought Plan 2022. As outlined in **Section 2.2** the assessment is summarised from that documented in the relevant EARs and the bespoke assessments in **Appendix 1** for those options without associated EARs. **Table 3-2** displays a summary of WFD compliance of each drought option.

Table 3-2 Summary of WFD compliance for the supply-side drought options in BWs Drought Plan 2022

Drought Option	WFD compliant	Qualification	Assessment reference
Blagdon Reservoir Drought Permit	**No**	Reduction in river flows in the River Yeo caused by the reduction in compensation release from Blagdon Reservoir potentially leading to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the Yeo - source to conf Congresbury Yeo water body (GB109052021640).	Blagdon Reservoir Drought Permit Environmental Assessment [9]
Chew Valley Reservoir Drought Permit	**No**	Reduction in river flows in the River Chew caused by the reduction in compensation release from Chew Valley Reservoir potentially leading to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the Chew Valley Lake to conf Winford Brook water body (GB109053021852) and the Chew - conf Winford Bk to conf R Avon (Brist) water body (GB109053021950)	Chew Valley Reservoir Drought Permit Environmental Assessment[10]
Cheddar Ponds Drought Permit	**No**	Reduction in river flows in the River Cheddar Yeo caused by the reduction in prescribed flow potentially leading to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the R Cheddar Yeo - source to conf Stubbingham Rhyne water body (GB109052021540)	Cheddar Ponds Drought Permit Environmental Assessment[11]
R24R and R24Ra (Well Head) abstraction	**No**	Reduction in river flows in the River Axe caused by the groundwater abstraction potentially leading to temporary status deterioration of the fish and macroinvertebrate WFD elements in the Axe - Cocklake to Brean Cross Sluice water body (GB109052021570)	Appendix A1.1

As summarised in **Table 3-2** all four supply-side drought options in BW's Drought Plan 2022 have been assessed as individually WFD non-compliant. A cumulative impact assessment of options being applied at the same time is reported in **Section 3.3.3**. For each of these options Regulation 18 information has been set out in **Appendix 2**.

3.3.2 Extreme drought management actions

As part of the review and update of the Drought Plan, Bristol Water has considered the actions that it could need to implement in the event of an extreme drought, after all the 'Level 3' (DMZ 5) restrictions have been put in place, in order to delay or remove the need for 'Level 4' (DMZ 6) emergency restrictions. The extreme drought management actions that could be available to Bristol Water are set out below in Table 3-3.

Appendix A3 provides a summary WFD compliance assessment regarding each of these extreme drought management actions and also sets out the triggers for carrying out more detailed assessment and data collation should an extreme drought arise and the possible need for any of these measures becomes evident.

Table 3-3 Extreme drought management actions

Management Action	Description
Demand – media campaign	This would involve a significant media campaign focused on the 'day zero' concept that would aim to get customer water use down to 80 l/head/day or lower to prevent the requirement for an emergency drought order. This campaign could be

[9] Ricardo (2019), Blagdon Reservoir Drought Permit Environmental Assessment
[10] Ricardo (2019), Chew Valley Reservoir Drought Permit Environmental Assessment
[11] Ricardo (2019), Cheddar Ponds Drought Permit Environmental Assessment

Management Action	Description
	coordinated with other water companies if they were in a similar position and with Water UK.
Demand – pressure reduction	Pressure reduction would be phased over the course of the drought. This action would be to reduce pressure at the customers tap to below the regulatory standards with the aim of reducing demand to 80l/head/day or lower, and to reduce leakage.
Supply – Drought Permit to temporarily amend the Minimum Residual Flow conditions for the P08R abstraction licence	Relaxation of the Minimum Residual Flow conditions to allow abstraction to continue at a higher rate than allowed under the abstraction licence when flow in the Ozleworth Stream drops below 13Ml/d. Under the drought permit, abstraction of up to 4.25Ml/d would be permitted when flows drop below 13Ml/d.
Supply – Drought Permit to temporarily amend the Minimum Residual Flow conditions for the P05R abstraction licence	Changes to the Minimum Residual Flow conditions set out in the P05R abstraction licence Under the licence conditions a flow of 4.41Ml/d at the Kenn gauge must be maintained. Under the drought permit conditions, the minimum flow requirement at the Kenn gauge would be reduced to 2.21Ml/d.
Supply – Drought Permit to temporarily amend the River Axe licence to allow abstraction for a longer period	Extension to the licensed abstraction period for the River Axe source by 2 months to include May and October to support the refill of Cheddar Reservoir (period of abstraction would be extended from November – April to October to May). The drought permit would also allow an increase to the annual abstraction volume from 4750Ml/year to 7145Ml/year (increase of 2395Ml/year).
Supply – Use of Emergency Storage and Drought Permit to allow zero compensation flow releases	On breaching the emergency storage level in the Mendip Reservoirs, the Drought Permit would allow Bristol Water to reduce the compensation flow volumes from the reservoirs to zero in order to keep as much water in the reservoirs as possible and/or use the Emergency Storage for public water supply..
Supply – lowering pumps in boreholes	If pump levels were the limiting factor in the groundwater source supply, and water was still available for abstraction below the normal pumping water level, then Bristol Water would consider lowering the borehole pumps to enable the remaining water to be abstracted. This may require a Drought Permit at some borehole sites depending on the specific abstraction licence conditions.
Supply – Re-instate source at Cold Bath Springs	Start abstracting from the Bristol Water source at Cold Bath Springs and pump into Barrow No 3.
Supply – Re-instate source at Gurney Slade	Start abstracting from the Bristol Water source at Gurney Slade and either pump into Line of Works, or installation of temporary treatment plant..

Further details are provided in the Drought Plan.

3.3.3 Cumulative impact assessment of supply-side options

This section of the WFD assessment considers the cumulative, in-combination effects of implementing the portfolio of Drought Plan options to assess how they may interact with each other, and in-combination with other plans, programmes or projects (both within BW and external to BW).

This section considers the cumulative impacts of the supply-side drought options both within BW 2022 Drought Plan (**Section 3.3.3.1**) and other water companies (and other external parties) drought plans (**Section 3.3.3.2**) using readily available information at the time of writing.

3.3.3.1 BW Drought Plan 2022 in-combination assessment

Within the Drought Plan 2022, combinations of drought management options potentially impacting the same river catchments are identified as:

- Cheddar Ponds drought permit and R24R and Well Head (R24Ra) abstraction

Table 3-4 provides an assessment of these drought management options that have overlapping areas of impact.

