

IAP Ref B2.WSH.CMI.A4

Water Bid Assessment Framework

April 2019

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1. Introduction

1.1. About Welsh Water

Welsh Water is the sixth largest of the ten regulated water and sewerage companies in England and Wales. Responsible for providing over three million people with a continuous, high quality supply of drinking water and for taking away, treating and properly disposing of the wastewater that is produced, we are fully committed to delivering best quality service to our customers and communities at least possible cost.

Since 2001, we have been owned, financed and managed by Glas Cymru and are unique in the water and sewerage sector, Glas Cymru is a company limited by guarantee and as such has no shareholders.

This means that we are constantly striving to identify better and cheaper ways of delivering the services we provide. Third parties who can offer good value inputs to our business have a vital role to play in helping us to pursue this objective, this is especially true in the area of water resources, leakage, and demand management. From the beginning of AMP7 we will have in place a formal framework that supports the procurement of those inputs.

1.2. About this document

The Bid Assessment Framework sets out our approach for inviting and assessing third party proposals for the provision of water resources, leakage and demand management services for Welsh Water's deficit zones as set out in our Water Resource Management Plan. The framework applies to Welsh Water and third parties, which may include suppliers or other wholesalers/licensed undertakers. Our framework takes into account our water resource planning requirements, procurement principles and competition obligations in order to set out how competitive tendering processes will operate.

Our competitive tendering process will operate in accordance with the procurement principles of transparency, non-discrimination and proportionality. These will be applied when considering third party submissions and in house proposals. Confidentiality, together with conflict of interest provisions, will also apply throughout the process to ensure that the integrity of the process is protected.

This document constitutes version 2 of our Bid Assessment Framework. It is being resubmitted as part of our response to Ofwat's Initial Assessment of Plans (IAP), but it is also stand-alone published document. To ensure continued evolution of this document, and to achieve Ofwat recommended good practices, we will complete regular external assurance reviews to identify any misuse of information and/or bias towards internal solutions.

The document is structured as follows: Section 1 constitutes the introduction to the framework. Sections 2-8 provide an overview of our overall procurement procedure, market engagement and pre-qualification criteria. Section 4 refers to our "Need Specification", the latest version of which is included in Appendix 1, drawing upon the detailed analysis presented in our Water Resource Management Plan (WRMP). The remaining sections complete the procurement aspects of the framework, including the procedures for bid evaluation, award process and a complaints procedure. Section 10 sets out our complaints procedure.

2. Procurement procedure

We are open to receiving and assessing competitive bids for the providing solutions for our water resources deficit zones as set out in our Need Specification, contained in Appendix 1 of this document, and as published in our Water Resource Management Plan for 2019 and our Water Resources Market Information tables. When significant changes occur our Need Specification will be updated and published on our website. Our website will provide all information necessary for a third party to propose solutions.

We intend to advertise our requirements by issuing Periodic indicative Notices (PIN) in the Official Journal of the European Union (OJEU) in accordance with the Utility Contracts Regulations 2016, on an interval frequency of no more than eighteen months from June 2020. In accordance with this procedure any organisation may submit a request to participate by providing the information for qualitative selection that is set out in Section 5 below and/or as is set out in the public notice. The notice will be available for organisations to respond to for 30 days from the date on which it is advertised.

We do not want to miss out on attractive proposals that arise outside of the 18 month timetable. We may also instigate a call for competition in response to a market opportunity or a material change in information regarding water deficit zones and instigate a procurement process in response to these situations. The frequency interval of 18 months will then be re-set from the date of issue of a call for competition that arises from the above.

Interested suppliers should monitor the Welsh Water website regularly where we will communicate the release of these adverts.

3. Market engagement

We welcome contact from third parties under this framework who have ideas and/or solutions to improve our leakage or demand management in our water deficit zones or who those who are able to provide additional water resources for these zones.

In order to provide easy access to relevant information suppliers can log onto our website and review our Water Resources Plans and information about how third parties can contribute to future water security for Wales. This includes instructions on when bid invitations will be available, guidance third parties may require about this framework and the processes that underpin it.

We can also provide details and guidance on how to access and submit tender returns and any current procurement opportunities that may be available.

You may wish to ask additional questions in relation to our Water Resource Management Plan and/or our leakage or demand management approach within our company.

Anyone wishing to get in contact with us should get in touch by contacting us via our procurement mailbox as set out below

procurementenquiries@dwrcymru.com

4. Need specification

We will maintain an up to date Need Specification (see Appendix 1 for current version as set out in our Water Resources Management Plan). This will be maintained on our website and will be issued together with our PIN. Organisations should review the Need Specification and this Bid Assessment Framework documentation to determine their position on making an application or when submitting proposals for review via our procurement contact address.

5. Tender Process

The procurement process will be proportionate to the need and we will ensure it is as straightforward and accessible as possible to encourage third parties to participate.

To ensure all third parties are provided with a fair and equal opportunity and that there is no bias towards the internal proposal the internal and external will be assessed against the same criteria. The information is managed confidentially we will utilise an eProcurement portal for issuing and managing the tender process this will ensure the provision of a full audit trail covering all documentation and communications with tenderers.

A typical process will involve the following stages:-

i) Issuing of EU Advert via TED

In the event that Welsh Water proposes to advertise an opportunity outside of the PIN cycle as described in Section 2 a procurement advert may be issued. All requirements over an EU threshold will be advertised via the European Public Procurement Journal's Tenders Electronic Daily (TED) portal.

From the issuing of the advertisement, interested organisations will be provided with a minimum of 30 days to respond with their expression of interest supported by a completed pre-qualification questionnaire (PQQ) document.

ii) Prequalification

A prequalification stage will ensure that no submissions are rejected without due consideration and that each submission is subject to the same screening criteria.

All organisations who wish to respond to the PIN or an EU advert via TED will be required to provide the following information.

- the organisation's financial position, including provision of financial accounts;
- the mandatory grounds for prequalification as set out in the Utility Contracts Regulations 2016;
- required insurances;
- health and safety accreditation; and
- form of tender.

Organisations will also be required to provide any further information as set out in the associated prequalification documentation provided as part of the tender process that is not listed above.

In parallel with the issuing of the EU advert we will publish prequalification documentation via the Bravo eProcurement portal. This will include standard questions concerning responding organisations' general suitability to supply our requirements as well as compliance with EU Procurement regulations.

Following the deadline for receipt of PQQ responses all received questionnaires shall be assessed and a recommendation report issued to take forward suitably qualified organisations to participate in the invitation to tender process.

Welsh Water reserves the right to set a limit on the number of organisations that it takes through to the tender stage

iii) Tender

Invitation to Tender documentation encompassing both technical and commercial aspects of our requirements will be issued to all pre-qualifying organisations via our E procurement tool. The suite of documents provided will include Instructions for Completion, Scope of Service, Commercial Response and Technical Response.

To ensure all tender submissions are given equal treatment and there is transparency as to how Welsh Water contracts with third party organisations, terms and conditions will be issued with the tender process documentation.

