Appendix 4 Enhancement business cases and cost adjustment claims

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## Overview

This summary sets out the enhancement expenditure in our plan and provides the detailed business cases to demonstrate the need for action and the solutions we have identified.

In Section 4.1 we have presented evidence for all material enhancements outside of the four areas where we believe cost adjustments are required. It includes the following business case summaries:

- 4.1.1 Security enhancements
- 4.1.2 Catchment management
- 4.1.3 New development
- 4.1.4 Water NEP and other enhancements
- 4.1.5 Wastewater NEP
- 4.1.6 Wastewater developer services and growth
- 4.1.7 Welsh language services

Section 4.2 and 4.3 contain the cost adjustment pro formas and detailed business cases respectively for the four cost adjustment claims. The four areas – Reservoir safety, Supply resilience, reducing lead and enhancing biodiversity and well-being.

- 4.2 proforma summaries for all cost adjustment claims
- 4.3 Approach to cost adjustment claims
  - 4.3.1 Supply resilience
  - 4.3.2 Reservoir safety
  - 4.3.3 Reducing lead
  - 4.3.4 Enhancing biodiversity and well-being

Our May submission also included two econometric modelling claims – for water and wastewater services respectively. This was based on the identified risk that our specific circumstances are such that econometric models may not be able to accurately predict required efficient expenditure. We remain of the view that the size, rurality and lack of historic data means that it will be very difficult to effectively model the expenditure requirement for Hafren Dyfrdwy (HDD) using high level industry econometric models. However, given that we are not yet aware of how Ofwat plans to calculate HDD's expenditure requirements, we have chosen not to restate these modelling claims at this stage. Instead we have focused on making cost adjustment cases for particularly sensitive blocks of expenditure that we consider will not be adequately allowed for.

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## 4.1 Wholesale enhancement investment

#### Interaction between enhancement expenditure and cost adjustment claims

In line with Information Notice 18/11, we've identified all material programme items of our enhancement expenditure and have:

- explained why the expenditure is classified as enhancement and not as base, including identifying the drivers of the expenditure and the benefits; and
- provided evidence to support the need for the expenditure and how customers are protected. As explained above, evidence to support cost efficiency is described in appendix 5.

Our enhancement cases include a wide range of inputs and data sources including:

- interpretation of current and future legislative and regulatory requirements as well as customer expectations;
- reference to associated current and historic performance baselines;
- overview of intervention options developed and estimation approaches used;
- assessment of benefits delivered from different intervention options; and
- sensitivity of investment to customer protection mechanisms.

Our general approach to developing business cases for enhancement not subject to adjustment claims is set out in the table below. In summary we have explained why the expenditure is classified as enhancement and not as base, including identifying the drivers of the expenditure and the benefits; and provided evidence to support the need for the expenditure and how customers are protected. Efficiency of the costs are covered in appendix 5 – Efficient costs.

Ofwat cost adjustment criteria	Relevance of cost adjustment criteria to a making a robust enhancement business case	Key themes considered in each enhancement business case
Need for investment	Specific relevance – A funda mental component of any business case	<ul> <li>Why do we consider this investment to be enhancement (i.e. driven by statutory increase, clear customer support or change in external conditions acting upon us)?</li> <li>What is the current level of service and how will it change?</li> </ul>
		• Does the proposed intervention deliver what customers / the statutory obligations want/require?
Best option for	Specific relevance – A fundamental component of any business case	<ul> <li>Is the programme optimal? Is it cost beneficial (discretionary investment) or cost effective (statutory investment)?</li> </ul>
customers		• What is the opportunity for a range of potential interventions within the programme?
		• What is the scope for wider benefits that will result?
Robustness and efficiency of costs	Specific relevance – A fundamental component of any business case. However, generally justified at a company level in appendix 5 – Securing cost efficiency.	<ul> <li>What is the basis for estimating the identified expenditure?</li> <li>As per the cost efficiency chapter – What confidence do we have that estimation methods are accurate and efficient relative to external benchmarks?</li> </ul>
		<ul> <li>How have we used wider information to understand additional opportunities for further efficiency?</li> </ul>
Customer protection	Specific relevance – A fundamental component of any business case	• How is the expenditure covered by proposed Performance Commitments and Outcome Delivery Incentives (as set out in the relevant chapters)?

		•	What wider statutory / regulatory mechanisms will hold us to account for non/ under or late delivery?
Affordability	Wider relevance – Best considered at a business plan rather than individual business case level.	٠	As per affordability and risk/reward chapters – Is the business plan affordable?
Board assurance	Wider relevance – Best considered at a business plan rather than individual business case level.	•	As per board assurance statement – Has the expenditure within the business plan been subjected to appropriate governance?
Need for cost adjustment	Not relevant-Business cases do not make any assumptions as to how Ofwat will independently assess the need for the identified expenditure.	NA	
Management control	Not relevant–Business cases consider the basis for all relevant enhancement expenditure rather than identifying reasons for variance relative to a generic benchmark.	NA	

#### Read more

- **Chapter 2:** Customer Insights; Describes the research we've carried out to understand the expectations and views of our customers.
- **Chapter 10:** Securing confidence and assurance; Sets out wider governance of our plan.
- **Appendices 2 and 3:** Rationale for PCs and Bespoke PC definitions; Provides contextual information on the drivers of expenditure, customer and stakeholder views and performance commitments.
- **Appendix 5:** Efficient costs; Provides evidence to support accuracy and efficiency of business plan expenditure.

#### Wholesale Water enhancement expenditure overview

Activity	Enhancement included in plan	Related Base included in plan*	Totex	Estimate of implicit allowance	Cost Adjustment claim	Table WS2 lines covered	Performance commitment coverage	Wider customer protection mechanism
Supply resilience	1.150	10.121	11.271	2.571	8.700	Capex: 14 (Base expenditure WS1, line 13)	<ul> <li>Water supply interruptions</li> <li>Water quality complaints</li> <li>Mains bursts</li> <li>Unplanned Outage</li> <li>Risk of severe restrictions in a drought</li> </ul>	WRMP process
Reservoir safety	4.350	3.150	7.500	0.420	7.080	Capex: 14, 24 (Base	• Water supply interruptions Risk of severe restrictions in a drought	Legislation
						expenditure WS1, line 12)		
Lead	2.930	0	2.930	0	2.930	Capex: 6	<ul><li>Number of lead pipes removed</li><li>Water quality compliance (CRI)</li></ul>	DWI undertakings or prosecutions
Wellbeing and biodiversity	1.890	0	1.890	0	1.890	Capex: 1, 25	<ul> <li>Hectares of land improved for Biodiversity</li> </ul>	Environment (Wales) Act
						Opex: 35, 37, 59		Well-being of future generations
Security	0.417				Nil	Capex: 15	Water supply interruptions	Legislation
Catchment management	0.399				Nil	Opex: 39, 47	<ul><li>Water quality compliance (CRI)</li><li>Water quality complaints</li></ul>	WRMP process
Developer services					Nil	Capex: 11, 12	• D-mex	Regulatory
New Development	4.009						• Properties at risk of low pressure	enforcement
Ancillary	1.555						• Length of river water quality improved	
NEP - Eels	1.412				Nil	Capex 2, 5, 21	Inspiring our customers to use water	
Taste colour odour	1.596					Opex36	wisely	
Meter optants	0.780						<ul><li>Per Capita Consumption (PCC)</li><li>Water quality complaints</li></ul>	
Total enhancement	20.287				20.600			
	(19.555 capex,							
	0.732 opex)							

\*(where cost adjustments relate to interventions allocated to both base and enhancement)

#### Wholesale Wastewater enhancement expenditure overview

£m	Enhancement included in plan	Table WWS2 lines covered	Performance commitment coverage	Wider customer protection mechanism
Wastewater environmental programme	2.717	Capex: 6, 7, 9, 10, 16, 18, 19 Opex: 51, 66	<ul> <li>Pollution incidents (Category 1-3)</li> <li>Treatment works compliance</li> <li>Satisfactory sludge use and disposal</li> <li>Length of river water quality improved (km)</li> </ul>	EA prosecutions
First time sewerage	0.003	Capex: 1		Water Industry Act 1991 enforcement
New development and growth	0.589	Capex: 25, 26	<ul><li>Internalsewer flooding</li><li>Risk of sewer flooding in a storm</li></ul>	Regulatory enforcement
Total enhancement	3.309			
	(Capex 3.111,			
	Opex 0.198)			

\*(where cost adjustments relate to interventions allocated to both base and enhan cement)

#### Retail enhancement expenditure overview

£m	Enhancement included in plan	Table WWS2 lines covered	Performance commitment coverage	Wider customer protection mechanism
Welshlanguagescheme	0.302	n/a (retail)	Compliance with Welsh Language standard	Welsh Language Act



## 4.1.1 Security business case

## **Overview**

#### What does this investment deliver?

This business case relates to the security investment for Hafren Dyfrdwy (HD). The formation of HD followed the purchase of Dee Valley by Severn Trent PLC in February 2017. HD is the home of all the Welsh assets of Severn Trent (ST) and Dee Valley, with all English assets remaining or moving into ST. ST and HD have separate water licences but both are part of Severn Trent Plc and therefore have the same security strategy and risk-based approach in the next AMP.

Business case	Security
AMP7 enhancement Capex	£0.417m
AMP7 enhancement Opex	£0
Price control	Water Network plus
Sensitive performance commitment	Customers are protected through legislation which we are required to adhere to

#### We've challenged ourselves to be ambitious against Ofwat's PR19 themes

#### Our challenges against Ofwat's PR19 themes

Innovation	Resilience	Affordability	Great customer service
Innovation is vital, with new technology rendering some traditional physical security protective measures less effective. As an example, drones mean that fencing can be easily breached and 3D printing means that previously secure keys can be replicated. These advances have been reflected in forthcoming legislation, the Protective Security Guidance 2020 (PSG 2020) & Networks and Information Systems Directive (NIS). This makes a step change in protection imperative. Our focus will be on detection and speed of response, moving away from the traditional processes of intruder alarms & reasonable prudent police responses. Our research has informed us of new innovative solutions in CCTV verification and remote monitoring, which will	Due to the nature of threat against our assets, we have challenged our ability to be resilient by: Confirming which terrorism & cyber risks we should be seeking to protect our customers from. Taking precautions that will mitigate the risk contamination from malicious threat (terrorism) through improved physical & cyber security. This will also minimise the risk of a long duration supply interruption (>24hrs). Identifying appropriate resistance/redundancy options or response/recovery options within the cost profile. Our resistance and recovery options include physical hardening of our sites and the installation of cyber security precautions, together with an operational control and monitoring facility.	We understand the affordability pressures our customers face and have challenged ourselves to drive down the financial impact of this investment. The affordability challenge has been refined following refinement of costs in the wider context of our overall plan. We have used a risk- based approach to manage affordability (in line with our cost benefit assessment), at a prioritised list of sites that will be phased over AMP7 and AMP8. Taking a risk-based approach reduces costs to customers by around 25% compared to a prescriptive	We plan to maintain a great level of customer service by protecting our assets and aligning with legislation. Improvements to security on our sites mitigates against the risk of contamination and sabotage, protects the security and resilience of our customers' water supply and delivers customer service.



ensure we meet the	standards-based
legislative change required.	approach.

#### This business case is supported by technical appendices

Annex 1	Understanding the implications of PSG (2020) & WUK Security Standards (2017)
Annex 2	Interpretation of annex 1 requirements

### **Need for investment**

Our investment will deliver a step change to align with new legislation, providing our customers with improved security and resilience of their water supply. Our programme is consistent with our customers' needs, reflects emerging threats and responds to the new PSG 2020 and NIS legislation.

Our proposals are underpinned by three pieces of evidence that demonstrate the need for this investment:

#### We must comply with legislation

Since AMP4 Dee Valley have been investing in line with current SEMD advice notes provided by Defra and enforced by Welsh Government. However, in April 2020, the advice notes will be replaced by the new legislation of PSG and Water UK Security Standards (WUKSS) and HD must be aligned with these.

The forthcoming legislation provides advice on the security risk-based approach for protection to required levels of the following sites:

- Category 3 Critical National Infrastructure;
- Category 2 National Infrastructure; and
- Category 1 National Infrastructure.