As summarised in **Table 3-4** cumulative effect assessments of these two options within the same catchment have been assessed as WFD non-compliant. However, it is noted that the WFD non-compliance in the Axe - Cocklake to Brean Cross Sluice water body (GB109052021570) as a result of simultaneous deployment of the two options is not greater than that which would arise as a result of deployment of the R24R and Well Head (R24Ra) abstraction option alone.

Table 3-4 BW Drought Plan 2022 in-combination WFD compliance assessment

Combination of options	Cumulative assessment	WFD compliant
Cheddar Ponds drought permit and R24R and Well Head (R24Ra) abstraction	The R24R Well drought permit would abstract from the Wells WFD groundwater body (GB40902G804700). It has been identified that there is a risk of this reinstated abstraction having impacts on the dependent surface water body Axe - Cocklake to Brean Cross Sluice (GB109052021570). The Cheddar Reservoir drought permit is anticipated to result in hydrological effects within the Cheddar Yeo that would extend to the confluence with the River Axe with the potential for minor impacts on the Axe - Cocklake to Brean Cross Sluice water body (GB109052021570). Hydrological impacts on the River Axe downstream of the Cheddar Yeo confluence may result from simultaneous operation of both drought options. However, the additional impact associated with the simultaneous deployment of these options is not expected to extend the zone or magnitude of hydrological impact or impact any more status elements than have already been assessed for the R24R and Well Head (R24Ra) abstraction option alone.	No

3.3.3.2 External party drought measure in-combination assessment

The following companies and organisations have drought plans which could influence water supplies into the BW supply area or could affect catchments which are part of the BW supply system. BW Drought Plan 2022 options have been compared against options in the drought plans of the following external parties:

- Wessex Water
- Welsh Water
- Severn Trent Water
- Canal and River Trust
- EA Midlands

Table 3-5 displays an assessment of the BW Drought Plan 2022 against these external parties' drought plans.

As summarised in **Table 3-5** there are no significant in-combination effects between BW's Drought Plan 2022 and those of other external parties.

Table 3-5 Summary of relevant drought actions in external party Drought Plans

Drought Plan	Option type	Option name	Option description	Scoped into WFD compliance assessment?
Wessex Water	Bulk water supply arrangements	Not Specified	It is specified in the Wessex Water drought plan that there are 5 exports of bulk water supplies from Wessex Water to BW[12]. It is specified that these arrangements would not be impacted in drought conditions. There is no overlapping zone of influence between any of the options in the BW drought plan and any option in the Wessex Water Drought Plan	No
Welsh Water	Not specified	Not specified	There are no drought options for Welsh Water and BW that have overlapping zones of impact.	No
Severn Trent Water	Not specified	Not specified	There are no drought options for Severn Trent Water and BW that have overlapping zones of impact.	No
Canal & River Trust	Not specified	Not specified	The Canal & River Trust abstraction to the Gloucester & Sharpness Canal is very varied, operating within a complex set of control rules dependant on tidal state and river flow. Demands also vary due to navigation requirements and inflows from elsewhere. The EA River Severn drought order now contains a condition that the Canal and River Trust will abstract a maximum of 300 Ml/d, only enforceable when the EA drought order is both active and flows at Deerhurst fall below 1,200 Ml/d. This is just above the average abstraction rate for July and August. For the purposes of this in-combination assessment, the Canal & River Trust abstraction has been assumed to be 300 Ml/d. There is not expected to be cumulative impact associated with this option and any of BW's drought options as they do not impact the same spatial area.	No
EA Wessex Drought Plan	Not specified	Not specified	It is not clear that the Wessex Area Environment Agency has a published drought plan.	No

[12] Wessex Water (2018) Drought Plan Final Plan; December 2018

4 Summary of WFD compliance of Bristol Water's Drought Plan

This report presents the WFD compliance assessment for all of the drought options contained within the BW Drought Plan 2022, both demand side and supply side options.

It has been established that all demand side options are WFD compliant. All of the supply side options are assessed as WFD non-compliant:

- Blagdon Reservoir Drought Permit
- Chew Valley Reservoir Drought Permit
- Cheddar Ponds Drought Permit
- R24R and Well Head (R24Ra) abstraction

The Blagdon Reservoir Drought Permit assessment has found that a reduction in river flows in the River Yeo caused by the reduction in compensation release from Blagdon Reservoir could potentially lead to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the Yeo - source to conf Congresbury Yeo water body (GB109052021640).

The Chew Valley Reservoir Drought Permit assessment has found that a reduction in river flows in the River Chew caused by the reduction in compensation release from Chew Valley Reservoir could potentially lead to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the Chew Valley Lake to conf Winford Brook water body (GB109053021852) and the Chew - conf Winford Bk to conf R Avon (Brist) water body (GB109053021950).

The Cheddar Ponds Drought Permit assessment has found that a reduction in river flows in the River Cheddar Yeo caused by the reduction in prescribed flow could potentially lead to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the R Cheddar Yeo - source to conf Stubbingham Rhyne water body (GB109052021540).

The initial, high level assessment of the R24R and Well Head (R24Ra) abstraction has found that reduction in river flows in the River Axe caused by the increased groundwater abstraction could potentially lead to temporary status deterioration of the fish and macroinvertebrate WFD elements in the Axe - Cocklake to Brean Cross Sluice water body (GB109052021570).

Information to support the WFD Regulation 18 exemptions for each of the supply actions deemed WFD non complaint has been set out in **Appendix 2**.

A1 High Level WFD Compliance Assessment of R24R and Well Head (R24Ra) abstraction

This section provides an overview of the 'R24R Well' drought option followed by a review of activities and scoping level assessment for identifying potential WFD impacts due to the operation of the scheme.

A1.1 Scheme description

The R24R Well (ST477502) and Well Head Spring (ST487503) abstract from the Wells WFD groundwater body (GB40902G804700) under Licence no. 16/52/12/G/047. Together these form the Roney Stoke Group. Locations are shown in Figure A1-1.

The abstractions have not been used in recent years (since 1999).

The licence details are as follows:

- 6.6 Ml/d maximum abstraction
- 1500 Ml/a maximum abstraction (4.11 Ml/d equivalent)
- 823 Ml maximum abstraction between May and October (4.5 Ml/d equivalent)

The scheme would be used to refill Cheddar Reservoir with respect to a one year-drought and support the local supply area with respect to a two-year drought. As such, a 4.2km pipeline to Cheddar WTW will be required.