Any queries arising from the documentation provided will be managed via the same E procurement tool. All clarification, except those agreed to be commercially sensitive, will be issued to all Tenderers. The assessment process to be used in the treatment of both commercial and technical responses forms part of this documentation.

The length of time allowed to complete and submit tenders will depend upon the complexity of the tender but shall not be less than 10 days. However, a more usual tender response timeframe is likely to be at least

30 days in order to provide tenderers with time to submit an appropriate response and in order to provide time for any clarifications to be answered and incorporated into the tenderers' responses. All key process stages and dates will be detailed within the Invitation to Tender's Instructions for Completion.

6. Evaluation

6.1. Our decision making process

To develop our WRMP19, we followed a robust process for decision-making that is compliant with regulatory guidance and best practice. This process helped us obtain a preferred set of solutions that resolves the supply demand imbalances projected in two of our water resources zones and satisfies our demand management targets for all water resource zones.

In order to ensure that we treat third party bids in a non-discriminatory manner we would apply this same process to them. In order to seek solutions that offer better performance or achieve results with less cost, we welcome proposals to assist with or improve our current solutions.

Our approach to considering any third party option is the same as for internal options in that we acknowledge that an option could be considered ineligible at any point in the decision-making process. The work involved with promoting an option will follow a staged approach and undergo screening and Strategic Environmental Assessment (SEA) scoping before the completion of detailed costing and any environmental assessments. This staged approach can save effort if an option is rejected for any reason at the early stages of assessment.

There may be circumstances where we are unable to proceed with an option which has successfully passed through our screening process and been selected within the modelling of best value. Reasons for this may include:

- being contractually obligated to continue with the current delivery;
- where, due to the stage of the project, the cost to continue using the existing delivery method is a lower residual cost than the alternative approach;
- where it is deemed that there would be a significant negative impact on customers or key stakeholders as a result of changing approach part way through an existing scheme;
- If an option is identified as being suitable but not required within the first 5 years of the programme of works, then we are unlikely to proceed immediately with implementation. This is because more beneficial options have been identified to progress with first.

Options which do not align to our business model or with our customer objectives will not be progressed and are likely to fail our screening criteria.

Our approach to decision making is outlined in Figure 1 below.

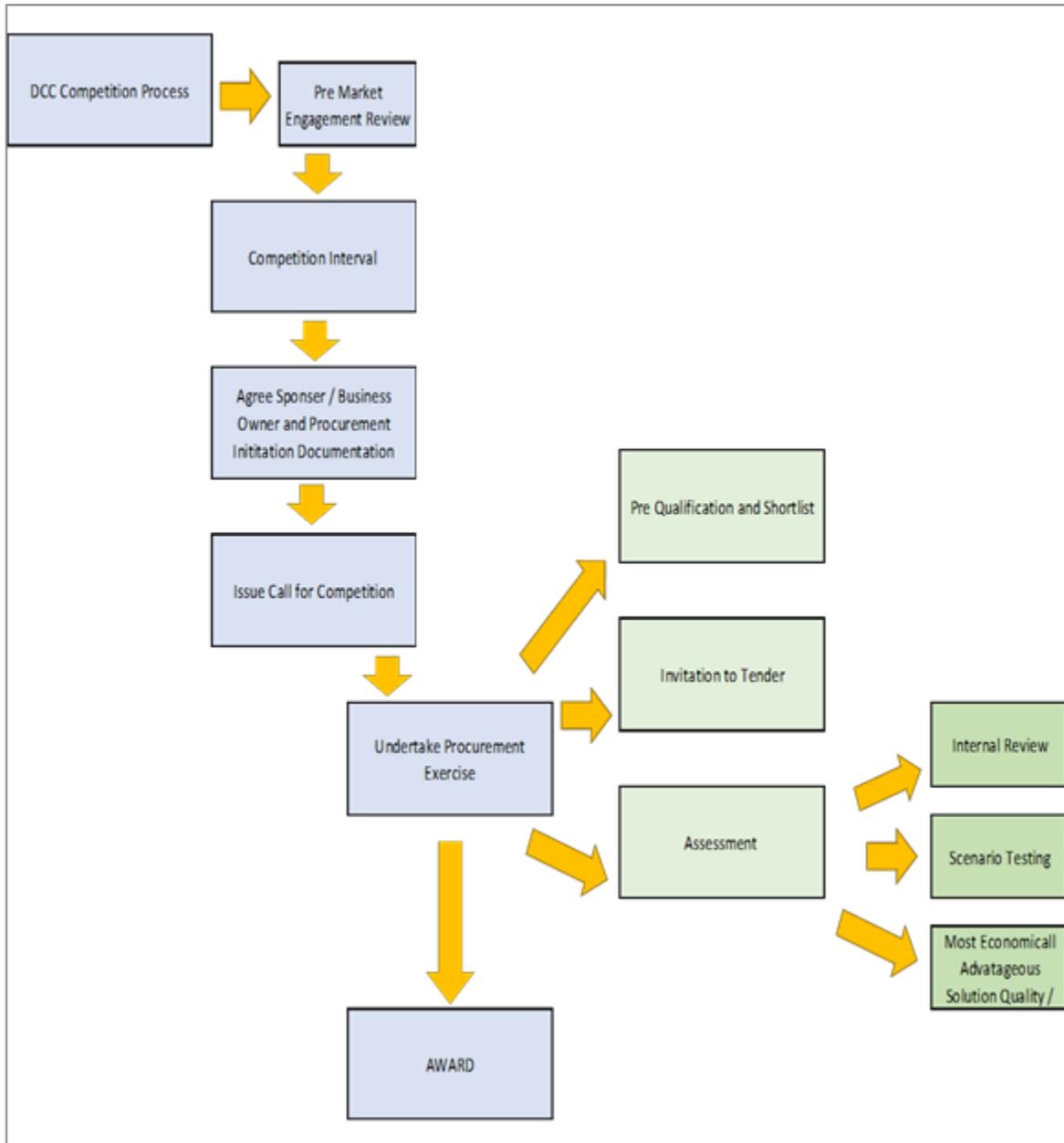


Figure 1 Decision-making approach

6.2. Screening

The table below outlines the screening criteria we would apply to any option received. Where an option is assessed as having an over-riding constraint (i.e. against any single criteria) or which performs poorly against the majority of criteria, then they will be rejected at this screening stage.

Assessment Category	Coarse Screening Key Considerations	Rationale for Rejecting Options at this Stage
Feasibility and Risk	Political acceptability and customer acceptability	The option directly contravenes either a stated policy or known customer preferences.
Engineering Implementation /	Engineering complexity and technological risks	The engineering or non-engineering implementation are either impossible or there are known insurmountable barriers.
Performance	Likely scale of supply benefit relative to the supply deficiency.	There is confidence that the resultant yield will be negligible and / or that an alternative option would serve this need better and more effectively.
Operational	Compliance risks	The option would cause a non-compliance issue (or increase the risk of non-compliance).
Environmental	Statutory risks to international and national designated sites	The option would have a major and unacceptable impact on a designated site, either during construction or longer-Term operation.
	HRA and WFD compliance risks	The option would have a major and unacceptable impact on a HRA site or WFD waterbody, either during construction or longer-term operation.
	Planning risks including landscape, recreation and heritage	The option would have a major and unacceptable impact on landscape, recreation, and heritage at a strategic level/number. E.g. major disruption / change to landscape, eyesore, removal of recreation access/facility etc.
	Socio-economic risks (including consideration of the Well Being of Future Generations (Wales) Act)	The option would result in loss of jobs, would directly prevent job creation (that is otherwise expected), or otherwise have a major negative impact on society.