Defra/Welsh Government have provided early sight of PSG to water companies so we can make provision in our PR19 plans – this business case is our response to the requirements. These guidance documents reflect a more risk-based approach to security design and implementation - as opposed to a more prescriptive standards-based approach. This risk-based approach seeks to ensure investments are proportionate to the actual risk and investment costs are kept to a minimum.

We have reviewed the impact of the new guidance and drawn on expert advice from CPNI security advisors. Our interpretation of the likely impact of the changes driven by PSG are set out in appendix 1. The common thread is the requirement for response actions to be initiated within a maximum of ten minutes.

In addition to PSG 2020, we must plan to respond to the requirements of the new EU directive on security of NIS. The NIS specifically covers cyber and physical security of corporate and operational technology at drinking water sites. It has a direct impact on Instrumentation, Control and Automation (ICA) systems. Our approach to ICA investment in water has been to balance risks/resilience and investment levels using internal and external experts. Thus far, we have maintained our assets within an acceptable risk profile resulting in no significant failures and no penetration of our core enterprise systems by unauthorised actors. However, the complexity and frequency of the threats we now face has increased exponentially in recent years. Government (through NCSC – the National Cyber Security Centre) has recognised this change and responded by implementing NIS to ensure this security risk is minimised.

#### Customers value/support this enhancement

Although our programme of work is driven by statute, and informed by latest intelligence, the outcomes it will deliver are consistent with our customers' priority of ensuring we continue to provide them with a safe, reliable and consistent service.



Given our customers' desire for HD to align with legislation and ensure a continuous and reliable supply of water at an affordable cost we have responded by:

- Confirming which risks we should be seeking to protect our customers from (terrorism and cyber threat).
- Taking precautions that will mitigate as far as possible the risk of contamination from malicious threat (terrorism) through improved physical and cyber security. This will also minimise the risk of a long duration supply interruption (>24hrs).
- Identifying appropriate resistance or redundancy options or response and recovery options within the cost profile. Our resistance and recovery options include physical hardening of our sites and the installation of cyber security precautions together with an operational control and monitoring facility.

On the basis of customer research, and evidence of customers' willingness to pay in our cost ben efit assessment, further action to improve security (as proposed in this case) is supported, notwithstanding the statutory need underpinning this proposal.

#### Current performance/investment is insufficient to deal with new legislation

During the current AMP period Severn Trent PLC's fundamental risk-based review of security strategy took a holistic approach to protective security. It considered each of the three elements: 1. Physical 2. Cyber 3. Personnel and applied the principles of Deter, Detect, Delay, Mitigate and Respond as required in PSG 2020. This approach will now be applied to HD as part of AMP7 to ensure alignment with new legislation.

This cost adjustment claim relates specifically to the step change investment to achieve the maximum ten minute response requirement in PSG. It will also address the threat from technology changes that render traditional physical protection obsolete (specifically electronic keys) and maintain the physical and electronic security at our Category 3 CNI site (this is new investment for HD as the site was previously part of ST).

With physical security deterrent and delay measures becoming less effective, much greater emphasis needs to be placed on detection, mitigation and response, as detailed in PSG 2020. The key to achieve a maximum ten minute response is to have the ability to effectively verify and assess an intrusion. The latest innovation offers a solution in the form of high resolution visual verification and electronic keys and this is core to our proposal.

The proposed investment and expenditure is outlined in the tables below.



Proposed solutions at Category 2 and 3 sites and timescales for implementation
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Asset	Issue	Hazard	Consequence	Solution	Priority	Timescale
Cat. 2 Reservoi rs	Protection of service reservoirs and associated operational assets including pumping stations and hatches	Civil and operational assets vulnerable to attack Malicious damage	Disruption of water service to customers; contamination of treated water, leading to injury or loss of life	Ensure security of DSRs and associated operational assets including pumping stations is aligned with latest guidelines including protection of hatches, use of visual verification and integration of intruder detection systems (IDS) and access control at the Alarm Receiving Centre	Risk-based enhanceme nt programme for Category 2 sites/assets	Physical: AMP7 and AMP8
Cat. 2 Water assets	Protection of high consequence waterassets throughaccess control	Sophisticated 3D printing can overcome high security keys. Operational assets vulnerable to attack and theft	Protection to any vul nerable points becoming ineffective	Keyaccessmanagement through use of electronic keys and access control	Risk-based enhanceme nt programme for Category 2 sites/assets	Physical: AMP7 & AMP8
Cat. 3 (CNI) site	Maintenance of CNI site and associated civil and operational assets including hatches	Civil and operational assets vul nerable to da mage and technology be coming outdated	High consequence asset – large numbers of customers; regulatory enforcement; disruption of water service to customers; contamination of treated water	Ensure physical & electronic security of operational assets, including treatment works, river intakes and raw water reservoirs are maintained and aligned with the latest guidelines through: physical hardening, electronic detection, vehicle and pedestrian access management, key access management and control, perimeter security, visual verification and integration of IDS and access control at the Alarm Receiving Centre	Risk-based maintenanc e programme for Category 3 site	Physical: a chieved in AMP6 Cyber: AMP7

While the same legislation and standards also apply to Category 1 sites, in order to ensure our proposals remain affordable and consistent with customer expectations – we propose to prioritise our highest risk Category 2 sites in AMP7 and any further sites will be risk-assessed in AMP8. In reducing the security programme based on risk and affordability, assumptions and decisions have been made which retain a number of risks. Hafren Dyfrdwy business plan expenditure has been identified for the following areas:

Summary of planned expenditure for AMP7			
Description	Number of sites prioritised (based on risk assessment)	Total (£m)	
Cat 2 service reservoirs	4	0.190	
Cat 2 reservoirs	5	0.015	
Cat 2 water asset	2	0.099	
Cat 3 CNI asset	1	0.100	
Chemicals storage	4	0.012	
Total		0.417	



## Best option for customers

Our customers trust us to be managing our assets now and in the future, in order to provide them with a safe and reliable water supply. We have considered a range of options at programme level to ensure we scale our proposal appropriately – including phasing and levels of risk – and challenged scope and costs at the project level to drive best value for customers.

#### **Options considered**

Our assessment considered the costs of different approaches to compliance (standards -based compared to risk-based) and implementation. These were compared to the resultant benefit of avoiding interruptions of a range of potential durations (three, seven and 30 days).

Option	Standard	Assets	Phasing
1	Standards based	All Category 1 and 2 sites	AMP7
2	Standards based	Prioritized Category 1 and 2 sites	AMP7 – Category 2
Standards based	Prioritised Category 1 and 2 sites	AMP8 – Category 1	
3	Risk based	All Category 1 and 2	AMP7
4 Dialahaaad		Driaritized Category 1 and 2	AMP7 – Category 2
	RISKDASEU	Prioritiseu Category I allu Z	AMP8 – Category 1

#### Interventions reviewed (pre affordability)

Pre affordability, based on cost benefit calculations completed for Severn Trent for an analogous set of interventions, we consider the best approach is option 4. However, following affordability discussions, we have carried out a further prioritisation of the interventions at cat 2 assets to be completed in AMP7, based on an assessment of risk faced.

## Robustness of costs and demonstrating efficiency

Our principal focus in this submission has been to develop a detailed business case to support the need to protect our customers. However, to give Ofwat as much transparency as early as possible, we've challenged ourselves to bring down the costs of individual solutions. While we have worked to reduce the overall costs of our proposals by taking a risk-based approach, we have continued to refine our case by:

- carrying out further detailed cost-benchmarking;
- continuing to explore Ofwat's approach to cost modelling;
- further testing assumptions, sensitivities and cost benefit assessments;
- testing affordability in the context of our overall plan; and
- undertaking more assurance and challenge (including from our CCG), before final Board review.

#### Costs in this case are based on updated cost curves

We have used two approaches to generate central estimates.

1. <u>Standard schemes and asset model solutions</u>: Core to this process are the unit cost curves, which are based on the outturn project costs and programme level average unit costs of the current programme. This provides consistency between AMP6 costs, our cost adjustment proposals and AMP7 delivery. This process is well established; it has been used consistently for over a decade and has been previously reviewed a nd/or assured by Atkins, EC Harris and Efficio. In addition, earlier this year, the cost curves used for our cost adjustment claims were validated and benchmarked with proprietary cost information by Jacobs.

2. <u>Bespoke cost estimates</u>: used when cost curves/equipment lists are not available for certain assets or solutions (for example, solutions using new innovative technology). Direct costs are estimated using frameworks, standard rates or bottom up estimates provided by our engineering teams and supply chain



partners. Where sub-contract activities have been required we have, where possible, sought three prices to ensure competitiveness.

For operational costs, we collect the actual cost data from our or other industry available records and challenge the costs based on the expected benefits from our improvement programmes. Future market trends for material expenditure are also considered to provide a future proof view on costs.

We have commissioned a further external benchmarking exercise by a third party to validate if the costs included in this case remain competitive both inside and, where possible, outside our sector. We will further refine the costs set out in this case, where appropriate, in advance of final submission.

## **Protecting customers**

The risk-based approach of the PSG 2020 places the onus on water undertakers to understand the nature, likelihood and potential impact of external threats in order to protect our customers. While the threat level determined for the water sector is currently 'low' as there have been no terrorist incidents in the UK, changes in both the national threat level and the nature of those threats mean we cannot be complacent. Intelligence informs us that threat actors now exist with both the intent and capability to attack our assets. In addition, cyber related attacks on energy and water infrastructure are increasingly occurring globally and we must plan for "when" not "if". Our position as a water and waste company owning significant national infrastructure, that is directly related to the health of our customers, means that we must upgrade protection against emerging threats.

Welsh Government have advised us that they will check alignment with PSG 2020 and also impose penalties and fines for lapses of, or insufficient, security. In order to confirm to Welsh Government that the required activities will have been undertaken we will be required to undertake an annual audit by an independent certified auditor, approved by the Secretary of State. We consider that this affords customers with protection against non-delivery.



## Annex 1: Interpretation of changes in obligation driven by Protective Security Guidance (2020)

SEMD Advice Note (2016)	PSG (2020) - Material Differences from SEMD Advice Notes
AN/3 and 4 - Critical National Infrastructure (CNI) Sites	Holistic security (physical, cyber & people security) is required at all CNI sites. Accountability for interpreting the threat and designing a response placed with the water company.
	Requirement to consider pace and speed of response to changes in the threat level / response level.
	Response to alarms required in less than ten minutes.
AN/3A - National	Holistic security (physical, cyber & people security) is required on NI sites.
Infrastructure (NI) Sites	Requirement to consider pace and speed of response to changes in the threat level / response level.
AN/7 and 7a - Storage of	Now also applies to NI sites.
toxic gases and chemical dosing	Site alarms must be treated as real with a response in less than ten minutes.
AN/8 and 8a - Service reservoir protection	Existing audio protection not suitable for timely alarm verification.
AN/10 - Security of alarmreceiving centres (ARC)	Requirement to follow advice from CPNI on any changes to current standards installed at the alarm receiving centre.
AN/12 The Protection of Boreholes	Borehole alarms have to go to alarm receiving centre (response required in less than ten minutes).

## Annex 2: Interpretation of annex 1 requirements

	CNI sites	Cat 2 DSR	Cat 2 – All Water Sites (incl. BHs/DSRs)
Standard	CPNI intelligenceled advice + Mandatory PSG	WUK SS guidance+ mandatory PSG	WUK SS guidance+ mandatory PSG
Approach	Risk Based Approach and CPNI and CTSAs engagement	Risk Based Approach	Risk Based Approach
Assurer	CPNI, DWI, Internal + SEMD Appointed Assurer	Internal + DWI, SEMD Appointed Assurer	Internal + SEMD Appointed Assurer
Enhancement required	Maintenance of all physical and electronic security	<ul> <li>New power and telecoms infrastructure to enable immediate visual verification</li> <li>Link to ARC</li> <li>Improved access control</li> </ul>	Improved access control through use of electronic keys



## 4.1.2 Catchment management business case

## **Overview**

#### What does this investment deliver?

In AMP7 we are proposing to deepen our current catchment management programme. The key components included in this plan are:

- Contribution to the Middle Dee partnership with United Utilities, Severn Trent on the basis of our respective abstraction licence volumes;
- a 50% capital grant scheme, administered by a new catchment scientist, to help farmers and landowner invest in structures to improve water quality, quantity and biodiversity;
- a pro-active maintenance programme for leats and other infrastructure to improve capture rate of inflows; and
- investigation and mitigation of algal blooms and manganese issues.