Table A1-1 presents a list of the key features of the R24R Well drought option.

Table A1-1 Key features of R24R Well drought option

R24R Well drought option	
Drought trigger	As reservoir storage enters Drought Management Zone 4
Deployable output	Practical maximum of 2.4Ml/d.
Source(s)	R24R Well and Wellhead Spring
Implementation timetable	Six month lead in time for preparatory / engineering works
Required permissions and constraints	Planning permission. Noted screened as WFD compliant following incorporation of best practice management and any required mitigation measures.

A1.2 Study area zone of influence

Water is abstracted from the Wells groundwater body (a Secondary B Aquifer) at R24R Well. Water is diverted by gravity pipeline from Wellhead, a spring at the head of the Stoke Brook, into the R24R Well. The pumpset in R24R Well therefore enables abstraction from both the Well Head and R24R Well sources. Well Head Spring and R24R Well form the R24Ra Group.

The Stoke Brook is a tributary of the River Axe (WFD WB ID: Axe - Cocklake to Brean Cross Sluice). It is noted Wellhead Spring operates as spring interception, although fed by groundwater, the abstraction is a surface water abstraction in practical terms.

Between Wellhead Spring and the edge of the moors/levels, the Stoke Brook is flow sensitive. Once on the Levels, the watercourse is level controlled.

Depending on groundwater levels, R24R Well is artesian and overflows into the Stoke Brook. Abstraction at such times would impact surface water flows downstream of the well only.

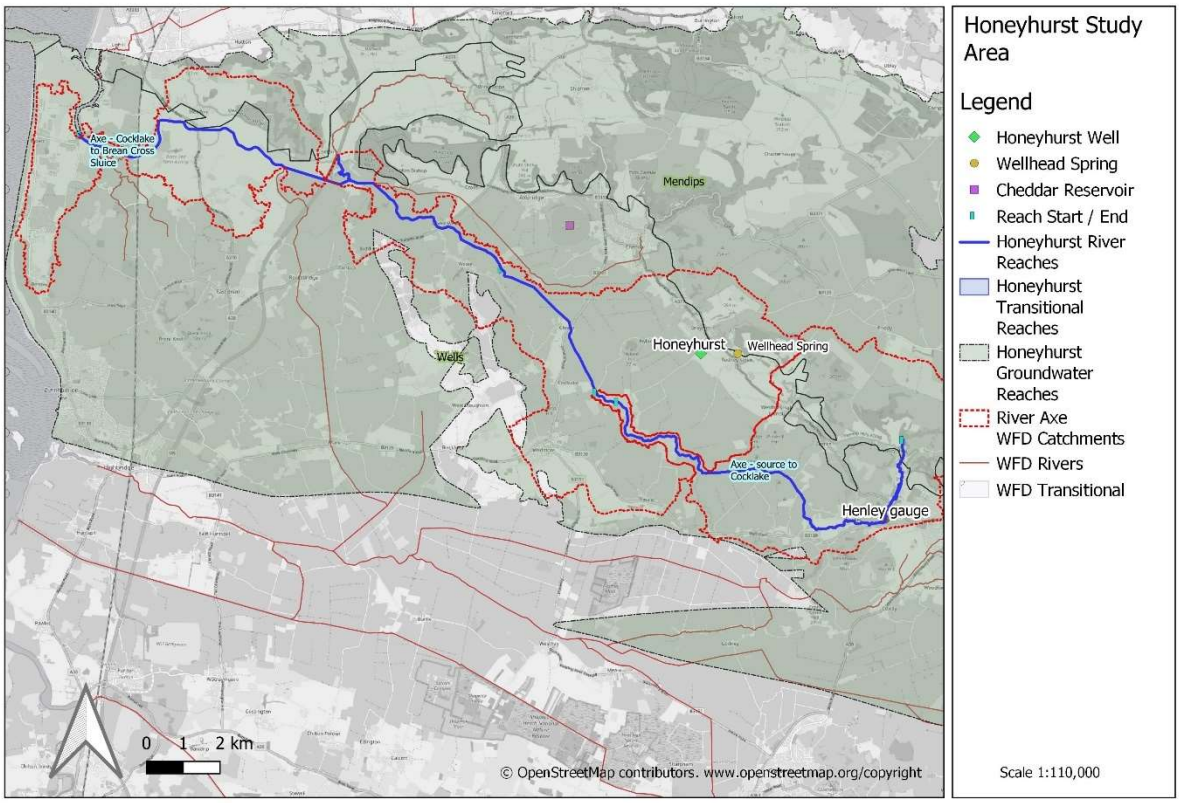
During abstraction, groundwater will be pumped and the effect of the abstraction on surface water flows may occur upstream of the well, depending on groundwater levels at the time.

It is noted there are no Ground Water Dependant Terrestrial Ecosystems (GWDTEs) that overlie the Wells WFD waterbody that are within vicinity of the abstractions that might be impacted by increased drawdown due to abstraction operations.

As such, the study area has been determined as the Axe catchment, include the Axe- Cocklake to

Brean Cross Sluice waterbodies and the underlying Wells Groundwater waterbody, the source of abstraction. It is noted the Brean Cross Sluice is a tidal sluice gate controlling levels within the Axe. Also included is the Mendips Groundwater waterbody, in case of any hydraulic connectivity with the Wells groundwater waterbody. Additionally, the area surrounding the pipeline to Cheddar WTW may be impacted and has been included.

Figure A1-1 R24R Well study area



A1.3 WFD water bodies and RBMP2 status

Study waterbodies identifies, identified, Axe - Cocklake to Brean Cross Sluice (GB109052021570), Wells (GB40902G804700) and Mendips (GB40901G804600) waterbodies. **Table A1-2** outlines the RBMP2 information for the R24R Well study waterbodies.