Table 1 Option Screening Criteria

6.3. Option details

For each option we require a robust estimate of the Yield/Demand Saving, CAPEX, OPEX (Fixed and Variable), carbon cost and environmental impact (SEA, HRA, WFD assessment). For WRMP19 we utilised our company standard Unit Cost Database (UCD) to calculate the Whole Life Costs of supply side options. Whole Life Costs include construction and commissioning costs, periodic replacement of equipment costs (Recurring CAPEX) and the cost of subsequent ongoing operating and maintenance to allow the continued efficient operation of the scheme (OPEX). All indirect costs have also been included such as insurance, management fees, design, investigation, overheads, project management and land compensation.

We would also require any chemical and power costs associated with the option, together with any additional OPEX costs of labour, maintenance, 'Bought in Services' and 'other' (such as administration costs) to be provided. To meet regulatory guidance we would require each

option submitted to provide Fixed and Recurring CAPEX carbon quantities and Operational carbon quantities.

6.4. Selection of the preferred solutions

For WRMP19 the way in which we assessed the best value solutions in our deficit WRZs involved the initial application of a least cost water resource planning optimisation model. Under this approach we first examine which programme of options is the most economical in terms of scheme costs against the benefit they provide. The benefit is defined as either the amount of additional water an option can provide, or the reduction in customer demand through water saved.

The model uses a mathematical optimisation to produce a least cost schedule of investments in these zones and is now an industry standard through guidance. We have applied the decision Lab model which was developed in 2012/13 to implement the EBSD methodology while providing the required flexibility in usage. It has been used to support multiple water companies in WRMP14 as well as WRMP19, and is therefore at a good stage of maturity.

The model produces a least cost optimised programme of investments over the selected planning period to meet the defined planning challenge.

There are 3 types of decision variables within the formulation:

- **Which Options** should be selected;
- **In which year** should the Option be selected / activated;
- **What utilisation** should be made of the Option in each year of the planning period.

The diagram below provides a high-level view of the model operation. The principal input data to the model is our supply demand balance information, all feasible supply and demand side options costs (CAPEX, OPEX, Carbon) and yields (expressed as MI/d).

Any third party scheme will be subject to the same assessment process as an internally developed scheme. To ensure this is the case we will provide as appropriate:

- the same template for third parties to enter input data
- background data to help with yield calculations (e.g. historic flow files and climate change flow files, significant characteristics of the network, etc.)
- guidance on the methods used to calculate yield and costs
- a review of yield, cost and carbon calculations from one of our engineers not connected with the tender decision

The accurate completion of the option template will enable us to incorporate and evaluate a third party option with our existing EBSD methods.

The assessment period is the number of years of costs that the model takes into account in the calculation of the NPV for a particular solution. This will be either equal to or longer than the planning period. A longer assessment period is recommended, and our model is set up to use an 80-year assessment period in line with the Water Resources Planning Guideline.

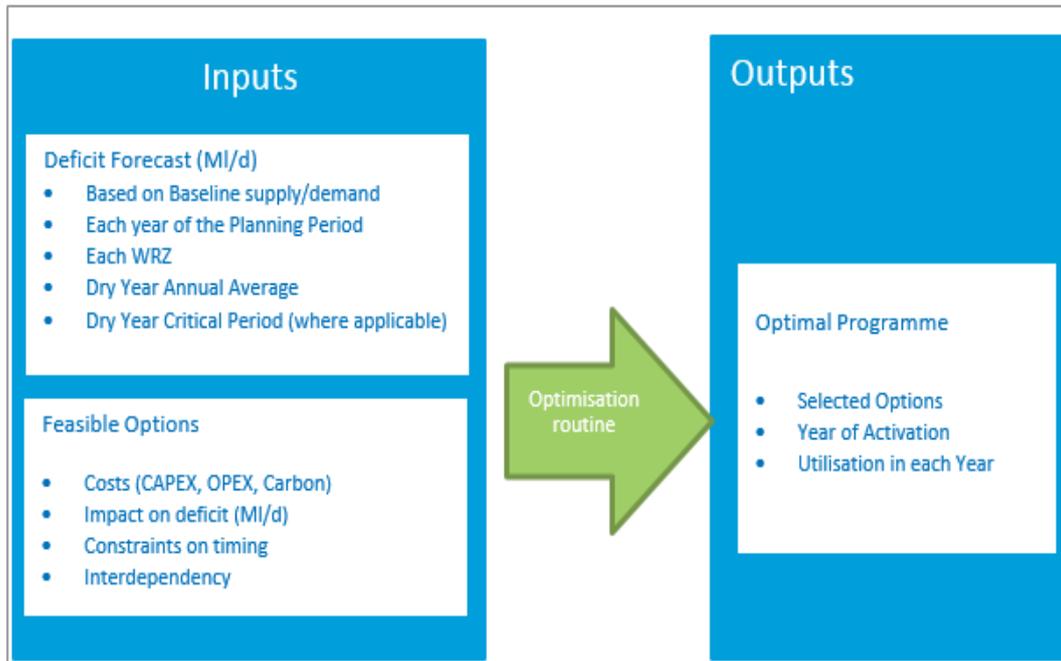


Figure 2 Overview of the optimization modelling approach

6.5. Environmental assessment

The Water Resources Planning Guidance requires us to assess whether our Plan options are subject to Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA). Welsh Government's "Strategic Environmental Assessment in Wales" states that the Regulations require a responsible authority to:

- Determine, where necessary in consultation with the Consultation Bodies (Natural Resources Wales, and Cadw) whether any plan or programme is subject to the Regulations and whether an environmental assessment is required;
- Ensure (if required) that an environmental assessment is conducted and that an Environmental Report is produced, covering the proposals in the plan or programme and realistic alternatives;
- Consult the 'Consultation Bodies' Natural Resources Wales and Cadw on the scope of the Environmental Report;
- Consult those bodies and the public on the plan or programme and the Environmental Report;
- Take account of the Environmental Report and the responses to the consultation before adopting the plan or programme;
- Publish information about the adoption of the plan or programme, including how the Environmental Report and responses to the consultation have been taken into account;
- Monitor the environmental effects of implementing the plan or programme.

In order to treat third party options the same as internal options, we require a third party to approach SEA and HRA processes with a similar level of effort. As stated in section 6.1, an initial SEA scoping report will be required to understand if the option is viable in environmental terms before a third party commissions a detailed assessment.

6.6. Ecosystems services assessment

We understand that we serve many differing groups of customers, with individual wants, needs and expectations of our services. From our extensive customer research and continued tracking of customer sentiment, we have developed six customer promises to reflect the service we should provide to all of our customers; the first two of which are:

- Safe, clean water for all;
- Safeguard our environment for future generations.