We investigated and eliminated the capital investment intensive alternatives on grounds of cost.

The combined cost of our catchment management plan is set out in the table below. Approximately two thirds of the costs relate to the employment of a catchment scientist and catchment advisor and one third for farmer grants.

Business case	Catchment Management	
AMP7 enhancement Capex	£0	
	£0.182m Water quality raw water deterioration (WS2 line 52)	
	£0.217m Water quality taste and odour (WS2 line 44)	
AMP7 enhancement Opex	£0.399m* Total	
	£0.050m Grants for biodiversity	
	(in biodiversity and wellbeing case)	
Pricecontrol	Water resources	
Consitive performance commitment	Drinking water quality complaints	
Sensitive performance commitment	Water supply interruptions	

\*of which £175,000 contribution to the Middle Dee catchment partnership

## What is driving the need for this enhancement investment?

In AMP6 Dee Valley Water initiated a catchment management strategy on the middle Dee catchment in partnership with United Utilities and the Welsh Dee Trust. This scheme aims to tackle rising pesticide levels in the river at source by working collaboratively with other land users and stakeholders in the catchment. It is an innovative, lower cost alternative to conventional capital intensive treatment options.

The catchment approach has been partially successful in controlling pesticides and we need to continue this work and also address emerging issues such as algal blooms at some of our upland reservoirs, that cause taste and odour issues and restrict the volume of water available. This enhancement business case sets out the need and efficient costs required to expand our catchment management programme in order to meet water quality standards and ensure a resilient water supply. Costs for the Middle Dee Partnership are shared with United Utilities and Severn Trent proportionally on the basis of abstraction volumes.

#### An expectation to explore innovative approaches

All of our water treatment works are designed to address the challenges of the raw water from the various sources, to ensure a consistent wholesome supply. We use a Water Safety Plan approach to proactively



address risks and where unacceptable risks are identified, we agree legal programmes of work with the Drinking Water Inspectorate (DWI) to resolve them.

In their Water Strategy for Wales, published in 2015, Welsh Government set out an expectation that we will explore innovative approaches to maintaining resilience of supply which will reduce overall costs. We consider catchment based approaches as a key means of delivering this goal.

Catchment management can help deliver our primary duties by helping to provide a wholesome, sufficient and economic supply of drinking water to our customers:

- **Good to Drink**: We must ensure that the water we provide meets the standards set out by the EU Drinking Water Directive, ensure the necessary protection is in place to prevent long term deterioration in water quality and manage immediate risks such as contamination. In particular, we must consider how we will support the objectives for any drinking water protected areas within our supply area.
- *Always On*: we must ensure that our water resources are sufficiently resilient to climate change, increases to population and the needs of the environment. The Water Resource Management Plan (WRMP) sets out how we will do this. Catchment management can play a part in using the natural environment to store more water.

Whilst the primary objective of catchment management is to protect and improve water quality, and to increase the amount of water stored in the catchment. However, we also have the opportunity to improve biodiversity at marginal cost by extending the scope of the natural features used to protect the quality and resilience of supplies.

#### **Building on our AMP6 Programme**

Water quality sampling and risk assessments on the river Dee have identified rising levels of pesticides, MCPA (2-methyl-4-chlorophenoxyacetic acid) and Metaldehyde. This has potential to impact on our treatment works at Llwyn Onn, and those at Boughton (owned by Severn Trent) and Huntington (owned by United Utilities).

In response, a catchment management programme in partnership with United Utilities and the Welsh Dee Trust was instigated to reduce the usage of the pesticides by local landowners and avoid the installation of costly removal treatment at all affected works. The initiative has been running since November 2015 with the support of the DWI.

The programme funds two Catchment Advisors to cover the Middle Dee and the Upper Dee. Initially their key role was to engage with landowners, farmers and local pesticide suppliers with the aim of reducing the use of Metaldehyde and other problematic pesticides in the catchment. They have managed and promoted a number of initiatives to meet this aim. Working alongside partner organisations, in 2016 alone, the catchment programme has achieved the following outcomes:

- 34 farm health checks with eight grants for farm improvement works;
- 100 farm visits of which 67 led to water management plans including soil testing and nutrient management plans, and 35 had potential grant opportunities;
- 85 sites were treated using the Weed Wiper hire scheme, 25 sprayers had MOTs funded and seven farmers received training; and
- four farms receiving subsidised slug pellets and 26 others took partin a pesticide amnesty, resulting in the consignment of 1833kg of pesticides.

#### The need for an expanded programme

#### Catchment management to reduce pesticides and diffuse pollution from agriculture

We have extensive pesticide monitoring data from across the Dee Catchment that shows the partial success of our current approach and enables us to better target our activities to higher risk areas. We need to continue with the existing engagement activities and deepen our approach to include more proactive interventions to



continue to manage the risk which is seen as seasonal spikes when heavy rainfall coincides with recent spraying on certain crops. The map and chart below shows a pesticide spike still present a risk to our treatment works on the river Dee.



#### Metaldehyde spike in the Worthenbury sub-catchment





While our main focus needs to continue to be on reducing diffuse pollution risk from agricultural land, ther e are other commercial users who have the potential to contribute to pesticides levels in water courses and we intend to increase engagement with these groups in AMP7. These include local authorities, golf courses, and caravan sites as well as industrial units, in particular the Wrexham Industrial Estate. Whilst the risk of pesticide and other sources of contamination to our groundwater sources is low we have considered how we could best use catchment management resources across Hafren Dyfrdwy to provide further protection.

#### Catchment management to address taste and colour issues at impounding reservoirs

We experience high manganese levels (driving discolouration issues) and algal blooms (driving taste issues) at some of our impounding reservoirs in the upper Dee catchment. These spikes are shown in the charts below. Increased levels of 'colour' (an indicator of Manganese) make the water more expensive to treat, impact the taste of the water and increase the risk of discolouration.







The processes installed at our water treatment works mean that we cannot use sources if algal blooms are significant. Our current solution is therefore to reduce abstraction from these reservoirs when issues arise. Whilst this option avoids the risk of increased water quality complaints, it restricts our flexibility and makes our raw water system less resilient. This is especially true when these issues are in the summer months should use these reservoir sources to supplement our river abstractions that may be under low flow restrictions.

We are confident that there are viable solutions available at catchment level to remove the taste and colour issues. We therefore intend to investigate the cause of the increasing manganese levels and algal blooms, and address the issues at source.



#### Catchment Management to increase water resource yield and resilience

We analysed the deployable output from our reservoir catchments in the draft Water Resources Management Plan. A comparison between historical inflow data against modelled output revealed that there was potentially a much greater inflow of water into our reservoir catchments than we are currently capturing. Improving inflow into the reservoirs through catchment management interventions would mean that these lower cost, gravity sources would be available to us for longer in normal years and be more sustainable during dry weather.

Reservoir	LF2K mean flow (Ml/d)	Reservoir Group	Yield (Ml/d) — based on 1927-2015 flow data
[REDACTED]	2.33	[REDACTED]	0.59
[REDACTED]	11.75		1 24
[REDACTED]	0.52	[KEDACIED]	1.24
[REDACTED]	6.91		2.4
[REDACTED]	0.26	[REDACTED]	2.1
[REDACTED]	9.59	[REDACTED]	3.72

#### Comparison of low flow 2000 data (LF2K) and original Dee Valley inflow data

While we are not forecasting a supply demand deficit, there is a great deal of uncertainty over climate change that could result in more severe droughts in the future. In addition, our current climate change modelling does not factor in possible impacts on water quality in the future which could also affect the resilience of our water resources.

#### Catchment Management to in to improve biodiversity

Section 6 of the Environment (Wales) Act 2016 introduces a duty on Hafren Dyfrdwy to "*maintain and enhance biodiversity in the exercise of functions and in so doing promote the resilience of ecosystems.*" Given that catchment management falls within the 'exercise of our functions' we have considered how we may, at marginal cost, also improve biodiversity. We propose therefore to additional grants so that projects in farm infrastructure to protect water quality and quantity could be 'tweaked' to also enhance biodiversity. Investment in 'natural features' could include extended riparian margins, grass swales, enhanced ditch wetlands and sediment ponds.

### **Best option for customers**

Our on-going AMP6 programmes have demonstrated that significant benefits are accrued from delivering catchment solutions relative to having to implement costly treatment solutions. We are confident that our expanded programme will protect these savings at the same time as delivering wider water quality, resilience and environmental benefits.

Considering the implementation of catchment management interventions to manage our taste, colour and risks at impounding reservoirs, we anticipate that this will not only reduce treatments costs, but also give us access to these sources throughout the year. This will provide additional resilience in our water resources.

In our willingness to pay research, we asked respondents to state their top three improvements, prompted by the list of service attributes provided. In both Mid Wales and North Wales improvements in the taste and smell of tap water were the most prioritised improvement.



## 4.1.3 Developer services business case

## **Overview**

#### What does this investment deliver?

This business cases sets out gross expenditure driven by the connection of new customers to our network in a way that maintains the level of service that we deliver. It accounts for costs incurred both on site (connecting new properties) and off site (reinforcing our wider infrastructure).

Business case	<b>Developer services</b> (all gross expenditure relating the new connections, onsite costs, and infrastructure reinforcement)
AMP7 enhancement Capex	£5.362m WS2 lines 11 and 12
AMP7 enhancement Opex	£O
Price control	Water network plus
Performance commitment	D-mex

## What is driving the need for this enhancement investment?

We have a duty under the Water Industry Act 1991 (s37) and our water supply licence to ensure that our raw water resources, treatment processes and distribution network are capable of meeting the demand for water. As part of discharging this duty we need to ensure that we can provide a connection point for new properties, that there is sufficient water to supply these properties and that there is no detriment caused to existing connected properties as a result.

The investment that we make in doing this is broadly split into two areas:

- The on-site work of laying new water mains and providing a connection to the existing network (that may involve the requisition of a new connection main) as well as any cost incurred in adopting new mains that have been built.
- The off-site work to reinforce the existing network to ensure there is sufficient supply to cope with the increased demand.

This is an enhancement investment because it is creating new assets, or assets with additional capacity that lead to us being able to serve additional customers.

We are legally required to invest in the on-site works to connect the new development to our existing network.

There is some degree of optionality around how and when we reinforce our network to ensure new customers can be supplied without detriment to existing customers. However, not investing in network reinforcement would result in deteriorating supply interruption and low pressure performance due to demand exceeding supply constraints. Supply interruptions and low pressure are both a high priority for our customers and stakeholders with preferences for improvement. Any deterioration would be unacceptable to them.

## How have we made sure that we are delivering the best option for customers?

The need for the investment is statutory but we do have options around how, where and when we provide connections and additional capacity. We have worked with developers and local councils to understand their local plans and obtain the best available information. However, there is still an element of uncertainty in this as development is frequently driven by macro-economic factors and Government policy. The forecasts used



for our new development and network reinforcement investment are consistent with those used in our long term Water Resource Management Plan (WRMP).

We engage with developers at an early stage in the planning process to discuss site layout and possible connection points such that the impact on our existing network is minimised where possible. We also consider a range of options - wider system interventions options as well as local options – and phase with capital maintenance requirements within the area. For example we may be able to deal with existing low pressure issues at the same time as catering for the new development or there may be additional resilience that we can add into our system as part of the solution.

## How have we demonstrated that the costs are robust and efficient?

Total costs of £5.3 million are split as follows:

- £1.3 million for network infrastructure reinforcements (App28 line 6)
- £1.3 million for new connections (WS2, line 12)
- £2.7 million for requisitions (WS2, line 11 less App28 line 6)

These costs are based on current run rates adjusted for forecast volumes. The majority of costs for developer services are contestable, meaning that we are competing for work with 'Self-lay Providers' (SLPs). Therefore our work is competitively priced and in line with market rates. We have benchmarked our costs and this has shown that we are one of the best in the industry in this area.