Table A1-2 WFD RBMP2 waterbodies within the study area

WFD waterbody name		Axe - Cocklake to Brean Cross Sluice	Wells	Mendips
WFD waterbody type		River	Groundwater Body	Groundwater Body
WFD waterbody ID		GB109052021570	GB40902G804700	GB40901G804600
RBMP2 Overall Status		Moderate (target of Good by 2027)	Good	Good
Hydromorphological designation		not designated artificial or heavily modified	n/a	n/a
Mitigation Measures Assessment		Not assessed	n/a	n/a
RBMP2 mitigation measures		No published mitigation measures	No published mitigation measures	No published mitigation measures
WFD Protected Areas		-	Drinking Water Directive	Drinking Water Directive Nitrates Directive
Biology status	Fish	Not assessed	n/a	n/a
	Macro-invertebrates	Moderate (target of Good by 2027)	n/a	n/a
	Macrophytes & Phytobenthos	Not Assessed	n/a	n/a
Physico-chemical	Ammonia (Phys-Chem)	High	n/a	n/a
	Dissolved oxygen	Good	n/a	n/a
	pH	High	n/a	n/a
	Phosphate	Moderate (target of Good by 2021)	n/a	n/a

WFD waterbody name		Axe - Cocklake to Brean Cross Sluice	Wells	Mendips
	Temperature	High	n/a	n/a
	Specific pollutants	High	High	n/a
Quantitative	Saline Intrusion	n/a	Good	Good
Quantitative	Water Balance	n/a	Good	Good
Quantitative	GWDTEs test		Good	Good
Quantitative	Dependent Surface Water Body Status	n/a	Good	Good
Chemical (Overall)		Fail (Lead)	Good	Good

Key to Table A1-2

Review for risk of status deterioration only (Objective 1)
Review for risk of in class deterioration only (Objective 1)
Review for risk of status deterioration (Objective 1) and for risk of impediment to improvement in status to target (Objective 2)
Review for risk of in class deterioration (Objective 1) and for risk of impediment to improvement in status to target (Objective 2)
Review for risk of compromising RBMP2 agreed measures (Objective 3)

It is noted that the Axe - Cocklake to Brean Cross Sluice has a 2nd cycle measure not linked to 2021 objectives. This is: KTM6 - Improving hydromorphological conditions of water bodies other than longitudinal continuity - Removal or easement of barriers to fish migration - Manage risk of fish entrainment.

A1.4 Review of activities

Table A1-3 presents a source-pathway-receptor approach to identifying the potential impacts to each WFD waterbody with respect to R24R Well drought option.

Table A1-3 Source pathway receptor approach to identifying elements for WFD compliance assessment of the R24R Well drought option

WFD waterbody	Axe - Cocklake to Brean Cross Sluice	Wells	Mendips	Other
Source	• Potential for reduction in flow during abstraction and recovery. • Potential for water quality changes due to flow changes during abstraction and recovery.	• Decreased water level due to abstraction • Change to localised groundwater flow direction	• Decreased water level due to abstraction • Change to localised groundwater flow direction	• Construction of pipe from abstraction to Cheddar WTW
Pathways	• River level decrease, flow velocity decrease • Change in water quality due to change of groundwater contributed flow portion.	• Reduced level	• Reduced level	Sediment Ingress to watercourse Pollution from construction chemicals and material
Receptors screened in	• Fish • Macro-invertebrates • Macrophytes and phytobenthos • Dissolved oxygen • Ammonia • pH • Phosphate • Chemical status elements (lead)	• Water Balance • Dependent surface waterbody status	• -None	• None
Receptors screened out	• Specific Pollutants	• GWDTE test • Saline Intrusion • Chemical status elements	• Water Balance • Dependent surface waterbody status • GWDTE test • Saline Intrusion • Chemical status elements	• All

A1.5 Scoping level assessment

The review of activities has identified a range of receptors to be included in the scoping level WFD assessment.

This scoping level assessment has been informed using data from Bristol Water's Henley gauging station (E006110). Data from 2010 onwards were used to assess the impact to the average daily flow value.

The potential effects on flows during maximum abstraction and practical maximum abstraction is shown in **Table A1-4**.

Table A1-4 Percentage reduction of flows as measured at Henley Gauge during operation of the R24R Drought Option

Seasonality	Qstatisic	Ml/d	Percent Reduction to Qstat at a 4.5Ml/d (Maximum) abstraction	Percent Reduction to Qstat at 2.4 Ml/d (Practical Maximum) abstraction
Summer	Q95	14.9	31.2	16.66
Summer	Q99	13.43	44.12	23.63
Summer	Q50	20.3	13.93	7.43
Year Round	Q95	15.1	27.78	14.85
Year Round	Q99	14.0	40.54	21.62
Year Round	Q50	24.9	9.38	5.00

In the absence of data around abstraction, groundwater levels once not artesian, and flows, and noting that Henley Gauge is more than 10km upstream from the confluence of the River Axe and Stoke Brook, and taking a precautionary approach to the assessment, a 1:1 relationship between abstraction and flow contributions to the Stoke Brook is assumed. This infers a risk of **Moderate** hydrological impacts to the River Axe downstream of the Stoke Brook Confluence. It is this assessment that is used to inform the impact on the WFD elements screened into the scoping level assessment.

An assessment of the impact of the receptors screened in for each waterbody in the study area is provided in **Table A1-5** and **Table A1-6**.

Table A1-5 Presentation of impacts of R24R Well drought option on WFD river waterbody GB109052021570 (Axe - Cocklake to Breancross Sluice)

Potential impact on			WFD objective compliance		
Hydro-morphology	Water quality	Biology	1	2	3
• Potential reduction in connectivity as a result of reduced flow over the identified barriers. Flows are not set to drop below the normal envelope of flows in this waterbody so, these weirs will not become more significant obstructions than they would be in normal conditions. • Negligible decrease in marginal habitats due to the level-controlled nature of the reach. • Potential for major impacts due to derogated flows depending on the seasonality of the drought option implementation.	• Potential for minor impacts to water quality (lead and its compounds) due to reduced dilution capacity resulting from a reduced contribution from ground water input, exasperating the pressure for abandoned mines as indicated by RNAG. • Potential for minor impacts to water quality (phosphate) due to reduced dilution capacity resulting from a reduced contribution from ground water input. • There are likely to be changes to physico-chemical support elements as a result of reduced dilution capacity resulting from a reduced contribution from ground water.	• **Invertebrates** – Potential for moderate impacts to flow sensitive invertebrate communities downstream of the Stoke Brook confluence due to the magnitude of flow reduction caused by the abstractions. Any flow reduction is likely to impact on river velocities, rather than level, due to the management of water level by weirs and other structures in the River Axe. ***– Low confidence*** • Potential minor temporary impacts to macroinvertebrates caused by changes to physicochemical water quality elements due to reduced groundwater contributions ***- Low confidence*** • Potential major impacts to invertebrates localised within the Stoke Brook due to derogated flows, completely removed flows or delayed flows depending on the seasonality of the drought option implementation, however this is uncertain due to limited ecological records within the Stoke Brook ***- Low confidence***	N	N/A	N/A
		• **Fish** – Potential for moderate impacts to flow sensitive fish communities downstream of the Stoke Brook confluence due to the magnitude of flow reduction caused by the abstractions. Any flow reduction is likely to impact on river velocities, rather than level, due to the management of water level by weirs and other structures in the River Axe. No impact due to delayed ephemeral portion of flows. ***– Low confidence*** • Potential minor temporary impacts to fish caused by changes to physicochemical water quality elements due to reduced groundwater contributions ***– Low confidence*** • As fish is classified as poor status by the EA in this water body, potential for in-class deterioration and impediments to improving class status. temporary impacts to fish caused by changes to physicochemical water quality elements due to reduced groundwater contributions • Potential major impacts to fish localised to within the Stoke Brook due to derogated flows, completely removed flows or delayed flows depending on the seasonality of the drought option implementation, however this is uncertain due to limited ecological records within the Stoke Brook ***- Low confidence***	N	N/A	