Above all, customers place a particular emphasis on the reliability of essential services – the provision of safe drinking water, and the protection of the environment. In line with WRMP guidance we have sought to integrate the ecosystem approach as far as possible within our options appraisal to ensure our preferred options fully consider any potential environmental effects.

The Ecosystem Services (ESS) Assessment undertaken as part of the WRMP is a quantitative and qualitative assessment of:

- The ESS present within the zone of influence of each WRMP feasible supply option (baselined at 2017);
- How the ESS present may change within the timeframe of the assessment (by 2050) in the absence of the WRMP option – the future baseline;
- How the ESS may change after the implementation of the WRMP feasible supply option (in relation to the future baseline).

6.7. Derivation of the best value solution for deficit zones

Based on the above evaluation criteria, we will utilise the UKWIR WRMP19 Decision Making process which seeks to provide water companies with a framework to produce robust and resilient plans that represents ‘best value’ investment. We need to demonstrate to our customers and regulators that our preferred solutions are appropriate to the scale of issue within the individual WRZs and represent the ‘best value’, rather than purely the least cost, solution.

To achieve this, the final stage in our decision making process enables this selection of the ‘best value’ solution by undertaking a broader evaluation of the benefits of the schemes over and above the least cost output from our optimisation model. We therefore balance these outputs against the requirements of the following:

- Customer surveys and other stakeholder feedback;
- Environmental impact;
- Our 2050 vision;
- Resilience to climate change;
- Resilience to 1 in 200 year drought;
- Specific sensitivities in the WRZ e.g. catchment water quality issues.

In the Invitation to Tender documents, we will provide details of the type of information required to characterise how well a third party option addresses these other 6 aspects to understand how much it contributes to a best value solution.

7. Governance and commercial sensitivity

We will appoint a procurement manager to undertake the procurement and assessment process as set out in Section 5 of this document. The procurement team within Welsh Water is not linked to any operational department and can therefore operate with complete independence and impartiality with respect to the tender process. The procurement will also operate under a business sponsor who will be accountable for overseeing the review.

In relation to commercial sensitivity the procurement manager will:

- ensure confidentiality and non-disclosure agreements are in place to provide security in relation to commercial and technical confidentiality;
- ensure that there are appropriate procedures in place to manage commercially sensitive data including the approach to digital security i.e. the data will be placed on a secure server and access to it will be approved only for technical reasons – none of the decision-makers will see this commercially confidential data.

The procurement manager will independently manage the procurement process and the assessment of the different options will be undertaken by an independent team not involved in the provision of the internal proposal.

8. Contract award

8.1. Assessment, recommendations and approval to proceed

Following the expiry of the deadline for tender receipt responses will be reviewed and assessed both technically and commercially via an assessment team qualified to conduct the appraisal. In respect to the technical appraisal individual appraisers shall first independently assess each response received prior to the coming together of the assessment team to review findings and agree final scores. Commercial assessments shall consist of the checking of returns, undertaking commercial assessment and the identification of any areas of concern which may need to be investigated prior to calculating the commercial score.

Clarification meetings may be held with tenderers to ensure that the assessment team has a clear understanding of tenderers' responses and proposals.

Following the completion of the above outline process a Recommendations Report will be produced and forwarded to the Business Sponsor for their review and approval.

8.2. Award announcement and stand still

Once the recommendations resulting from the assessment of returns has been approved an award announcement shall be made and a 10 day standstill period observed to allow all tenderers to review Welsh Water's award decision. All Tenderers will be issued with a summary of Welsh Water's assessment of all proposals and that of the awarded party. The summary will not compromise confidentiality.

We value a fair and equitable approach and have defined a straightforward complaints process described in section 11 of this document. This includes a complaints form to be submitted to member of the procurement team. If a complaint is identified during the 10

day standstill period, where this is applicable, we will consider extending the standstill period if needed.

8.3. Contract award

Following the expiry of the standstill period and provided that there have been no substantive challenges received, then the contract will be issued to the successful party(s) and the contract implementation process shall commence.

9. Communication of decision

The communication process would be undertaken via the e-procurement portal by means of a notice of award or notice of unsuccessful letter.

10. Complaints procedure

We value a fair and equitable approach and have defined a straightforward complaints process to address any appeals.

The complainant should lodge their complaint with a member of the procurement team so that the matter can be investigated, scores validated and investigation undertaken into the issue(s) raised to provide a response to the complainant and to produce a report to be submitted to the Bid Sponsor.

If a complainant is not satisfied, then the matter would be referred to the Head of Regulations and the Head of Procurement and Estates for review and provision of a formal response to the complainant

In the event that there is still a dissatisfaction expressed by the complainant the complaint will progress to a Board member who has not been involved in the assessment and procurement process so far and they will undertake a further independent review.

Appendix: Need specification

1. Water resources planning overview

We have recently published and consulted on our draft Water Resources Management Plan for 2019 (WRMP19) which covers the period 2020 to 2050. In order to develop our WRMP19 we project the future total demand for water from our domestic and business customers and leakage from our supply system. We then calculate how much water will be available from our current water sources in each zone to meet the demand. Long term water resource planning is a complex process involving the analysis of large amounts of data. We need to make an allowance for the uncertainties in our supply and future demand data and this risk allowance is known in the industry as “headroom”. We generate a supply against demand balance for each water resource zone which includes an uncertainty/headroom allowance. Figure 1 below shows a graphical representation of this balance.

Where the zonal supply demand balance, including the effect of uncertainty, shows a potential shortfall, the Plan identifies the options that either reduce demand or increase supplies to resolve the imbalance.