Our approach to cost efficiency is described in appendix 5 – Efficient Costs.

## How are customers protected?

#### **Regulatory mechanisms**

We have statutory duties under the Water Industry Act to allow connections to our network and to ensure our water supply system is able to accommodate new developments. In the event of non-compliance, enforcement action will be triggered.

For the non-contestable work (of which the infrastructure renewals is the major part), we can demonstrate that our costs are efficient, and as set out above, we proactively work with developers and local authorities to try and ensure these costs are minimised.

#### **Performance commitments**

D-Mex – underperformance penalties apply.



## 4.1.4 Ancillary water service business case

## **Overview**

#### What does this investment deliver?

This business cases sets out addition enhancement expenditure included in our plan relating to:

- delivering new obligations as set out in the Eels regulations (and included in the water NEP);
- capital interventions to improve the taste, colour and odour of the water we deliver; and
- installation of revenue meters in properties where customers request one.

Business case	Ancillary water enhancement expenditure (Eels regulations, Taste colour and odour, Meter optants)	
AMP7 enhancement Capex	£3.760m WS2 lines 2, 5 and 21	
AMP7 enhancement Opex	£0.028m WS2 line 41	
Price control	£1.412m Water Resources	
	£2.376m Water network plus	
Sensitive performance commitment	Inspiring our customers to use water wisely	
	Per Capita Consumption (PCC) Water quality complaints	

## What is driving the need for this enhancement investment?

#### **Eels screen**

We are required to install a screen at the Bangor on Dee Intake and undertake a series of fish passage investigations. These have been specified in the NEP programme in response to our obligations under the Eels regulations, as a result of investigations during AMP6.

#### Enhancing taste, colour and odour performance

Our customers expect us to deliver a good quality and consistent product every time they open the tap. Changes in appearance and taste due to our treatment processes, different sources of water or movements around our network can all cause customer dissatisfaction. We are proposing to enhance the level of service we provide to customers. We are confident that this enhancement is supported by customers and is demonstrated by cost benefit analysis.

Driven by our customer engagement, we have developed a challenging performance commitment to reduce the number of drinking water quality complaints through AMP7 by more than 35%. Our research showed that reducing taste and odour complaints were considered a high priority in both north and mid Wales (with improvements to appearance complaints of medium priority). 76% of households and 88% of non-household customers found the proposed targets acceptable. The proposed level of improvement was considered excellent and stretching. Customers also placed a high priority on going above and beyond the performance commitment level in the context of ODIs.

#### **Meter optants**

We are required to provide a meter to any customer that requests one as part of our Water Industry Act duties. The expenditure included in the plan relates to a forecast number of optants shown in table WS3. This is in line with our current volumes.



## How have we made sure that we are delivering the best option for customers?

#### **Eels screen**

To satisfy the obligation to install an eel screen that has been placed upon us, we have engineered and costed the necessary solution. We are proposing to install a Hydrolox band screen on the existing intake structure. The band screen has been designed for a maximum flow of 52.4ML/day (0.61m3/s), in line with the capacity of the intake.

#### Enhancing taste, colour and odour performance

Our journey to enhance taste, colour and odour performance has already seen significant progress being made during AMP6. The improvement has been driven by our strategy of upgrading treatment works to stop discolouration potential entering our network and then systematically cleaning the water mains. We have maintained our enhanced level of mains cleaning and completed around 500km of mains flushing during this AMP.

Making further improvements in line with customer expectations across AMP7 will require longer-term investment and optimisation based on what we have learned to date. We are proposing a suite of activities comprising:

- extending the mains cleaning programme;
- application of portable air valves;
- tackling illegal standpipe use;
- proactive communication with customers to pre warn them if we think there might be an issue;
- upgrading and improving controls at troublesome pumping stations;
- replacement of unlined castiron mains -targeting hotspot areas based on sampling data; and
- "predict and prevent" roll out following the innovation trials we have undertaken on real-time network modelling of events for mitigation and proactive messaging.

We have tested the cost benefit of our proposed programme of interventions using the willingness to pay to reduce the number of complaints as set out in our performance commitment. This analysis showed that the programme is cost beneficial with a net present value of intervention of approaching £2 million (NPV benefits – NPV costs) and a cost benefit ratio of more than 1.7.

We will also be exploring the ways in which taste, colour and odour issues can be resolved at source. This will involve a collaborative research project to investigate the role of catchment management in reducing taste and odour issues. Such improvements will lead to gradual incremental improvements rather than an immediate step change. Our catchment management proposals are set out in a separate enhancement business case (4.2.2).

#### **Meter optants**

In responding to customers that request a meter, we seek to locate and install meters in a way that maximises supply demand benefit (through the identification of supply pipeleakage) and meter reading efficiency and facilitates long term ease of maintenance. Meters are preferably installed externally at the boundary where practical (or enabled so that they can be read remotely).

## How have we demonstrated that the costs are robust and efficient?

Our company wide approach to cost efficiency is described in appendix 5 –Efficient costs. The basis of costs for each component is discussed briefly in turn.



#### **Eels screen**

The estimate for the eels screen is derived from an independent bottom up quotation to the required intervention. This used rates from the SPON's Civil engineering & Highway Works Price Book and specialist budget quotations for the screen, mechanical and electrical components. Additional add on costs were then estimated using specific multipliers of the construction costs.

#### Enhancing taste colour and odour performance

Our programme intervention costs take account of the unit costs delivered during our current programme. These have then been scaled to deliver an optimum level of benefit. We have also included bottom up costs for air valve maintenance that is not in the historic baseline.

#### **Meter optants**

To ensure that we are using an efficient meter installation cost, we have benchmarked against the efficient unit rate that was used during PR14. The costs in this plan cost align with this rate.

## How are customers protected?

#### **Regulatory Mechanisms**

Regarding eels and metering expenditure, customers are protected by the regulatory enforcement of obligations placed upon us by legislation.

#### **Performance Commitments**

Regarding our taste, colour and odour capital programme, customers are protected by the challenging water quality complaints performance commitment that we have set.

# Other enhancements where costs are included in the base service (not included in WS2)

## Delivering a step change in leakage without the need for additional enhancement expenditure

Despite this business plan including an extremely challenging performance commitment to reduce leakage by 15%, we have committed to delivering this step change in performance without any additional enhancement expenditure.

The performance commitment proposed is stretching and significantly beyond the sustainable economic level of leakage. All of the Hafren Dyfrdwy water resources zones are projected to remain in supply demand surplus over the current water resources planning horizon. Furthermore, current performance compares well relative to the rest of the industry when analysed on both per km and per property basis. This is illustrated by the 2017/18 leakage performance in the graph below.





Comparative leakage performance (2017/18 shadow reporting data, TMS removed as an outlier)

Given the favourable supply demand position and leakage performance, we did not consider it appropriate to mirror Ofwat's expectation of a 15% leakage reduction in our draft Water Resources Management Plan (WRMP) but instead proposed a performance commitment to reduce leakage by 7.5% in AMP7 and 15% by the end of AMP8.

The acceptability of this level of performance was tested with our customers. In our PC and ODI research we found that 71% of household customers, and 69% of non-household customers, found our proposed target acceptable. Our Willingness to Pay research indicated that whilst reducing leakage was a priority for improvement for household customers there was limited willingness to pay for leakage reduction. Some customers in our qualitative research discussions suggested that the target level may still be too high irrespective of our good comparative performance.

Ofwat and NRW fed back on our draft WRMP that we should reconsider whether our initial target was stretching enough. Consequently we have listened carefully to stakeholders, customers and policy makers and have included a 15% reduction in leakage in AMP7 without proposing an enhancement in required totex.

We consider that this is an incredibly stretching target given our relatively low levels of leakage compared to the rest of the industry and that this is additional activity that is not required to meet the supply demand balance. We have calculated that the attainment and maintenance of a 15% reduction in leakage performance using our existing technology and process is likely to cost a minimum of £0.1m in additional opex each year (based on our leakage cost curves). We will strive to optimise existing investment we are making in telemetry and instrumentation during AMP6 to deliver greater benefits than currently envisaged. We will also need to do more to integrate leakage into our business as usual activities. This should provide some opportunities for more efficient deployment of our leakage programmes.



## 4.1.5 Wastewater environmental programme business case

## **Overview**

#### What does this investment deliver?

We are committed to environmental leadership and embrace the new approach to the sustainable management of natural resources in Wales. This business case sets out the statutory obligations contained in the National Environment Programme (NEP) issued by Natural Resources Wales and the activity and investment we will make to meet these statutory duties.

In the May submission we included this as a potential cost adjustment claim, but in response to Ofwat information note IN18/11 we are no longer including it as a cost adjustment claim. Instead this information provides the supporting evidence to demonstrate that we have proactively engaged with NRW to understand our contribution to safeguarding and enhancing the environment in our region and then identified the most cost effective way of meeting those obligations.

The measures contained within this business case form part of our Thriving Environment outcome. This business case is specific to measures contained within NEP3, the third version of the NEP, as issued by NRW in March 2018. NEP3 sets out a formal list of obligations that will deliver environmental enhancements required of us under various pieces of legislation.

Business case	Wastewater environmental programme
AMP7 enhancement Capex	£2.519m WWS2 lines 6, 7, 9, 10, 16, 18 and 19
AMP7 enhancement Opex	£0.198m WWS2 lines 51 and 66
Pricecontrol	Wastewater network plus
Consitivo norformo non commitment	Pollution incidents
Sensitive performance commitment	Treatment works compliance

#### **Customer support and affordability**

Our proposals are supported by multiple customer engagement insights. Our research reveals a deep connection between customers and their local environment and a belief that we should protect and improve it wherever we can. Our customers, particularly in Mid Wales, live in rural areas and have a high appreciation for the natural environment in which they reside and with which they interact on a daily basis. They are not concerned about differentiating between meeting legal requirements and taking further action. They are concerned, however, that the affordability consequences should be managed.

As cost beneficial Water Framework Directive improvement measures are a legislative requirement, we have assessed the cost benefit of our Water Framework Directive improvement projects using the National Water Environment Benefit Survey (NWEBS) values. These were generated by the Environment Agency for River Basin Management Plan cycle 2 and used to underpin AMP6 WFD NEP5 improvement obligations. Specifically, we used the low range figure for improving rivers from moderate to good status in the Severn Uplands catchment area, which encompasses Mid Wales. This benefit figure is £12,200 per km, per year. We have confirmed that WFD improvement projects contained in Natural Resources Wales' NEP3 spreadsheet are cost beneficial at this benefit rate.

We have been unable to generate a meaningful benefit figure from our own customer research. Whilst customers did express a willingness to pay for environmental improvements, the very small customer base means that individual willingness to pay does not translate into a benefit valuation sufficient to render our Water Framework Directive schemes cost beneficial.

Affordability has been a key consideration in forming our proposals. While there is little choice over investment to meet statutory obligations, we are seeking to strike the right balance between risk, action and affordability across all proposed investment.



#### Underpinned by legislation

Whilst there is customer support for improvements, the proposals in this business case also support the Welsh Government's vision for Wales' water environment and are underpinned by statute.

- Urban Wastewater Treatment Directive 1991 (Urban Waste Water Treatment (England and Wales) Regulations 1994) (UWWTD). Protecting our environment from potentially detrimental wastewater discharges by designating sensitive waterbodies and controlling discharges from storm sewage overflows. To ensure compliance with this legislation, we are required to monitor overflow performance and submit data to NRW.
- Water Framework Directive 2000 (Water Framework Regulations 2003). The legislative framework to ensure no deterioration to rivers and the objective of achieving good ecological status in all rivers where it is technically feasible and affordable.
- Environment (Wales) Act 2016. A duty on public authorities to seek to maintain and enhance biodiversity and in so doing promote the resilience of ecosystems. This replaces the biodiversity duty in the Natural Environment and Rural Communities Act 2006 (known as the NERC Act) in Wales.
- Wildlife and Countryside Act (1981) + EU Regulation (1141/2014) on invasive alien (non-native) species. The Wildlife and Countryside Act is the primary piece of legislation that sets out duties to control and eradicate invasive non-native species (INNS). This is supplemented by an EU regulation on INNS.