Potential impact on			WFD objective compliance		
Hydro-morphology	Water quality	Biology	1	2	3
		• **Macrophytes and Phytobenthos** – Potential for moderate impacts to flow sensitive macrophyte communities downstream of the Stoke Brook confluence due to flow reduction caused by the abstractions. Any flow reduction is likely to impact on river velocities, rather than level, due to the management of water level by weirs and other structures in the River Axe. No impact due to delayed ephemeral portion of flows. ***– Low confidence*** • Potential minor temporary impacts to macrophytes caused by changes to physicochemical water quality elements due to reduced groundwater contributions • ***- Low confidence*** • Potential major impacts to macrophytes localised to within the Stoke Brook due to derogated flows, completely removed flows or delayed flows depending on the seasonality of the drought option implementation, however this is uncertain due to limited ecological records within the Stoke Brook ***- Low confidence***	N	N/A	

Table A1-6 Presentation of impacts of R24R Well drought option on WFD groundwater GB40902G804700 (Wells)

Potential impact on		WFD objective compliance		
Water Balance	Dependant Surface Water Body Status	1	2	3
• Minor (temporary and local) impacts on the water balance due to localised drawdown during and following abstraction if abstraction from R24R Well exceeds the natural overflow rate of the spring, depending on seasonality of the abstraction, noting that the spring stops flowing during dry periods • Negligible impact from operation of the Wellhead spring abstraction	Potential for moderate impacts to ecology of the Axe - source to Cocklake (GB109052021520) dependant surface water body.	N	N/A	N/A

A1.6 WFD Regulations compliance summary

The WFD assessment has identified that the R24R Well drought option may impact a range of WFD elements in the Axe - Cocklake to Brean Cross Sluice (GB109052021570), Wells (GB40902G804700) Rothley Brook into Cropston WTW). It has been identified throughout this assessment that moderate flow changes as a result of the reinstated abstraction within the R24Ra Group could result in greater than minor impacts on fish and invertebrate WFD status elements within the Axe. There is the potential for the impacts identified to cause temporary deterioration in WFD status for fish and macroinvertebrates. As a result, the R24R Well drought option is deemed non-compliant with WFD Objective 1 and WFD Objective 2. There are no published RBMP2 mitigation measures for any of the study waterbodies therefore this drought option is compliant with WFD Objective 3. Overall, the R24R Well drought option is deemed potentially WFD non-compliant. This assessment is precautionary, based on very limited data and does not consider ways in which the option could be constrained, for example in relation to flows at Henley Gauge to overcome WFD compliance risks.

A2 WFD Regulation 18 Exemption Information

This appendix contains the relevant information to use in the scenario that any of the drought options that have been deemed potentially WFD non-compliant lead to WFD non-compliance after a drought event. This has been set out for the following drought options:

- Blagdon Reservoir Drought Permit
- Chew Valley Reservoir Drought Permit
- Cheddar Ponds Drought Permit
- R24R and Well Head (R24Ra) abstraction

A2.1 Blagdon Reservoir Drought Permit

Requirement	**Information prepared for the drought permit/order application version**
Clearly identify all actions that could cause temporary deterioration using appropriate assessment methods	Reduction in river flows in the River Yeo caused by the reduction in compensation release from Blagdon Reservoir potentially leading to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the Yeo - source to conf Congresbury Yeo water body (GB109052021640).
Clearly describe why the circumstances are exceptional using hydrological data and any other relevant indicators	Each drought situation is unique; therefore, it is not appropriate to prescribe these circumstances at this stage of the process. This will be informed through the consideration of the rainfall, temperature and river flows in the lead up to the application for this drought permit.
Clearly justify why an action that causes temporary deterioration is preferable to the alternatives	This option would only be used in an extreme drought scenario, i.e. greater than a 1 in 200 year drought. It would be used to prevent the need for Level 4 customer supply restrictions, such as standpipes and rota-cuts under Emergency Drought Order
Include details of planned mitigation to minimise the impacts of such actions before during and after	Monitoring-led mitigation measures have been identified as part of the environmental assessment studies through consultation with the Environment Agency and Natural England and are documented in the Environmental Assessment Report[13]. Mitigation measures have been proposed for the following environmental features: • Macrophytes/*Ranunculus* • Macroinvertebrates • White clawed crayfish • Fish community
Set out what action you will take to restore the water body following the drought	See EAR[14]

[13]Ricardo (2019), Blagdon Reservoir Drought Permit Environmental Assessment
[14]*ibid*

A2.2 Chew Valley Reservoir Drought Permit

Requirement	**Information prepared for the drought permit/order application version**
Clearly identify all actions that could cause temporary deterioration using appropriate assessment methods	Reduction in river flows in the River Chew caused by the reduction in compensation release from Chew Valley Reservoir potentially leading to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the Chew Valley Lake to conf Winford Brook water body (GB109053021852) and the Chew - conf Winford Bk to conf R Avon (Brist) water body (GB109053021950)
Clearly describe why the circumstances are exceptional using hydrological data and any other relevant indicators	Each drought situation is unique; therefore, it is not appropriate to prescribe these circumstances at this stage of the process. This will be informed through the consideration of the rainfall, temperature and river flows in the lead up to the application for this drought permit.
Clearly justify why an action that causes temporary deterioration is preferable to the alternatives	This option would only be used in an extreme drought scenario, i.e. greater than a 1 in 200 year drought. It would be used to prevent the need for Level 4 customer supply restrictions, such as standpipes and rota-cuts under Emergency Drought Order
Include details of planned mitigation to minimise the impacts of such actions before during and after	Monitoring-led mitigation measures have been identified as part of the environmental assessment studies through consultation with the Environment Agency and Natural England and are documented in the Environmental Assessment Report[15]. Mitigation measures have been proposed for the following environmental features: • Macrophytes/*Ranunculus* • Macroinvertebrates • White clawed crayfish • Fish community
Set out what action you will take to restore the water body following the drought	See EAR[16]