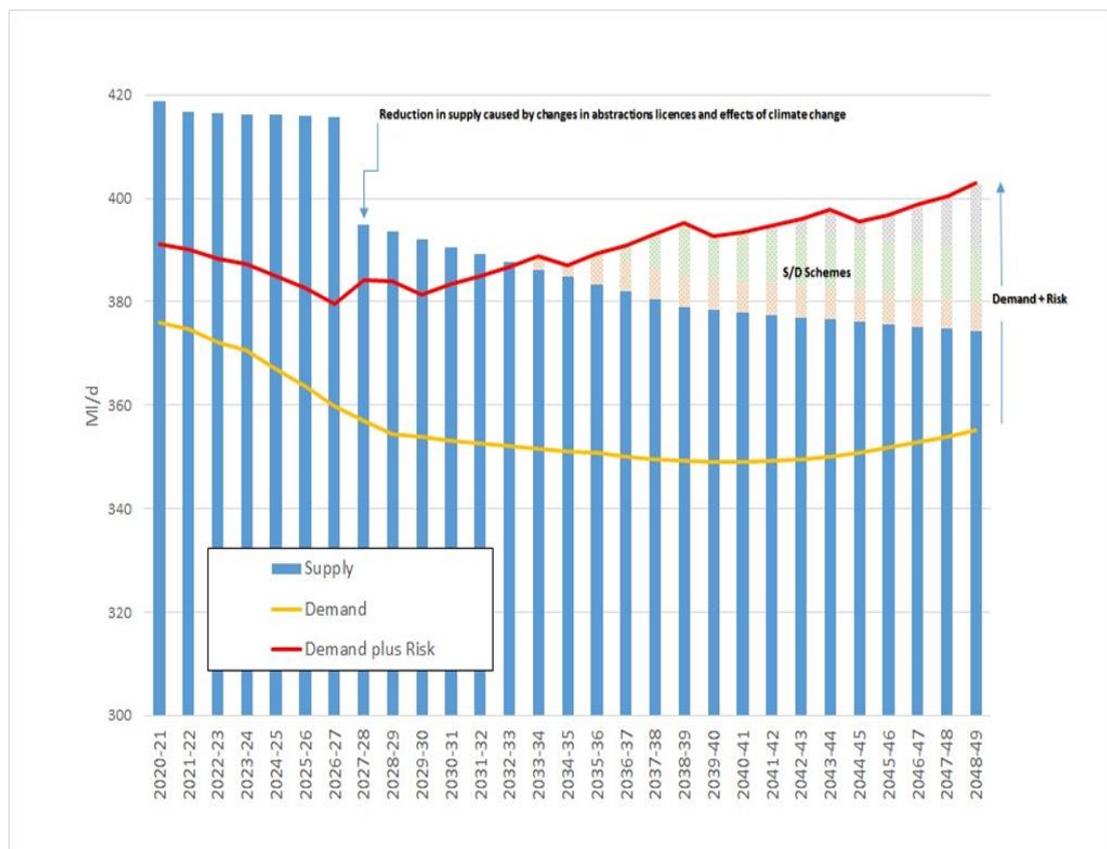


Figure 1 Example supply demand balance graph

2. Water resource zone demand position

In our draft Water Resource Management Plan, we have targets for leakage reduction and demand savings related to water efficiency. Meeting the Ofwat challenge of a 15% reduction in leakage by the end of AMP7 requires a saving of 26 MI/d. We will continue with our ‘find and fix’ program to reduce leakage in distribution mains but will devote more emphasis on customer pipes through our Project Cartref approach which allow us to address internal plumbing losses while promoting water efficiency programs.

3. Water resource zone supply position

Figure 2 and Table 1 below show the Supply/Demand balance position for each of our water resource zones. There are two zones where we forecast a water resource deficit during the 30 year planning period, namely Tywyn Aberdyfi and Pembrokeshire.



Figure 2 Water Resource Zone Supply Demand Position

WRZ	2025 Surplus MI/d	2050 Surplus MI/d
NEYM	8.1	6.4
Clwyd Coastal	1.3	2.5
Alwen Dee	2.1	2.1
Tywyn Aberdyfi	-0.8	-1.5
Bala	0.3	0.3
Blaenau Ffestiniog	0.3	0.3
Barmouth	0.0	0
North Ceredigion		
Lleyn Harlech	3.0	2.9
Dyffryn Conwy	2.1	2.7
Sth Meirionnydd	0.4	0.4
Ross	3.3	3.6
Elan	0.4	0.5
Hereford	8.8	9.9
Llyswen	1.5	1.5
Monmouth	0.6	0.7
Pilleth	0.3	0.3
Brecon	0.6	0.7
Vowchurch	0.0	0
Whitbourne	0.1	0.1
SEWCUS	16.0	18.6
Tywi	22.7	24.5
Mid & Sth Ceredigion	2.7	2.5
Nth Ceredigion	1.8	2.0
Pembrokeshire	-3.6	-13.8

Table 1 Water Resources Zone Supply Demand Position

Supply demand balances for the two deficit zones (Tywyn Aberdyfi and Pembrokeshire) are set out in Figures 3 to 6 below.