Where proposed improvements are subject to a final confirmation through the NEP process (that is, those measures classed as 'amber' status by NRW), we have ensured customers are protected from the risk of nondelivery using a performance commitment measure based on length of river improved (reference performance commitment C1 for WFD and UWWTD work).

Statute	Area	Requirements	Timing	Customers protected by:
	CSO investigations	Mandatory	AMP7	Investigations only
UWWTD	FFT/DWF monitoring	Mandatory	AMP7	Statutory enforcement action
	Improvement	Mandatory	AMP7	Statutory enforcement action
WFD	Improvement – good ecological status	Mandatory (if cost-beneficial)	Some discretion until 2027	WFD performance commitment
Environment (Wales) Act	Biodiversity investigation and implementation	Mandatory	AMP7	Statutory enforcement action
INNS	Investigation and implementation	Mandatory	AMP7	Statutory enforcement action

#### Table showing how customers are protected by a combination of statute and performance commitments

#### We've driven down scope and cost

To achieve savings for our customers, we have worked collaboratively with NRW to develop the NEP. Where appropriate, we have challenged their evidence of the need to intervene. Where we accept the evidence of a need to act, we have then challenged ourselves on how to minimise the investment needed to deliver NRW's requirements.

#### Achieving multiple benefits for our customers and communities

Our proposed investment will deliver the following benefits for customers and the environment:

• improved condition of 21.9 km of rivers in Wales;



- investigate and, where cost beneficial, improve biodiversity; and
- measures to control invasive non-native species where our investigations indicate their presence.

#### Summary of proposed benefits

Benefit	Measure
Kilometres of river improved	21.9 km
Sewage works treating increased flow (storm spill reduction)	2 no.
Sewage works with additional storm storage capacity (storm spill reduction)	2 no.

#### The Water Industry National Environment Programme

All of our quality obligations are contained within the NEP3 spreadsheet issued by Natural Resources Wales in March 2018. There are no obligations pertaining to Hafren Dyfrdwy in the WINEP3 spreadsheet issued by the Environment Agency.

There is one obligation contained within NRW's NEP3 that has been included at the request of the Environment Agency. This relates to a proposed new Urban Wastewater Treatment Directive sensitive area designation in England. The discharge from Welshpool STW has been determined to meet UWWTD criteria for inclusion in this new English designation. Whilst the obligation is placed upon a Hafren Dyfrdwy sewage works, the outcome from the improvement is entirely related to an issue on the English side of the border. As such, the cost of the improvement work has been included within Severn Trent's business plan. As this is an 'Amber' status, uncertain obligation, this scheme is also covered by Severn Trent's customer protection mechanism. There is no cost exposure for customers of Hafren Dyfrdwy.

Confirmation of delivery of all obligations contained within NEP3 will come from NRW. Where the obligation requires a change to a discharge permit, we will take the implementation date on the new permit as being the obligation delivery date. For obligations not requiring a permit revision, delivery will need to be confirmed by NRW through the NEP delivery tracker process.

#### Supporting technical annexes

In addition to this business case further supporting information will is provided in the following annex:

Annex 1 Context of the statutory obligations

## What is driving the need for this enhancement investment?

This business case is underpinned by statutory drivers that have been put in place to improve the environment by improving the quality of all discharges back into the rivers. During AMP6 we have carried out investigations required under the current NEP5 to understand the impact we are having on the environment. These investigations form the basis of the requirements set out in this case and NEP3, which was published in March 2018. We are required to make provisions in our plan for investment required to meet obligations contained within NEP3, although elements of this will not receive final confirmation until 2021 (in line with the RBMP3 ministerial sign-off). We recognise this creates uncertainty for our customers and so we have included a customer protection mechanism.

#### Meeting our statutory obligations

Our proposed programme is underpinned by a number of statutory drivers. While meeting the requirements of legislation is mandatory, the improvements required by the WFD do allow for some discretion about timing (until 2027) and must be affordable. These legislative drivers are set out in Annex 1 and cover:

• Urban Wastewater Treatment Directive 1991 (England and Wales Regulations 1994)



- Water Framework Directive 2000 (Water Framework Regulations 2003)
- Environment (Wales) Act 2016
- Wildlife and Countryside Act (1981) and EU Regulation (1141/2014) on invasive alien (non-native) species

NRW is the authority responsible for implementation of both the UWWTD and WFD in Wales. NRW uses the NEP to set out the actions that companies will need to complete to meet their environmental obligations.

#### We understand our contribution/place within the catchment

We understand the position and the impact of our discharges with respect to the river needs in Wales. Combining our knowledge with River Basin Management Plan data has allowed us to evidence how and where our discharges are reasons for not achieving good status. Where we are not a reason for not achieving good status we can evidence how our discharges are not causing significant detriment to the waterbodies we discharge to.

The complex network of rivers in our Mid Wales operational catchment shown in the figure below, alongside the location and size of our treatment works, illustrates the potential complexity of any impacts. However it can also be seen that a number of our works are not particularly large (<2,000 population equivalent treated) and are not at the top of their respective catchments, allowing dilution to mitigate against issues which treated sewage discharges can typically cause.





#### **Environmental performance and challenges**

Rivers in Mid Wales are generally in a far healthier state than the UK as a whole. This is a reflection of lower population density and less intensive agricultural practices. A small number of sewage effluent related issues have been identified, primarily relating to failure to meet the WFD phosphate standard. Resolution of the



majority of these issues is included within our AMP7 business plan. One issue has been held over until AMP8, as further evidence is required to confirm that our activities are the cause of river quality failure.

#### A revised interpretation of the UWWTD risks non-compliance

Following infraction proceedings brought against the UK by the European Union in 2012, interpretation, by UK regulators, of the UWWTD has changed in relation to intermittent discharges from storm water overflows. We have not previously sought to address any environmental issues created as a result of the revised interpretation of the UWWTD. Our obligations under UWWTD (and WFD) are not expected to change as a result of Brexit. Whilst the government could revise this legislation post Brexit, they have given no indication that they intend to do so.

#### Assessment of need at our wastewater treatment works

To make sure we are compliant with this revised interpretation at our wastewater treatment works, NRW has prescribed drivers to support an increase in Flow to Full Treatment (FFT) and storm tank storage capacity. They also prescribed drivers to support the monitoring of compliance with FFT through more accurate measurement of FFT and the provision of Event Duration Monitors (EDMs) at storm overflows.

As explained in section 4, we worked with NRW to agree these improvements and ensure that the scope of our programme is no larger than it needs to be. Through reviewing our flow data, the proportion of population connected to foul only sewers, and the capacity of existing assets, we have **significantly reduced** the number of proposed interventions in NEP3 to two FFT increases (from seven FFT increases prior to NEP3) and two storm tank storage increases (from three increases prior to NEP3).

#### Assessment of need on our wider network - Combined Sewer Overflows (CSOs)

In order to make sure our wider wastewater network – and specifically CSOs – are compliant with the UWWTD, NRW require wastewater companies to understand the environmental impact of all high frequency spilling overflows during AMP7, and then improve those negatively impacting the local environment, society and economy where it is cost beneficial to do so.

The 21st Century Drainage Group (21stCDG) has developed, the 'Storm Overflow Assessment Framework (SOAF)', for water and sewerage companies to assess the impacts of high frequency spilling CSOs. Where spill data logged by the Event Duration Monitors (EDMs) identifies high frequency spilling CSOs, water and sewerage companies are recommended to follow the five stage process outlined by the SOAF (see table below).

Stage	Action
1	Check whether the CSO is spilling frequently due to exceptional weather events and whether it is due to hydraulic restrictions or maintenance issues
2	If the root cause for the high frequency spilling of a CSO is due to hydraulicissues then conduct environmental assessments to determine whether the CSO is negatively impacting the river environment
3	Identify whether the CSO serves a PE >2,000 (UWWTD only applies to catchments with a PE > 2,000) and undertake cost benefit analysis considering both environmental and socio-economic benefits
4	Investment decision based on the results of stages 1-4
5	Deliver solutions

#### Stage approach used by the 'Storm Overflow Assessment Framework'

NEP3 includes five named SOAF investigations based upon EDM data already available that has identified high frequency spilling CSOs. However, NRW expect that companies will conduct investigations on all high frequency CSOs in AMP7, once confirmed by EDM data. As explained in the 'Solutions identified' section



(below), for CSOs that do not yet have EDMs, we have used statistical extrapolation to predict the number of investigations required and made provision for a further three investigations.

#### We must deliver WFD improvements - where cost-beneficial to do so

WFD improvements towards 'good ecological status' are subject to a cost-benefit threshold and affordability tests. Improvements must also be underpinned by sound evidence of a need to intervene.

To accompany the publication of River Basin Management Plan 2, NRW published a list of 'Reasons for Not Achieving Good status' (RNAG), which supports the formal river classification data set. These two sets of data identified three waterbodies in our region where water company activities are a probable cause of failure to achieve good ecological status. These correspond to the waterbody investigations included in our AMP6 programme, which has driven the improvement programme included in this business case. Our AMP6 investigations have substantiated the reported cause of failure in two of the three waterbodies. For the third, the evidence that our activities are a cause of failure is inconclusive and we are not proposing an intervention in AMP7 (and NRW have agreed not to include this measure in NEP3).

#### Our customers support - and are willing to pay - for us to do more

Customers place great value on the environment. Our customer needs research told us that customers in North Wales and Mid Wales have a significant connection with the natural environment. This can be through close proximity to rural Wales, through active involvement in rural life or simply by a desire to see the environment protected for future generations.

Our willingness to pay research showed that customers value improvements in river water quality, although given the low customer base this valuation is insufficient to render the programme cost beneficial. Compared to other areas for improvement (some of which have a more direct impact on customers in their own homes such as the taste and smell of their drinking water, or internal sewer flooding), river water quality emerges as a medium priority for improvement.

Improving biodiversity is also something that customers care about, although it is not necessarily spontaneously linked to water company activities. In our willingness to pay research 44% of customers selected improving biodiversity as a top three priority, compared to other initiatives such as education, reducing carbon emissions and providing recreation opportunities.

Within the PCs and ODIs research 83% of household customers, and 90% of non-household customers found our proposed biodiversity target acceptable. Furthermore, when faced with a series of investment choices, and bill impacts, enhancing biodiversity was the area in which more customers selected the "do more" option. Overall 53% of customers supported the proposed option, with 39% selecting the "do more" option. Only 5% of customers wanted us to "do less" than proposed.

#### Stakeholders have shaped our approach

We've consulted with our stakeholders about our proposals. In addition to our ongoing collaboration with NRW, in June 2017 we held workshops with stakeholders to discuss how we can best address the future challenges we face.

Twenty three stakeholders attended our Welsh Water Resources Management Plan workshops in Wrexham and Newtown in June 2017. We had representatives from the Welsh Government, RSPB, NRW, North Wales Wildlife Trust, Montgomeryshire Wildlife Trust, Environment Agency, Canal and Rivers Trust, United Utilities, DWI, our CCG, CCWater, CLA, Farmers Union of Wales, and Dŵr Cymru. More than 140 pieces of feedback were reviewed across a range of topics including water resources, waste water improvements, catchment management and our wider obligations. There was a clear message that stakeholders expected us to embrace the sustainable management of natural resources approach within our Welsh opera tions and enthusiasm for exploring partnership opportunities, particularly in relation to delivering against the biodiversity duty.



#### Our customer challenge group is informing how we respond to customers

Our customer challenge group (CCG) is a multi-stakeholder body created to challenge whether our plans meet the needs of our customers, are supported by them and are delivered in a way that is congruent to their preferences.

Our approach to customer research, and emerging conclusions drawn from it, have been challenged by the CCG. We began our discussions with the CCG in 2017 and have held successive meetings as our research and proposals have developed.

The CCG support our consideration of the wider needs and ambition in Wales and our approach to seeking customers' views on this matter.