[15]Ricardo (2019), Chew Valley Reservoir Drought Permit Environmental Assessment
[16]*ibid*

A2.3 Cheddar Ponds Drought Permit

Requirement	**Information prepared for the drought permit/order application version**
Clearly identify all actions that could cause temporary deterioration using appropriate assessment methods	Reduction in river flows in the River Cheddar Yeo caused by the reduction in prescribed flow potentially leading to temporary status deterioration of the fish, macroinvertebrate and macrophyte WFD elements in the R Cheddar Yeo - source to conf Stubbingham Rhyne water body (GB109052021540)
Clearly describe why the circumstances are exceptional using hydrological data and any other relevant indicators	Each drought situation is unique; therefore, it is not appropriate to prescribe these circumstances at this stage of the process. This will be informed through the consideration of the rainfall, temperature and river flows in the lead up to the application for this drought permit.
Clearly justify why an action that causes temporary deterioration is preferable to the alternatives	This option would only be used in an extreme drought scenario, i.e. greater than a 1 in 200 year drought. It would be used to prevent the need for Level 4 customer supply restrictions, such as standpipes and rota-cuts under Emergency Drought Order
Include details of planned mitigation to minimise the impacts of such actions before during and after	Monitoring-led mitigation measures have been identified as part of the environmental assessment studies through consultation with the Environment Agency and Natural England and are documented in the Environmental Assessment Report[17]. Mitigation measures have been proposed for the following environmental features: • Macrophytes/*Ranunculus* • Macroinvertebrates • Fish community
Set out what action you will take to restore the water body following the drought	See EAR[18]

[17]Ricardo (2019), Cheddar Ponds Drought Permit Environmental Assessment
[18]*ibid*

A2.4 R24R and Well Head (R24Ra) abstraction

Requirement	**Information prepared for the drought permit/order application version**
Clearly identify all actions that could cause temporary deterioration using appropriate assessment methods	Reduction in river flows in the River Axe caused by the increased groundwater abstraction potentially leading to temporary status deterioration of the fish and macroinvertebrate WFD elements in the Axe - Cocklake to Brean Cross Sluice water body (GB109052021570)
Clearly describe why the circumstances are exceptional using hydrological data and any other relevant indicators	Each drought situation is unique; therefore, it is not appropriate to prescribe these circumstances at this stage of the process. This will be informed through the consideration of the rainfall, temperature and river flows in the lead up to the application for this drought permit.
Clearly justify why an action that causes temporary deterioration is preferable to the alternatives	This option would only be used in an extreme drought scenario, i.e. greater than a 1 in 200 year drought. It would be used to prevent the need for Level 4 customer supply restrictions, such as standpipes and rota-cuts under Emergency Drought Order
Include details of planned mitigation to minimise the impacts of such actions before during and after	Monitoring-led mitigation measures are being identified as part of the environmental assessment studies and will be developed through consultation with the Environment Agency and Natural England and documented in the Environmental Assessment Report. Mitigation measures will be proposed for relevant impacted environmental features.
Set out what action you will take to restore the water body following the drought	These actions will be documented in the Environmental Assessment Report and will be developed through consultation with the Environment Agency and Natural England.

A3 Summary WFD Compliance Assessment of Supply-side Extreme Drought Management Actions

In response to the representation comments on the draft Drought Plan regarding the extreme drought management actions, a summary environmental assessment of each of these actions has been included in this appendix (as well as relevant information included as appendices to the SEA and HRA reports). As agreed with the Environment Agency, this is a “light touch” approach which sets out the triggers for carrying out more detailed assessment and data collation should an extreme drought event arise and the possible need for any of these measures becomes evident. These more detailed assessments will be discussed with the Environment Agency once the trigger has been reached. This is a proportionate approach to actions that would only be contemplated in an extreme drought which has a very low likelihood of arising during the lifetime of the Drought Plan.

The WFD summary assessment information is provided in the tables below for each of the supply-side extreme drought management actions included in the Drought Plan.

Table A3.1 Supply - Temporarily amend the River Axe licence to allow abstraction for a longer period

Type of action	Comments
Area affected	Whole supply area / whole resource zone
Trigger for implementation	Forecasting approach to the Level 4 trigger within 6 weeks.
Estimated benefit/saving	Additional yield of between 1.5Ml/d and 6.5Ml/d depending on the severity of the drought and flow availability in the river.
Description	Bristol Water has a licence to abstract from the River Axe over the winter period from November and April. This water is pre-treated and then transferred into Cheddar Reservoir. An extension of the abstraction period and the total annual licence volume would provide additional support for reservoir refill over the winter period. Under this option Bristol Water are proposing an extension of the period of abstraction by 2 months to include May and October (period of abstraction extended from November – April, to October to May) and an increase in the annual abstraction volume from 4750Ml/year to 7145Ml/year (increase of 2395Ml/year). As the drought permit would be valid for up to 6 months, Bristol Water would apply for the appropriate terms of licence extension based on the time of year the application is being submitted.
Time to implementation	Minimum of 6 weeks if no public hearing required, depending on the supporting environmental information available. Longer if a public hearing is called.
Permissions required	Drought permit from the Environment Agency.
Environmental Effects (WFD)	Reduction in river flows in the River Axe caused by the increased river abstraction potentially leading to temporary status deterioration in the Axe - Cocklake to Brean Cross Sluice water body (GB109052021570). The risk of temporary WFD deterioration is potentially associated with a decrease in habitat availability and habitat quality in river and a reduction in habitat connectivity due to reduction in flow over in channel barriers. It is noted that the reach itself is level controlled which would maintain marginal habitats. Potential effects associate predominantly with invertebrates and fish communities downstream of abstraction due to flow reduction caused by the abstractions. The minimum flow requirements in the licence which will minimise the magnitude of effects. Also potentially requires a cumulative assessment with other drought actions which may be in place in the River Axe catchment at the time: notably a R24R and Well Head (R24Ra) abstraction and a Cheddar Ponds Drought Permit.
Data requirements to support detailed assessment	Data to support the preparation of EARs (incorporating Environmental Monitoring Plans) in line with Defra and Environment Agency Guidance, taking full account of latest River Basin Management Plan status for relevant water bodies. Undertake walkover surveys of potentially impacted reaches to improve the detail and breadth of possible migratory fish barriers and identify possible mitigation measures and post-drought restoration actions.
Trigger and further assessment required if option is to be implemented during an extreme drought	WFD assessment to be carried out in accordance with the WFD tests when the Level 3 (DMZ 5) trigger is reached. Further assessment for the WFD will be informed by the development of the EAR to accompany the drought permit application.