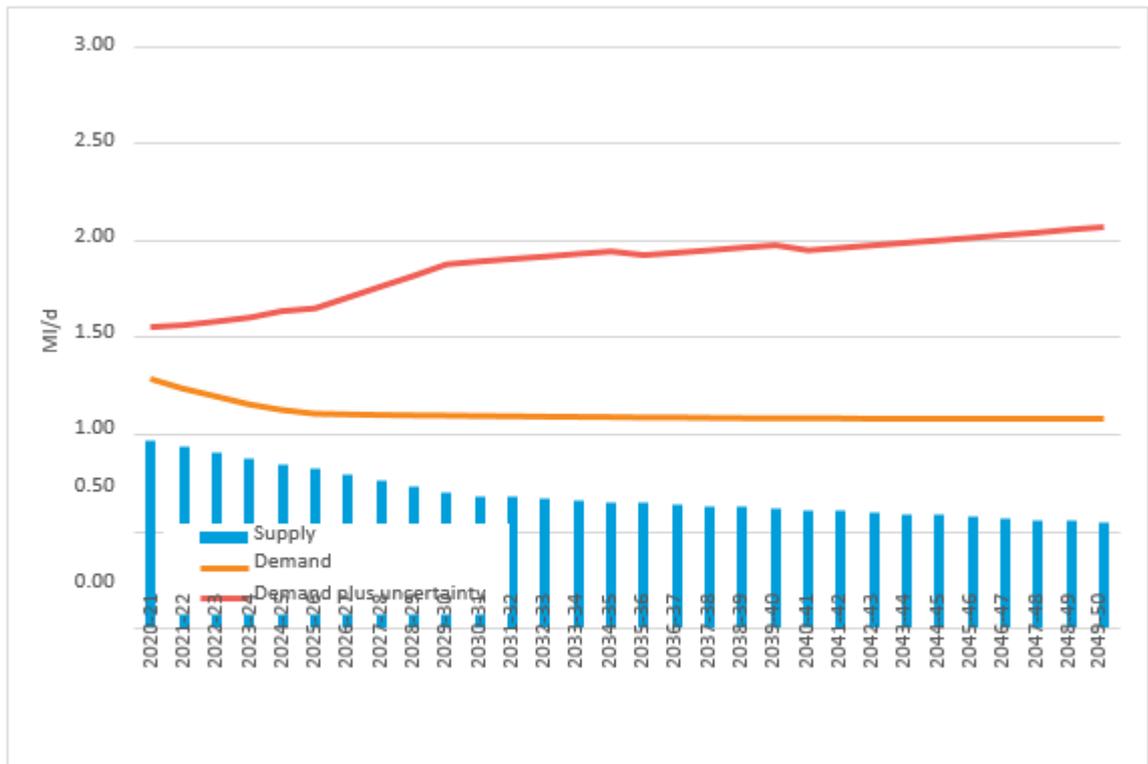


Figure 3 Tywyn Aberdyfi Annual Average Supply Demand Balance

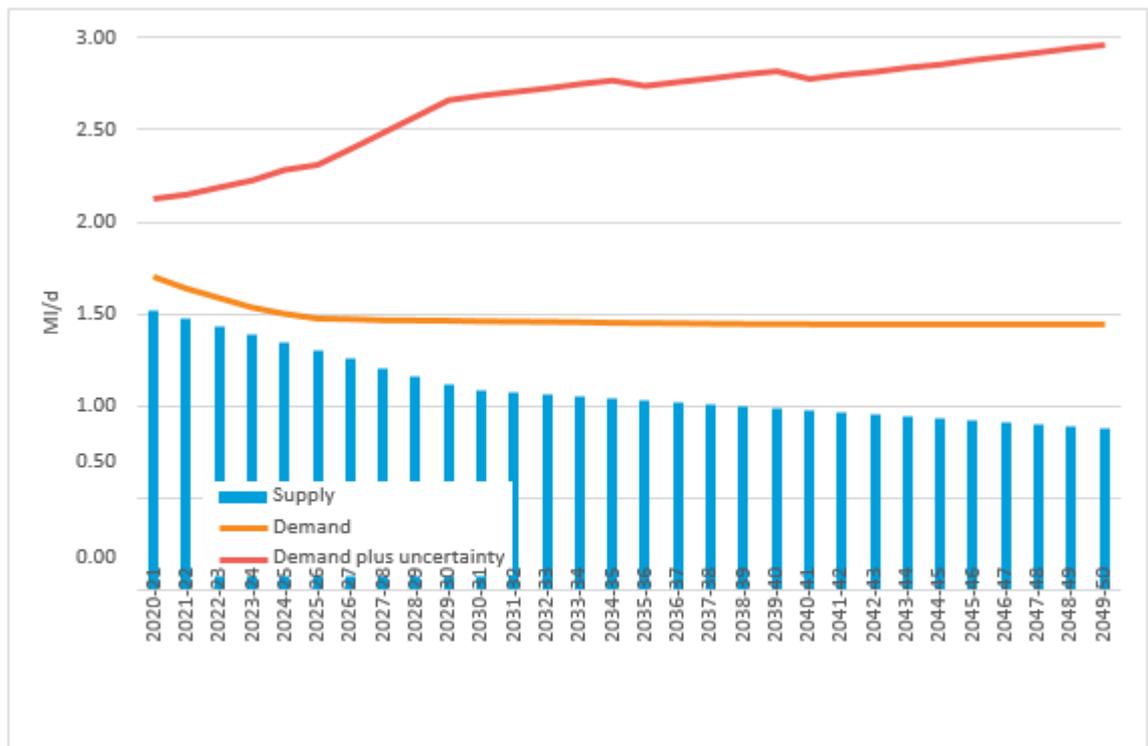


Figure 4 Tywyn Aberdyfi Critical Period Supply Demand Balance

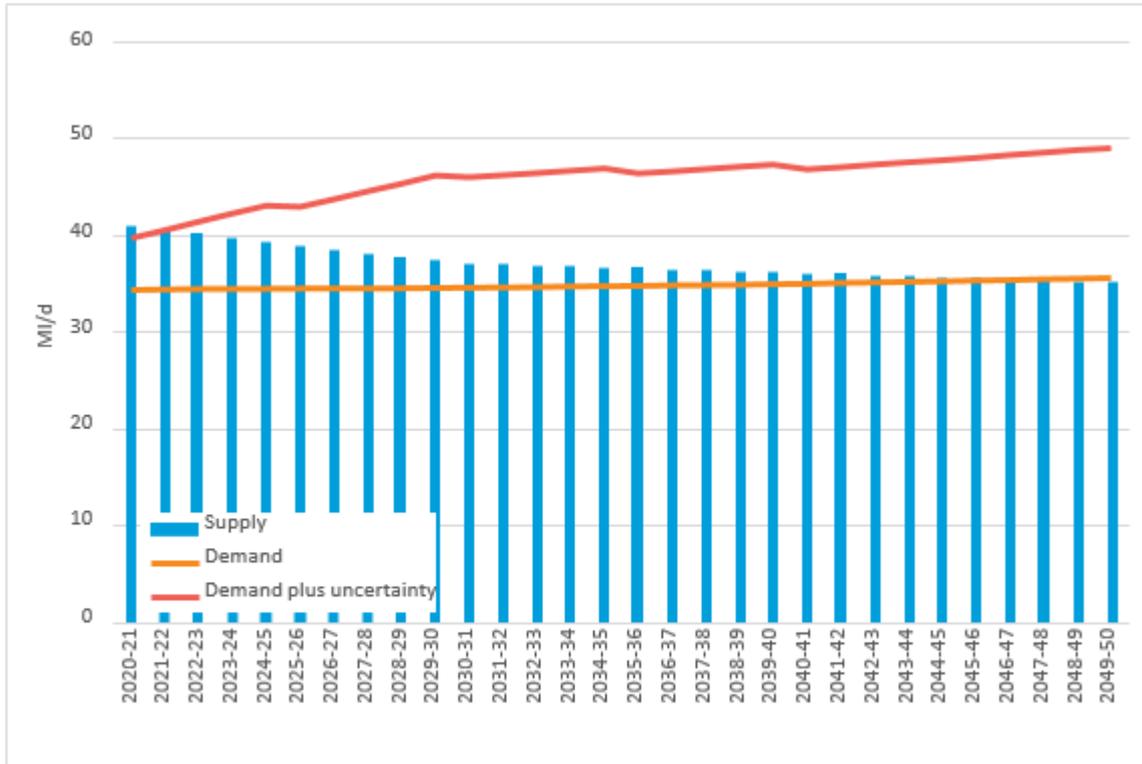


Figure 5 Pembrookeshire Annual Average supply demand balance

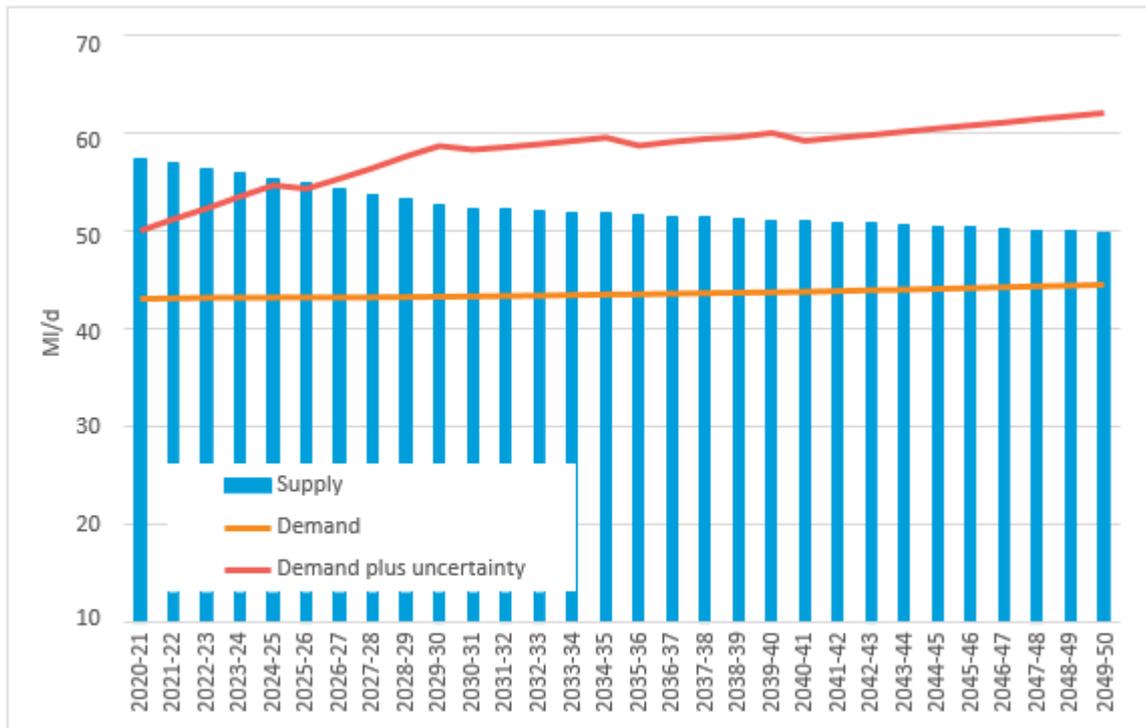


Figure 6 Pembrookeshire Critical period supply demand balance

Details of the two deficit zones and the drivers behind the shortfalls are set out in the following sections.