Other questions or discussions that emerged during our ongoing consultation covered the following areas (including our responses):

- Are outputs measuring and using a standardised methodologies?
  - Our outputs are contained in the NEP and completion of our obligations will need to be signed off by NRW.
- What will customers see/feel/get for this investment?
  - In terms of improvements customers will benefit from 21.9km of rivers in their regions improved, four sites where storm spills will be reduced and a number of hectares with enhanced biodiversity. They will also benefit from our compliance with legislation and our use of investigations to further our understanding of how we impact the environment, so they know we are seeking to be responsible for this impact.
- Have we engaged with NRW and if so, what challenges/issues have NRW raised and have we resolved them?
  - We have engaged with NRW openly to understand where we need to monitor, investigate and improve. With NRW we have shared data to challenge the need for improvement and they have shared new evidence with us and included an improvement at Newtown STW based on this evidence. The entries in NEP3 are the result of the resolution of the challenges and issues raised.

## How have we made sure that we are delivering the best option for customers?

This business case has been developed iteratively. We've challenged ourselves to deliver successive cost and scope reductions, while adding multiple benefits for our customers and the water environment.

As we've developed our case, we have worked to exploit the potential for scope and/or cost reductions using the following levers:

- **Need** to ensure that schemes have only been included where we can demonstrate that there is a compliance issue to resolve and that it would be reasonable to expect Hafren Dyfrdwy to contribute.
- **Phasing/timing** to ensure that we make the right intervention at the right time avoiding the potential for duplication between AMPs and smoothing bill impacts.
- **Synergies** taking a 'catchment view' across drivers and schemes to find synergies, strip out duplication and exploit multiple benefits. Identifying opportunities for partnership working wherever possible.
- **Optioneering** to ensure our solutions represent value for money.
- Innovation to drive down costs, or exploit additional benefits.

The table below summarises the outcomes of this challenge and review process, both internally and through our engagement with NRW.



#### Successive reductions in scope

Driver	Area	Initial needs assessment	Revised needs	
UWWTD	CSO investigations	8 Storm Overflow Assessment Framework investigations (stages 1-4)	8 Storm Overflow Assessment Framework investigations (stages 1-4)	
		14 new FFT flow monitors	1 new flow monitor and 13 modifications	
	FFT/DWF and storm event duration monitoring	9 new event duration monitors	14 new event duration monitors	
		1 new DWF monitor	Certify an existing DWF flow monitor	
	Improvement - FFT	7 flow to full treatment capacity increases	2 flow to full treatment increases	
	Improvement – Storm storage	3 storm tank capacity increases	2 storm tank capacity increases	
Environment (Wales) Act	Biodiversity investigation and implementation	Biodiversity audits on our wastewater sites and produce an action plan. Carry out 'quick win' biodiversity enhancements identified through site audit assessments		
WFD	Improvement – good ecological status	3 waterbodies improved	3 waterbodies improved	
INNS	Investigation and implementation	Surveillance and risk analysis + local interventions as identified by site assessments		

#### We've driven down scope and costs on the UWWTD

#### Determining the number (and cost) of storm discharge reductions required under the UWWTD

NRW expect us to evidence the improvements proposed to meet the requirements of the UWWTD as described in the driver documents they have issued. We were also issued with a notional list of potential improvements.

We have evaluated the data available to support improvements through:

- Evaluating the evidence base, to show if the current FFT is appropriate, showing either:
  - o We are using the storm route during 'dry days', as defined by NRW guidance
  - o  $\,$  We are unable to empty the storm tanks within a reasonable amount of time on a 'dry day'  $\,$
- Evaluating the evidence base, to show if storm storage capacity is appropriate

The improvements proposed to ensure compliance with the UWWTD at sewage treatment works are either increases in storage volumes or an increase in hydraulic capacity through the works. They were costed through our unit cost estimator, which has been updated to represent our latest actual costs of delivery.

#### Determining the number (and cost) of CSO investigations required under the UWWTD

As explained in section 3, NRW expect all high frequency spills to be investigated in line with the SO AF guidance stages 1-4 in AMP7. We have already installed more than 50% of the required event duration monitors in our AMP6 programme and the data returned has identified five high spill frequency overflows. Based upon current conversion rate, we have allowed for a further three investigations to be generated by the remaining EDM programme.



#### Working collaboratively with NRW, we've optimised our NEP

By working collaboratively with NRW, we have ensured that there is well-evidenced need for us to take action and that the action we take is efficient and effective.

#### A collaborative approach for WFD improvements - wastewater treatment works

For WFD improvements relating to our wastewater treatment works, we've used a two-stage assessment process with NRW to review the classification evidence supporting any improvement (set out in the table below). This ensures that any improvements proposed are well-evidenced.

Stage 1: A technical evidence test aimed at demonstrating that:	Stage 2: Applied if stage 1 criteria are met to determine:
a) There is a quantifiable WFD compliance problem to _resolve.	a) Is the solution technically achievable and cost- beneficial?
b) It would be reasonable to expect Hafren Dyfrdwy to contribute towards resolution.	b) Is this the best time to make the intervention?

Stage 1 technical evidence comprises:

- Baseline waterbody classification data published by NRW in 2015 in support of RBMP2
- Reasons for Not Achieving Good status (RNAG) data published by NRW in 2015 in support of RBMP2
- SAGIS (Source Apportionment in GIS) a river quality modelling tool that apportions load inputs into rivers by sector/activity and quantifies the level of improvement required to meet objectives

Stage 2 evidence comprises:

- Technical viability assessment can the required improvement be delivered?
- Cost benefit assessment
- Assessment of other investment needs in the catchment. Are there grounds to defer to AMP8?

Our approach, collaborating with NRW, has ensured that the improvements identified meet a real need in terms of environmental improvement. It also ensures that the timing for these investments is appropriate with respect to the evidence available, the costs and what is currently technically achievable.

#### We've identified opportunities to deliver multiple benefits

We have mapped out the extra benefits that would be delivered in addition to the core objective of river quality enhancement to ensure that we prioritise investments that deliver maximum benefit to both our customers and the environment. These additional benefits include:

- downstream Biodiversity Action Plan Priority Habitat areas;
- public amenity areas and visitor attractions through which benefitting rivers flow;
- downstream protected areas (SSSI, SAC etc.) that would benefit from improved river quality; and
- proximity of improvements to areas of low social mobility.

Through qualitatively assessing the additional benefits we will be better able to communicate to customers the contribution they make to the environment in their region. We will also be able to prioritise investments with multiple benefits over those which perform similarly on our cost benefit test but don't have multiple benefits.



## Solutions identified

#### We are only putting forward improvements that are cost beneficial and included in NEP3.

We have calculated the initial capex or opex to create the solution and included any change in opex that we consider will be experienced during AMP7 (this is termed REOC). We have developed an outline programme and schedule to allow efficient but achievable delivery. REOC will be incurred from the point of bringing the solution on line.

#### Expenditure driven by UWWTD obligations

The latest estimated costs of complying with the mandatory UWWTD obligations are provided in the table below.

Investment area	Capex £m	REOC £kpa	AMP7 totex £m
UWWTD (sewage works flow monitoring)	0.125	2.5	0.130
UWWTD (Improvement – Flow to full treatment)	0.356	1	0.358
UWWTD (Improvement – Stormwater storage)	0.728		0.728
UWWTD (Event duration monitoring)	0.362	6	0.482
UWWTD – CSO impact investigations	0.947		0.947
Total	0.685	9.5	0.703

#### UWWTD components and estimated costs

#### Flow to Full Treatment and storm tank capacity increases

Within NEP2 (version 2 of the NEP), NRW identified seven sites where a flow to full treatment capacity increase could be required to meet the requirements of the UWWTD. We have reviewed the evidence and have been able to demonstrate that five of these sites are treating an appropriate flow to full treatment and NRW have removed these from NEP3. Of the remaining two sites, one will require an intervention to provide additional capacity. We have reviewed existing capacity at the other and concluded that no intervention is required as existing assets can treat the additional flows required. NRW also identified three sites where an increase in storm tank capacity would be required. We have reviewed and challenged the evidence and concluded that just one of the three sites requires intervention. We have reviewed existing capacity at one other and concluded that no intervention is required as existing assets can satisfy the obligation.

#### Flow to Full Treatment and Dry Weather Flow monitoring

NRW initially identified 14 sites where existing monitors are not sufficient to demonstrate compliance with flow to full treatment permit conditions. This could have necessitated provision of new MCERTs compliant monitors at the sewage works inlets. We have reviewed our existing assets and concluded that on 13 sites, the existing assets, with minor alteration, are capable of delivering NRW's obligation. One site requires a new flow measurement structure and associated meter.

One site has been identified as being at risk of exceeding the 50m<sup>3</sup>/d dry weather flow threshold for requiring certified flow monitoring equipment. We have confirmed that the site already has an installed flow meter that should be suitable for this purpose.

#### Event duration monitoring

NRW require event duration monitors on all storm sewage discharges to the environment and on overflows into storm tanks. The latter forms part of the requirement to confirm compliance with permitted FFT. As a result, we/NRW have identified 14 overflows that will require new event duration monitors.



#### **CSO** impact investigations

NRW have identified five named CSOs to be investigated under the SOAF process. They also expect that any further overflows that meet the SOAF criteria will be investigated in AMP7 and have included an NEP3 driver to this effect. Based upon extrapolation from EDM monitors already installed, we anticipate a further three investigations will be identified.

#### New sensitive area designation

NEP3 includes an obligation to install phosphate removal at Welshpool STW. This has been included at the request of the Environment Agency, as Welshpool has been determined to have a qualifying discharge to a proposed new sensitive area designation in England. As the obligation relates solely to an environmental improvement requirement in England, the cost of the work will be included within Severn Trent's business plan.

#### **Expenditure to deliver WFD improvements**

#### Improvements related to wastewater treatment works

To assess the cost-benefit of WFD related improvements, we have scoped and costed three schemes. The costs from these improvements are then grouped together based on the waterbodies being improved. This is then compared to the benefits associated with these improvements, in terms of kilometres of river improved. We have only proposed improvements which were found to be cost beneficial.

#### Cost beneficial WFD estimated costs

Investment area	Capex £m	REOC £k	AMP7 totex £m
WFD (improvement)	1.715	41.4	1.797

In our AMP6 NEP, NRW included an obligation to investigate three failing waterbodies where a probable cause of failure is phosphate from sewage effluent. Whilst the formal investigations are incomplete, we have been able to use the initial results and our river quality models to inform PR19. In addition, NRW have now identified a section of the River Severn that is failing the ammonia target on account of the discharge from Newtown STW.

#### **River Camlad**

Investigation work confirmed that this river is failing for phosphate due, in part, to the impact of sewage effluent. Using our river quality model we quantified a phosphate load reduction required to deliver our fair share of the required improvement. Our model has identified a number of works upgrade permutations that can deliver the load reduction required and we have selected two sites for improvement. These two sites are able to deliver the load reduction needed without the need to deploy expensive enhanced phosphate removal technology. One of the two sites is also included in the mandatory Flow to Full Treatment increase programme under UWWTD. We consider that AMP7 is the optimum time to intervene to deliver the WFD outcome as this will facilitate efficiencies in procurement. We have subjected this proposed enhancement to cost benefit analysis and concluded it to be cost beneficial.

NEP3 ID	Site	Waterbody	Benefit length km	Delivery date
7CST0107	Church Stoke	GB109054049380	1*	22/12/2024
7CST0123	Montgomery	GB109054049380	4.6	22/12/2024

\*The river Camlad is a cross-border waterbody that comes under NRW's jurisdiction for administrative purposes. The actual length of river benefitting from the Church Stoke scheme (being the river length from Church Stoke down to Montgomery) is approximately 13km. However, the NEP3 spreadsheet only records 1km, being the distance from Church Stoke STW to the English border. For the avoidance of confusion, we will report in accordance with the stated NEP3 figure.


## Bele Brook

Our initial investigation has confirmed that this river is also failing the WFD phosphate target and that sewage effluent is a contributory cause. There is only one sewage works within this river system so our modelling is limited to determining the required load reduction. We have concluded that the WFD target can be met through the addition of chemical dosing alone. We have subjected this proposed enhancement to cost benefit analysis and concluded it to be cost beneficial.