Table A3.2 Supply - Temporarily amend the Minimum Residual Flow conditions for the P08R abstraction licence

Type of action	Comments
Area affected	Whole supply area / whole resource zone
Trigger for implementation	Forecasting approach to the Level 4 trigger within 6 weeks.
Estimated benefit/saving	Estimated yield of c. 2Ml/d. This is based on a change to the authorised quantities of water to be abstracted at P08R when flow in the Ozleworth Brook is less than 13 Ml/d.
Description	Bristol Water has a groundwater licence to abstract at P08R throughout the year. The volume of water that can be abstracted is linked to the flow in the Ozleworth Brook. A change to the maximum quantity authorised to be abstracted under the specified flow conditions would enable abstraction to continue under drought conditions. Under this option it is proposed that abstraction of up to 4.5Ml/d would be permitted when flows in the Ozleworth Brook drop below 13Ml/d.
Time to implementation	Minimum of 6 weeks if no public hearing required, depending on the supporting environmental information available. Longer if a public hearing is called.
Permissions required	Drought permit from the Environment Agency
Environmental Effects (WFD)	Reduction in river flows in the Ozleworth Brook and Little Avon caused by the increased groundwater abstraction potentially leading to temporary status deterioration in the Kenn - source to Ozleworth Bk – source to conf Little Avon R (GB109054026610), Little Avon – Ozleworth Bk to conf Tortworth Bk water body (GB109054026600) and the Little Avon – conf Tortworth Bk to mouth water body (GB109054026620). The risk of temporary WFD deterioration is potentially associated with a decrease in habitat availability and habitat quality in river and a reduction in habitat connectivity due to reduction in flow over in channel barriers. It is noted that the reach itself is level controlled which would maintain marginal habitats. Potential effects associate predominantly with invertebrates and fish communities downstream of abstraction due to flow reduction caused by the abstractions. Also potential for reduced dilution of existing downstream water quality pressures.
Data requirements to support detailed assessment	Data to support the preparation of EARs (incorporating Environmental Monitoring Plans) in line with Defra and Environment Agency Guidance, taking full account of latest River Basin Management Plan status for relevant water bodies. Undertake walkover surveys of potentially impacted reaches to improve the detail and breadth of possible migratory fish barriers and identify possible mitigation measures and post-drought restoration actions.
Trigger and further assessment required if option is to be implemented during an extreme drought	WFD assessment to be carried out in accordance with the WFD tests when the Level 3 (DMZ 5) trigger is reached. Further assessment for the WFD will be informed by the development of the EAR to accompany the drought permit application.

Table A3.3 Supply - Temporarily amend the Minimum Residual Flow conditions for the P05R abstraction licence

Type of action	Comments
Area affected	Whole supply area / whole resource zone
Trigger for implementation	Forecasting approach to the Level 4 trigger within 6 weeks.
Estimated benefit/saving	2.2 Ml/d based on the assumption of reducing the minimum flow condition at the River Kenn at Kenn Gauge to 2.21Ml/d.
Description	Bristol Water has a groundwater licence to abstract from P05R Well throughout the year. The volume of water that can be abstracted is linked to the flow at the Kenn gauge. During the summer, reduced river flows can restrict the volume of water available for abstraction. A change to the minimum flow at which abstraction is allowed would enable abstraction to continue for a longer period under drought conditions. Under this option Bristol Water are proposing that the flow at the Kenn gauge above which abstraction is allowed is reduced from 4.41Ml/d to 2.21Ml/d.
Time to implementation	Minimum of 6 weeks if no public hearing required, depending on the supporting environmental information available. Longer if a public hearing is called.
Permissions required	Drought permit from the Environment Agency.
Environmental Effects (WFD)	Reduction in river flows in the River Kenn caused by the increased groundwater abstraction potentially leading to temporary status deterioration in the Kenn - source to Kenn Moor SSSI water body (GB109052021670) and macroinvertebrates in the Kenn Moor SSSI water body (GB109052021682). The risk of temporary WFD deterioration is potentially associated with a decrease in habitat availability and habitat quality in river and a reduction in habitat connectivity due to reduction in flow over in channel barriers. It is noted that the reach itself is level controlled which would maintain marginal habitats. Potential effects associate predominantly with invertebrates and fish communities downstream of abstraction due to flow reduction caused by the abstractions.
Data requirements to support detailed assessment	Data to support the preparation of EARs (incorporating Environmental Monitoring Plans) in line with Defra and Environment Agency Guidance, taking full account of latest River Basin Management Plan status for relevant water bodies. Undertake walkover surveys of potentially impacted reaches to improve the detail and breadth of possible migratory fish barriers and identify possible mitigation measures and post-drought restoration actions.
Trigger and further assessment required if option is to be implemented during an extreme drought	WFD assessment to be carried out in accordance with the WFD tests when the Level 3 (DMZ 5) trigger is reached. Further assessment for the WFD will be informed by the development of the EAR to accompany the drought permit application.