4. Tywyn Aberdyfi water resource zone

This water resource zone covers the small coastal area around the towns of Tywyn and Aberdyfi in Mid Wales. There are approximately 4,700 customers in this zone but demand can increase significantly during the summer due to tourism.

4.1. Operation of the water resources

Penybont is the only water treatment works in the zone. It is fed from two small river abstractions; the Afon Fathew and the Nant Braich-y-Rhiw (see Figure 7 below). The Nant Braich-y-Rhiw abstraction licence has a condition which prevents us from using this source when the river levels are low. This comes into operation during most summer periods; we are then reliant upon the Afon Fathew.

The zone currently has no exports or imports of water.

4.2. Demand

Demand in the zone is expected to decrease slightly across the planning period. A very marginal increase in population is forecast from 4,730 in 2020 to 4,900 by 2050 although this demand is expected to be offset by a reduction in how much water is used per person per day. As with other zones across Wales, the reduction in usage per person is supported by a forecast increase in metering in the zone, from 60% of households in 2020 to 88% by 2050.

4.3. Climate change

A detailed climate change assessment has been undertaken which indicates there is a high risk to our supplies in the future. The two river abstractions are highly vulnerable to low flows in the summer, which are forecast to become more severe due to the effects of climate change. It is likely that the current operation of the zone is not sustainable when accounting for potential future effects of climate change. We have therefore had to include a large margin for uncertainty within our calculations.

4.4. Resilience

An initial analysis of extreme drought events has been undertaken for the zone, the results of which show that in a 1 in 200 year drought event, supplies to the zone as a whole cannot be maintained. River flows in the Afon Fathew and Nant Braich y Rhiw would not be sufficient during a 1 in 200 year drought to support the required levels of abstraction to meet zonal demand.

4.5. Water resource position

For our WRMP19 we investigated further the catchment hydrology and now believe the river flows in a dry summer are likely to be even lower than previously thought and so there is less water available for abstraction. This makes the zone extremely vulnerable to dry periods, an effect which is exacerbated when we take account of climate change. This means that the water available to us across the planning period is less than we need to meet the predicted demands for water plus our Target Headroom uncertainty allowance. For this Plan we are therefore forecasting a supply demand shortfall in the zone. Our analysis shows that the flow in these streams will not be sufficient to meet demand during severe drought

periods and this will lead to a zonal supply demand deficit reaching 0.8 MI/d by 2025. This might be compounded by the risk of poor stream water quality during summer storm events which can cause water treatment issues.

4.6. WRMP19 solution

Our preferred solution is to construct a new river intake on the nearby Afon Dysynni which can provide the volumes of water required, and to transfer this water to the Penybont water treatment works. The Afon Dysynni is much larger than our existing sources and the amount of water that we would abstract is a small fraction of the amount of water in the river even during drought periods. This is a sustainable and more resilient source of water to severe droughts and the effects of climate change. This solution is by far the lowest cost of all options, with the least environmental impact. It is proposed to support this solution with a raw water bankside storage reservoir to enable short term shut down of the existing stream sources. The overall scheme cost is estimated to be approximately £7.5 million.

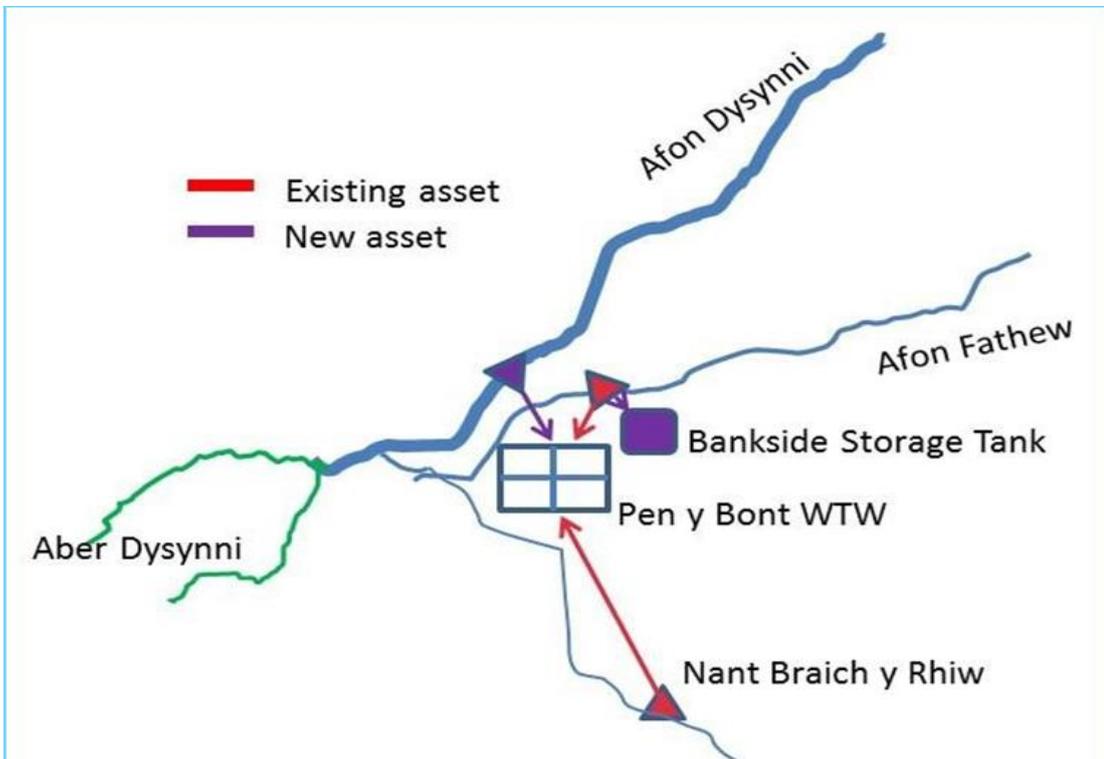


Figure 7 The Tywyn Aberdyfi Water Supply System

5. The Pembrokeshire water resource zone

This zone covers the far south west corner of Wales, stretching from Pendine Sands in the east to the Pembrokeshire Coastal National Park in the west and from the villages of Manorbier in the south to Newport in the north (see Figure 8 below).