NEP3 ID	Site	Waterbody	Benefit length km	Delivery date
7CST0111	Guilsfield	GB109054049670	1.6	22/12/2024

#### Afon Cynllaith

Our initial investigation shows that this river is probably not failing the WFD target on account of a discharge from our sewage works. Initial results indicate that any river quality failure is fairly marginal and that phosphate load from our sewage works is a small percentage of the total load in the river. We have discussed this with NRW and concluded that there is insufficient evidence to support an intervention in AMP7. This position will be reviewed upon delivery of the final investigation report and, if intervention is required, we would propose this for an early AMP8 delivery.

#### **River Severn**

NRW have identified that the river quality monitoring point downstream of Newtown STW is failing to meet the WFD objective for ammonia and proposed a change to our discharge permit. We have given careful consideration to existing works performance and asset capacity and concluded that this permit condition tightening can be accepted through optimisation of existing assets and at no cost to our customers.

NEP3 ID	Site	Waterbody	Benefit length km	Delivery date
7CST0126	Newtown (Dolfor Lock)	GB109054049310	14.5	22/12/2024

## Expenditure driven by the Environment (Wales) Act

We are committed to adopting site management processes that protect and enhance biodiversity on our wastewater treatment sites. This will entail managing operational land differently and also identifying surplus non-operational land that can be managed specifically to enhance biodiversity.

Biodiversity enhancement activity to comply with the Environment (Wales) Act is included in the NEP3 and agreed with NRW. This includes an obligation to carry out biodiversity audits on our sites and produce a biodiversity action plan. NRW have also included an obligation to carry out 'quick win' biodiversity enhancements that are identified through the site auditassessments.

These biodiversity NEP3 obligations are not specific to Ofwat's price controls in that they apply to both water resource and wastewater treatment assets. Investments covered by this business case are limited to the wastewater networks+ price control. Biodiversity investments on clean water sites are covered in the Biodiversity and well-being cost adjustment claim.

The first phase of work will be an investigation into the scales and types of habitats incorporating an audit of Section 7 species and the presence of invasive non-native species. These investigations will then be used to develop a biodiversity action plan and shape grounds maintenance activities.

#### **Biodiversity Opportunities**

We are in discussions with local organisations to identify potential biodiversity enhancement opportunities at our sites. The picture below is an example of one opportunity at Newtown Sewage Works, where we have an existing arrangement with Montgomeryshire Wildlife Trust. We have identified an opportunity to extend the existing nature reserve by adding a disused lagoon to the nature reserve site. This is a potential example of a 'quick win' biodiversity improvement required of us by NRW under the NEP3 obligation.





#### **Biodiversity investment**

Investment area	Coney Em	REOC	Opex	AMD7 totay fm	
			PA £k	AIVIP7 LOLEX LIII	
Biodiversity		-	21	0.105	

## Expenditure driven by invasive non-native species requirements

NEP3 includes obligations to investigate pathways for the possible spread of invasive non-native species and also to take action to control their spread. We will also work with partners on measures to control INNS (e.g. Himalayan Balsam) where this is complementary to our core activities. These NEP3 obligations are not specific to Ofwat's price controls – investment included in this business case is specific to the wastewater networks+ price control. INNS investment on clean water sites is covered in the Environment Act and Well-being Special Cost Factor case.

### **INNS investment**

Investment area	Canex fm	REOC	Opex	AMP7 totex fm
	PA		PA £k	
INNS		-	5	0.025

## Total wastewater environmental programme investment included in the plan

## Summary of overall estimated costs

Driver	Capex	REOC PA	Project opex	AMP7 totex
	£m	£k	PA £k	£m
UWWTD	0.7	9.5		0.79



Water Framework Directive	1.715	41.4		1.797
Biodiversity			21	0.105
Invasive non-native species			5	0.025
Total	2.519	50.9	26	2.717

## **Protecting customers**

The table below summarises areas of risk and our chosen approach with supporting arguments.

Proposed	approach	to	managing	uncertainty
rioposeu	approach	ιU	managing	uncertainty

lssue	Chosen approach	Alternatives considered and rejected	Share of residual risk of chosen approach
Uncertainty over full scope of investment required until WFD RBMP3 sign-off in 2021	We will only make provision for enhancements that are 'green' or 'amber' in NRW's NEP3. We have worked with NRW to ensure that these projects are clearly supported by the available evidence and meet cost benefit criteria.	Inclusion of measures with lower levels of supporting evidence. Adjust the benefits of the WFD programme by pre- empting what will happen at RBMP3.	Customers are protected from cost uncertainty through use of a WFD performance commitment that allows the return of unused resources to our customers.

The customer protection mechanism for our Amber WFD schemes will only cover obligations where we are making a financial provision in our plan. We consider that customers do not require protection where outcomes will be delivered at no cost through optimisation of existing assets.

In terms of river length improved, the obligation at Newtown (14.5 km) makes up 66% of our total WFD obligation. This obligation can be delivered without the need for investment. Inclusion of this obligation within a customer protection mechanism could give rise to a perverse outcome - if Newtown is confirmed as certain, but the other schemes are dropped from the NEP, then the sum returned to customers under the uncertainty mechanism would be significantly less than the amount paid.

Customers will be reimbursed on a f per Km basis (as set out in the table below), based upon variance between the benefit lengths stated in NEP3 and the actual outturn.

Site	River length	Agregate Totex	Penalty/reward per Km
Church Stoke	1	£1,797,300	£242,878
Montgomery	4.8	_	
Guilsfield	1.6		

## **Responding to challenge**

As we developed this business case, we've responded to challenge from both our Customer Challenge group and assurance providers.

#### Assurance of our case

We recognise the importance of submitting well-evidenced, high-quality and consistent cases. We have an established risk-based, three-lines of defence assurance process that we use for regulatory submissions.



We designed a bespoke assurance framework to support the development of our plan to the highest quality. This Board-led framework builds upon our robust annual assurance processes. Each 'building block' within our plan was assessed for 'bottom up' risk to include the individual components (e.g. data/source, methodology, judgements and assumptions) against our likelihood factors (level of change, complexity, roles and responsibilities and subjectivity) and our impact factors (financial value, customer impact, competition, statutory/regulatory requirement). The level of risk determined the type and level of assurance required with significant or high risk building blocks allocated to an independent third line assurance provider depending on the particular expertise required (technical/regulatory, financial, specialist model expertise etc.).

For more information on how we developed and applied our framework to our cost adjustment claims and the findings of the assurance, please read our 'securing trust, confidence and assurance' chapter.

#### Responding to customer challenge group

The customer challenge group discussed and challenged our approach and proposals on a regular basis through 2017 and 2018. As already described in the 'What is driving the need for investment' section, we responded to those challenges iteratively when developing our plan. A substantive concern from CCG was the apportionment of costs between England and Wales where National Environment Programme investment benefits both sets of customers. We sought feedback from NRW about this and they responded that if investment in Wales is required but all the benefit was in England then they'd expect the costs to be included in the England plan. Our plan contains one such upgrade, at Welshpool STW, where the upgrade is in Wales, the benefit is in England. Therefore the costs of this upgrade are not included in this business case.



## Annex 1: Context of our statutory obligations

# Urban Wastewater Treatment Directive 1991 (Urban Waste Water Treatment (England and Wales) Regulations 1994)

The UWWTD aims to protect the environment from potentially detrimental wastewater discharges from urban and sub-urban areas and certain industrial sectors. It dictates the levels of sewage treatment required depending on the nutrient sensitivity of nearby rivers and the population equivalent treated at sewage treatment works.

Rivers at risk of eutrophication are classed as 'sensitive' under the UWWTD and will be so designated by the Welsh Government following evidence review and recommendations from Natural Resources Wales. If a river is designated then any qualifying discharge will require upgrading to remove phosphate and/or nitrate to the limits specified in the directive.

The UWWTD also contains requirements relating to storm water overflows at sewage treatment works and combined sewer overflows (CSOs) across the sewerage network with the aim of limiting river pollution.

In 2012 the European Commission (EC) raised infraction proceedings against the UK government for failure to appropriately implement the Urban Waste Water Treatment Directive (UWWTD)<sup>1</sup>. The proceedings focused on a statement in the Directive specifying that all flows should be treated except in 'unusually heavy rainfall'. In response to this the Secretary for State for the Environment sent a letter to all water companies and Ofwat requiring the 'vast majority' of overflows to be monitored and reported for spill frequency by 2020<sup>2</sup>. We are undertaking our monitoring programme in AMP6. Based on the findings of this programme of work we are preparing to undertake environmental impact investigations in AMP7 to understand if any work needs to be done in AMP8. It is important to note that these CSOs were considered compliant and meeting the UWWTD under the UK's previous interpretation.

The need to undertake work as a result of this legislation is captured in the NEP as issued by NRW. This specified at a site-by-site level.

We have agreed improved monitoring at 21 points, an increased flow to full treatment and an increased storm tank with NRW.

## Water Framework Directive 2000 (Water Framework Regulations 2003)

The WFD aims to improve water quality in all European Union nations. Member states are committed to achieving 'good' status of all water bodies where this is cost beneficial and technically achievable. The Directive was adopted in 2000 and transposed into domestic legislation in 2003 (Water Framework Regulations 2003). Implementation commenced at the end of 2009 and must be completed by 2027.

The WFD is delivered using River Basin Management Plans (RBMPs). RBMPs set out how stakeholders with vested interests within catchments, such as water companies, local authorities and others, can cooperate to improve the water environment. Our region is covered by the River Severn and River Dee RBMPs.

## 'No deterioration'.

The WFD includes a mandatory 'no deterioration' objective – effectively prohibiting any deterioration of the water environment in the future.

Our wastewater treatment works are currently permitted by NRW on the basis of dry weather flow (DWF) and a set of quality standards - these in effect set a maximum load that can be discharged to river. Measured DWFs are usually less than the permitted DWF and the effluent quality is better than is required by the quality

<sup>2</sup> <u>https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/364435/letter\_2013\_07\_18\_RB\_to\_CEOs\_-</u> <u>CSO\_spills\_2\_.pdf</u>

<sup>&</sup>lt;sup>1</sup> <u>http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62010CJ0301</u>



standards – this helps us to ensure a high level of discharge permit compliance. NRW have not determined that any of our sites are at risk of breaching the no deterioration objective and there are no schemes under this driver.

### Improvements under the WFD – achieving good ecological status.

'Good ecological status' is the target classification included in the WFD. In order for surface water bodies to achieve good ecological status, they must pass certain criteria – biological quality (composition/abundance of fish, etc.), hydromorphological quality (river continuity, flow dynamics, etc.) and physicochemical quality (nutrient conditions, pollutants, etc.). The overall classification is determined by which of these criteria the water body ranks the lowest on.

The current target is for all waters to achieve good ecological status (or good ecological potential) by 2027 (the end of RBMP3<sup>3</sup>). This requirement is subject to the necessary improvements satisfying both cost benefit and technical feasibility criteria. Cost beneficial improvements can be phased out to 2027 to avoid the imposition of disproportionate costs. Where improvements to achieve good ecological status are not technically feasible (e.g. due to natural background conditions), alternative objectives can be set.

The UK government has set out its aim of **"Improving at least three quarters of our waters to be close to their natural state as soon as is practicable**"<sup>4</sup>. Although the UWWTD and WFD are European Union Directives, both have been transposed into UK law. Based on our discussions with NRW, we do not foresee any changes in the standards that must be reached as a consequence of the UK exiting the European Union.

We have agreed improvements at 4 sites with NRW to deliver WFD improvements to three water bodies.

## Environment (Wales) Act 2016 - section 6 biodiversity duty

The Environment (Wales) Act 2016 puts in placelegislation to plan and manage Wales' natural resources in a more proactive, sustainable and joined up way. In relation to Wales, this new duty replaces the biodiversity duty in the Natural Environment and Rural Communities Act 2006 (referred to as the NERC Act) which required that public authorities must have regard to conserving biodiversity.

Section 6 of the Act introduces a duty on public authorities operating in Wales to **"maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions".** Public authority in this instance includes water and wastewater companies and we are required to set out an action plan for how we will comply with this duty.

Specifically, the duty requires us to take account of the resilience of ecosystems, particularly the following aspects:

- the diversity between and within ecosystems;
- the connections between and within ecosystems;
- the scale of ecosystems;
- the condition of ecosystems (including their structure and functioning); and
- the adaptability of ecosystems.