Table A3.4 Supply – Emergency storage and zero compensation releases

Type of action	Comments
Area affected	Whole supply area / whole resource zone
Trigger for implementation	Forecasting approach to the Level 4 trigger within 6 weeks.
Estimated benefit/saving	The Emergency storage in the Mendip Reservoirs provides approximately 30 days supply as required from this part of the system. Assuming the compensation releases from the reservoirs have already been reduced, then between an additional 6.8Ml/d and 11.6 Ml/d would be available by reducing them to zero.
Description	On breaching the emergency storage level in the reservoirs, we would reduce the compensation volumes to zero in order to keep as much water in the reservoirs and available for public water supply as possible.
Time to implementation	Immediate. Reservoir level would drop into the emergency storage area and the compensation would be reduced to zero.
Permissions required	Drought permit from the Environment Agency to amend the licence conditions to implement zero compensation releases from reservoirs.
Environmental Effects (WFD)	**Major** adverse effects on aquatic ecology associated with relevant downstream river water bodies drying for an initial reach and a major reduction in flow and wetted habitat throughout the downstream river water body system. Also major adverse effects regarding water quality including those resulting from zero or minimal dilution of treated wastewater effluent, with consequent major adverse effects on aquatic ecology. Magnitude of ecological effects likely to associate with a need to undertake major restoration programme post-drought.
Data requirements to support detailed assessment	High confidence in pathway of effects based on existing datasets. Undertake walkover surveys of potentially impacted reaches to improve the detail and breadth of possible mitigation measures and post-drought restoration actions.
Trigger and further assessment required if option is to be implemented during an extreme drought	WFD assessment to be carried out in accordance with the WFD tests when the Level 3 (DMZ 5) trigger is reached. Further assessment for the WFD will be informed by the development of the EAR to accompany the drought permit application.

Table A3.5 Supply – lowering pumps in boreholes

Type of action	Supply – lowering pumps in boreholes
Area affected	Whole supply area / whole resource zone
Trigger for implementation	Forecasting that Bristol Water are going to be approaching the Level 4 (DMZ6) trigger within 6 weeks
Estimated benefit/saving	Unknown. Groundwater sources would be selected based on the drought response and how resilient they have been.
Description	If pump levels were the limiting factor in the groundwater source supply, and water was still available for abstraction below the normal pumping water level, then we would consider lowering the pumps to enable the remaining water to be abstracted.
Time to implementation	Relatively short time to implement this response. Depending on the site it is likely to require some engineering works.
Permissions required	Possible drought permit if action resulted in abstracting outside licence conditions. This would be reviewed on a site by site/licence by licence basis in close liaison with the Environment Agency.
Environmental Effects (WFD)	Likely to lead to further reduction to local groundwater levels and storage which may impact temporarily on WFD groundwater body status including any GWDTEs and/or any dependent surface waters, with consequent risk of temporary adverse effects for the WFD ecological status of surface river water bodies.
Data requirements to support detailed assessment	Site specific details regarding borehole pump lowering against existing level. Site specific details of hourly, daily, annual abstraction rates at lower pump level. Baseline data on groundwater levels in the area and any available drawdown data. Groundwater body latest WFD chemical and quantitative status and any supporting WFD data from EA monitoring, plus similar status and supporting data for any relevant GWDTEs and/or dependent surface water bodies. Undertake walkover surveys of potentially impacted reaches to improve the detail and breadth of possible mitigation measures and post-drought restoration actions.
Trigger and further assessment required if option is to be implemented during an extreme drought	WFD assessment to be carried out in accordance with the WFD tests when the Level 3 (DMZ 5) trigger is reached. Further assessment will follow the EAR approach to confirm the summary impacts identified in this table.

Table A3.6 Supply – Re-instate source at Cold Bath Springs

Type of action	Comments
Area affected	Whole supply area / whole resource zone
Trigger for implementation	Forecasting approach to the Level 4 trigger within 6 weeks.
Estimated benefit/saving	3Ml/d annual average yield (5Ml/d peak daily) based on historic licence conditions.
Description	Start abstracting from the source at Cold Bath Springs and pump into Barrow No 3.
Time to implementation	Engineering and infrastructure requirements would be associated with this option to bring it back into supply. Time to implementation likely to be up to 6 months.
Permissions required	Drought Permit from Environment Agency.
Environmental Effects (WFD)	Interaction between groundwater abstraction, and effects on the aquifer, GWDTE and/or dependent surface water bodies not reviewed. This may temporarily affect groundwater body status and affect surface waters, including leading to potential temporary impacts on the WFD ecological status of river water bodies
Data requirements to support detailed assessment	Existing information associated with when the source was in supply. Baseline data on groundwater levels and spring flows in the area and any available drawdown data. Location of any GWDTEs and/or dependent surface water bodies. Groundwater body latest WFD chemical and quantitative status and any supporting WFD data from EA monitoring, plus similar status and supporting data for any relevant GWDTEs and/or dependent surface water bodies. Undertake walkover surveys of potentially impacted reaches to improve the detail and breadth of possible mitigation measures and post-drought restoration actions.
Trigger and further assessment required if option is to be implemented during an extreme drought	WFD assessment to be carried out in accordance with the WFD tests when the Level 3 (DMZ 5) trigger is reached. Further assessment will follow the EAR approach to confirm the summary impacts identified in this table.

Table E9 Supply – Re-instate source at Gurney Slade

Type of action	Comments
Area affected	Whole supply area / whole resource zone
Trigger for implementation	Forecasting that we are going to be approaching the Level 4 trigger within 6 weeks.
Estimated benefit/saving	2Ml/d yield based on estimated dry weather yield – previous licence 4.4Ml/d annual average from May to October (10Ml/d peak daily)
Description	Start abstracting from the source at Gurney Slade and either pump into Line of Works, or installation of temporary treatment plant of site.
Time to implementation	Engineering and infrastructure requirements would be associated with this option to bring it back into supply. Time to implementation likely to be up to 6 months.
Permissions required	Drought Permit from Environment Agency. Regulation 27 risk assessment to be completed and a Regulation 28 report submitted to DWI.
Environmental Effects (WFD)	Interaction between groundwater abstraction, and effects on the aquifer, GWDTE and/or dependent surface water bodies not reviewed. This may temporarily affect groundwater body status and affect surface waters, including leading to potential temporary impacts on the WFD ecological status of river water bodies.
Data requirements to support detailed assessment	Existing information associated with when the source was in supply. Baseline data on groundwater levels and spring flows in the area and any available drawdown data. Location of any GWDTEs and/or dependent surface water bodies. Groundwater body latest WFD chemical and quantitative status and any supporting WFD data from EA monitoring, plus similar status and supporting data for any relevant GWDTEs and/or dependent surface water bodies. Undertake walkover surveys of potentially impacted reaches to improve the detail and breadth of possible mitigation measures and post-drought restoration actions.
Trigger and further assessment required if option is to be implemented during an extreme drought	WFD assessment to be carried out in accordance with the WFD tests when the Level 3 (DMZ 5) trigger is reached. Further assessment will follow the EAR approach to confirm the summary impacts identified in this table.