5.1. Operation of the water resources

The largest treatment works in the zone is Bolton Hill, which is supplied by Canaston Bridge pumping station on the Eastern Cleddau and Crowhill pumping station on the Western Cleddau.

Canaston Bridge pumps water from two sources: a river intake on the Eastern Cleddau which is supported by releases of water from Llysyfran Reservoir, and a small piped supply from Valley Court springs. In addition to treated water for domestic customers, the Canaston Bridge – Bolton Hill arrangement supplies untreated water to the oil refineries south and north of Milford Haven.

The other major treatment works in the zone is Preseli, which is supplied from Rosebush reservoir. If storage in Rosebush is low, Preseli can be supported with water pumped from Llysyfran whilst Rosebush can be supported with water pumped from a river intake on the Eastern Cleddau at Pont Hywel. However, this supply is limited due to recent restrictions placed upon the abstraction licence for this source.

Pendine borehole supplies the eastern part of the WRZ which can also be supported from the Bolton Hill system.

5.2. Changes to the zone

To protect the Afonydd Cleddau Special Area of Conservation, the amount of water we are allowed to take from the river will reduce in 2019.

At Pont Hywel, this reduces the support which can be provided to Rosebush and results in lower storage in the reservoir.

At Crowhill, this reduces the amount that can be taken from the river to supply Bolton Hill. This increases the reliance of Bolton Hill on Canaston Bridge.

At Canaston Bridge, a licence change reduces the amount that can be taken from the river in the spring and autumn and so increases the need for releases of water from Llysyfran to support the river.

With increased demand on Llysyfran to support Rosebush and Canaston Bridge, the storage in the reservoir is fully utilised in dry years. This increases the vulnerability of the resource to the effects of climate change and more severe droughts than those we have seen historically.

5.3. Climate change

Our modelling of climate change has shown that affects our resources in two ways; first, it directly reduces the inflow to our reservoirs and secondly, it reduces the flows in rivers that are supported by reservoir releases. In Pembrokeshire this means less water would be

available in Llysyfran into the future and more water would need to be released to support abstraction at the Eastern Cleddau at Canaston Bridge. Llysyfran is also required to provide greater support to Preseli works.

This combined pressure exacerbates low storage in drought years in Llysyfran. As the amount of water remaining in storage in Llysyfran and Rosebush in a dry year already limits the amount of water which can be put into supply, this further reduces the amount of water available to customers. The impact of climate change will increase across the planning period, hence our available supply steadily decreases.

5.4. Resilience

To assess the resilience of the zone to drought, we tested our model with more extreme and varied droughts than those in our historical record. This testing revealed that the zone is currently vulnerable to droughts between 1 in 50 and 1 in 100 year severity, as storage in Llysyfran becomes critical to maintaining supply to customers.

Population is forecast to increase from 123,000 to over 136,000 by 2050. Demand is forecast to rise steadily through the planning period. Housing development, centred on 'Haverfordwest, Milford Haven, Neyland, Pembroke, Pembroke dock, Fishguard and Goodwick'¹, and the commensurate increase in demand will be partially mitigated by a reduction in how much water is used per person across the population.

5.5. Water resource position

The supply demand balances for the zone shows a deficit starting in 2022/23 which increases to a maximum of 14 MI/d in 2049/50. This deficit is driven by the reduced storage in Llysyfran, which is forecast to worsen when the impacts of climate change are assessed. This reduction in storage increases the allowance that we need to make for both the impact of climate change, and the uncertainty surrounding the potential scale of that impact.

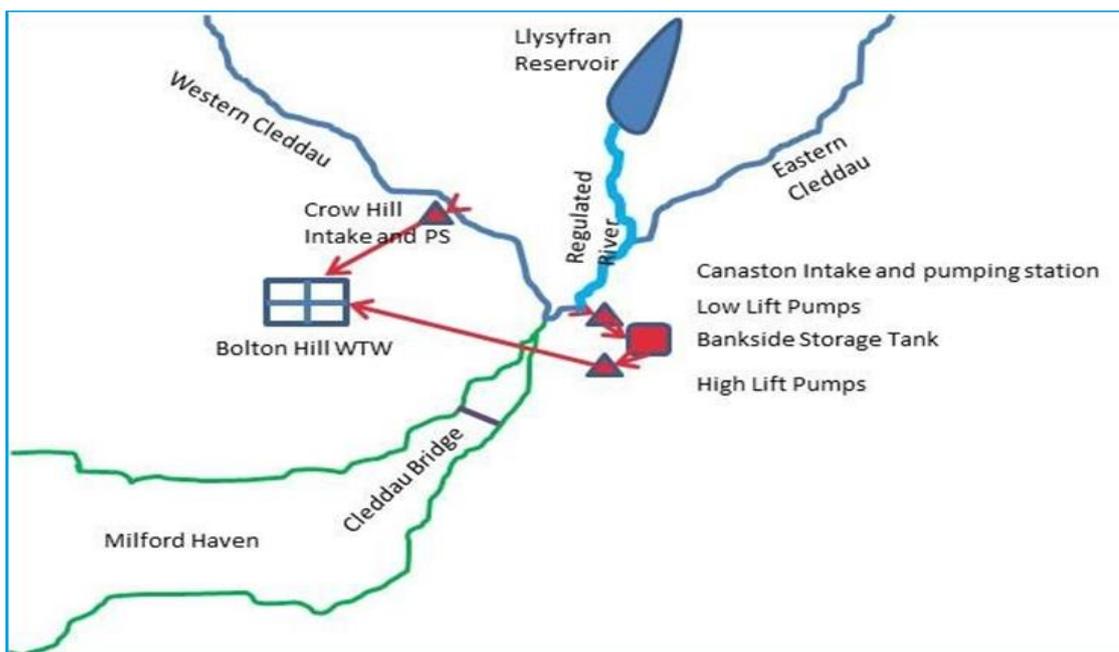


Figure 8 The Pembrokeshire Water Supply System

The Canaston pumping station has fixed flow rate pumps and the operation of the station, within the terms of the abstraction licence, means that we currently need to over-release water into the Eastern Cleddau River while we are abstracting lower down the river. This means that we release too much water that could be saved during dry years in case of drought. The installation of variable speed pumps in the pumping station will enable more efficient river regulation to preserve Llysyfran reservoir storage during critical dry years. The change in operation will preserve sufficient water in Llysyfran to meet the supply against demand shortfall during severe droughts.

This scheme was identified as the best value solution as it was by far the lowest cost option of those available that resolved the forecast deficit and provided additional resilience against climate change and severe drought. The existing pumping station is relatively old and we will need to maintain the existing pumps in the near future and this scheme also meets the capital maintenance needs at the pumping station. The estimated cost of this option is around £13 million.

6. Water trading position

As stated in our Draft Water Resources Management plan, we are seeking either bulk raw or treated water supplies in the following zones at the indicative quantities stated below:

- Pembrokeshire (~1 - 10 MI/d);
- Tywyn Aberdyfi (~0.1 - 0.5 MI/d);
- North Eryri Ynys Mon (~1 - 10 MI/d);
- SEWCUS (~2 - 30 MI/d).

These bulk raw or treated water supplies are needs that could also be provided by third parties.