We must prepare a plan setting out how we will comply with the duty and report on progress against the plan by the end of 2019 and every three years thereafter.

<sup>&</sup>lt;sup>3</sup> The 3 represents the 3<sup>rd</sup> iteration of River Basin Management Planning, each plan covers a period of 6 years

<sup>&</sup>lt;sup>4</sup> As set out in "A Green Future: Our 25 Year Plan to Improve the Environment", HM Government, 2018 (https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/673203/25-year-environment-plan.pdf)



Under section 7 of the Act, Welsh Government, in consultation with NRW, will prepare and publish a list of the living organisms and types of habitat which in their opinion are of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales. We must have regard to this list when preparing our biodiversity plan, as well as the State of Natural Resources report (first published in 2016) and any area statements which NRW will be issuing under section 11 of the Act.

We have agreed to investigate our sites and implement an agreed action plan with NRW.

## Wildlife and Countryside act (1981) + EU Regulation (1141/2014) on invasive alien (nonnative) species

The Wildlife and Countryside Act sets out duties to control and eradicate invasive non-native species (INNS). This is supplemented by the EU Invasive Alien Species (the IAS Regulation) which provides for a set of measures to be taken across the EU in relation to invasive alien species included on a list of Invasive Alien Species of Union concern.

Three distinct types of measures are envisaged:

- **Prevention**: a number of robust measures aimed at preventing IAS of Union concern from entering the EU, either intentionally or unintentionally.
- **Early detection and rapid eradication**: Member States must put in place a surveillance system to detect the presence of IAS of Union concern as early as possible and take rapid eradication measures to prevent them from establishing.
- **Management**: some IAS of Union concern are already well-established in certain Member States and concerted management action is needed so that they do not spread any further and to minimise the harm they cause.

In the Great Britain Invasive Non-native Species Strategy the UK, Scottish and Welsh Governments have committed to developing a legislative framework for addressing INNS that is coherent, comprehensive and flexible.

To aid delivery of the EU IAS Regulation and GB INNS Strategy, NRW have developed new INNS drivers for inclusion in the NEP for AMP7. We will need to understand the key pathways of spread of INNS on our assets and catchments and how these pathways of spread can be mitigated. In addition, the majority of the investigations and schemes will contribute to prevention of deterioration for WFD.

We have agreed to investigate our sites and implement an agreed action plan with NRW.



## 4.1.6 Wastewater developer services and growth business case

## **Overview**

## What does this investment deliver?

This business case sets out additional enhancement expenditure included in our plan relating to new development and growth obligations.

Business case	Wastewater developer services and growth
AMP7 enhancement Capex	£0.589m WWS2 lines 25 and 26
AMP7 enhancement Opex	£0
Pricecontrol	Wastewater network plus
Sensitive performance commitment	D-mex
	Internal sewer flooding
	Risk of sewer flooding is a storm

## What is driving the need for this enhancement investment?

## **New Development**

We have a duty under the Water Industry Act 1991 (s94) and our licence to ensure that our sewerage and waste water treatment systems can 'effectually drain' a catchment. As part of discharging our duties under the Water Industry Act we must ensure that we provide a new public sewer if requested (a sewer requisition under s98), that we adopt suitably constructed sewers (s104), that we allow connections to our sewers (s106) and that we provide sufficient capacity in our sewers and at our treatment works such that performance does not deteriorate.

The investment that we make in doing this is broadly split into two areas:

- The on-site work of laying new sewers and providing a connection to the existing network (that may involve the requisition of a new sewer) as well as any cost incurred in adopting new sewers that have been built.
- The off-site work to reinforce the existing network to ensure there is sufficient capacity to drain and treat the additional flows.

This is an enhancement investment because it is creating new assets, or assets with additional capacity that lead to us being able to serve additional customers. We have a statutory duty to invest in the on-site works to allow the connection of a new development to our existing network.

There is some degree of optionality around how and when we reinforce our network to ensure new customers can be connected without detriment to existing asset performance. However not investing in network reinforcement would result in deterioration of our performance on sewer flooding metrics, pollution and permit compliance. Sewer flooding and pollution are both important issues for our customers and stakeholders with preferences for improvement. Any deterioration would be unacceptable to them. Compliance with our Environmental Permits is a legal requirement and non-compliance could result in enforcement or prosecution.

## Growth

The need to provide additional capacity to cater for future increases in domestic population served and trade effluent received is to meet a statutory requirement as laid down in Section 94 (clauses 1a and 1b) of the Water Industry Act (1991). This key duty states that the sewerage undertaker must make provision for the emptying of sewers and effectually dealing with, by means of sewage disposal works or otherwise, the



contents of those sewers. This investment is designed to allow ongoing adherence to our statutory requirements.

The size of our wastewater treatment supply/demand programme is linked to the size of our quality enhancement programme. The new assets being provided to deliver our NEP obligations are sized to cater for predicted demand increases. As such, a marginal cost for these new assets is proportionally allocated to supply/demand based upon the percentage increase in population to be served.

# How have we made sure that we are delivering the best option for customers?

## New development

The need for the investment is statutory but we do have options around how, where and when we provide connections and additional capacity. There are a number of ways in which we do this to ensure that we provide the most cost effective or cost beneficial option. Before undertaking work, we first engage with developers to best understand how the impact on the existing network can be minimised. We also consider options that will deliver wider benefits to performance or capital maintenance as well as opportunities for more strategic solutions.

We have worked with developers and local councils to understand their local plans and obtain the best available information. However there is still an element of uncertainty in this as development is frequently driven by macro-economic factors and Government policy. The forecasts used for our new development and network reinforcement investment are consistent with those used in our long term Drainage and Wastewater Management Plans (DWMPs) and use the same base data as our Water Resource Management Plans (WRMPs).

## Growth

As this business case is to address a regulatory requirement it has not been the subject of customer engagement.

When evaluating the upgrades required in the waste quality programme we have combined drivers and evaluated the optimal solution to address all needs. Through following this process we have reduced costs by having a single intervention (rather than installing potentially incompatible upgrades in successive AMPs). This allows us to choose the best option for customers, for inclusion in our business plan, across the different drivers.

Future demand has been quantified with reference to councils' local development plans which generally adopt either a 2033 or 2035 development horizon. We have therefore opted to size our new assets to match these development forecasts. The assets that we will be providing in AMP7 will not be amenable to marginal upsizing part way through the local development plan period. Adopting a shorter term design horizon therefore risks having to install an additional process unit in AMP8 in parallel with the AMP7 upgrade, resulting in an overall capacity increase in excess of foreseeable demand. It would also be inefficient from a procurement perspective to repeatedly revisit sites to deliver small capacity increases. Our strategy for both quality and growth enhancements is to invest at the right time to deliver long term solutions.

## How have we demonstrated that the costs are robust and efficient?

## **New Development**

We have benchmarked our costs and this has shown that we are one of the best in the industry in this area. Whilst costs have risen in recent years, our ongoing contract negotiations with suppliers is anticipated to bring these costs down and this is reflected in our plan.



## Growth

As all of our supply/demand investment is tied to our NEP quality obligations, the cost of this part of the programme has de facto been subject to the same level of scrutiny as the cost claim business case. A full description of the costing methodology is provided in the WINEP3 cost adjustment business case.

## How are customers protected?

## **Regulatory Mechanisms**

Customers will be protected by our obligations under the water industry act to provide new connections when required. Regarding new development customers will also be protected through the D-mex regulatory mechanism.

## **Performance Commitments**

Regarding growth expenditure, customers will also be protected through the internal sewer flooding, risk of sewer flooding in a storm and treatments works compliance performance commitments.



# 4.1.7 Welsh language services business case

## Overview

As a company operating wholly in Wales, Hafren Dyfrdwy is fully committed to treating Welsh and English languages on an equal basis, as required under the Welsh language Act 1993 and the Welsh Language (Wales) Measure 2011. This case sets out the costs and benefits to our customers of the activities we carry out to offer the availability of communication through the medium of Welsh.

This is an enhancement case, which falls outside of the Ofwat totex modelling approach. We are enhancing the scheme to reflect the fact that we are now a company operating wholly in Wales and therefore the statutory obligation applies to all of our customers and the service is being enhanced where customers value it.

In the May submission to Ofwat we identified this as a potential cost adjustment claim. We have since developed detailed costings and challenged ourselves to be even more efficient; the costs have now reduced below the materiality threshold and therefore this claim has not been submitted.

This case relates to our household retail price control, within the outcome 'An outstanding customer experience'.

We have tested customers' views and it is clear that the Welsh language is part of what it means to live and work in Wales and is a recognised part of Welsh culture and heritage. We have also considered the broader ambition set out in the Well-being of Future Generations (Wales) Act 2015, which has a goal that is specifically aimed at encouraging and enhancing the use and availability of the Welsh Language. The Welsh Government has set a target of having one million Welsh speakers by 2050. In response to these drivers, but balanced with the anticipated modest demand on these services in the next five years, this case sets out our commitment to continue to offer the services set out in our existing Welsh Language Scheme in North Wales and extend it to customers living in our Mid Wales region.

Business case	Welsh language services
AMP7 enhancement Capex	£0.302m Table R1
AMP7 enhancement Opex	£O
Price control	Household Retail
Sensitive performance commitment	Compliance with legislation on Welsh language
	standards

We've challenged ourselves to be ambitious against Ofwat's PR19 themes.

Innovation	Resilience	Affordability	Great customer service
Whisper on calls to call centre to say the call is from Wales.	Training opportunities for our employees to learn or refresh language skills.	We have sought solutions that keep costs as low as possible.	Customers value having the choice of language and feel
Considering technology to ensure correct answer phone/automated messages are bilingual for our customers in Wales.	Consideration of how to prepare for an increase in population wanting to communicate in Welsh (as a result of wider policies, particularly the national curriculum promoting the teaching of Welsh language in schools).	Ensuring we target service areas/channels that customers value and utilise most, taking account of the evidence that more people prefer to talk to us in Welsh compared to those wishing to complete forms in Welsh.	Welsh is part of their local identity. Build trust with our Welsh customers. Support our brand and public image equally in Welsh and English.



## This business case is supported by technical annexes

In addition to this business case further supporting information is presented in the following annexes:

Annex 1	Hafren Dyfrdwy Welsh language Scheme
Annex 2	Customer research summary

## **Need for investment**

Our proposals are underpinned by three pieces of evidence that demonstrate the need for this investment:

- meeting the legislative requirements as set out in the Welsh Language Act;
- recognition of the Well-being of Future Generations (Wales) Act 2015; and
- our customers and stakeholders support and value the proposed service offering.

## We must comply with legislation

Since the middle of the 16th century, English had been enforced as the only language used in public administration, including courts of law. The **Welsh Language Act 1993** placed the Welsh language on an equal footing with regard to the public sector. It created the Welsh Language Board who were tasked with promoting the use of Welsh and ensuring compliance with all other provisions. It also provided Welsh speakers with the right to speak Welsh during court proceedings, and set out that, for all companies within the public sector serving Welsh customers, 'so far as is reasonably practicable, the Welsh and English languages are to be treated on the basis of equality.' The National Assembly passed the Welsh Language (Wales) Measure 2011 to modernise the existing laws regarding the use of Welsh in the delivery of public services.

The principal statutes which contain provisions that apply in relation to the Welsh language are:

- The Welsh Language Act 1993; and
- The Welsh Language (Wales) Measure 2011.

The Welsh Language Board has been replaced by a Welsh Language Commissioner who enforces the existing system of Welsh language schemes. The current legislation for the Welsh Language Act of 1993 requires us to have a published Welsh language scheme, which is approved by the Welsh Language Commissioner.

Further changes had been proposed to gradually replace the language schemes with standards of conduct relating to the Welsh language. On 5 June 2018, the Welsh Government confirmed these changes were on hold, whilst they reconsider the best balance of incentives and legislation.

#### Wider legislation in Wales

The Well-being of Future Generations Act (Wales) 2015 applies principally to public bodies, but through the Welsh Government's Strategic Priority Statement to Ofwat, we are obliged to work in a way that is cognisant of this Act. This business case relates to the well-being goal, **"A Wales of vibrant culture and thriving Welsh language".** 

Hafren Dyfrdwy are committed to helping the Welsh Government with their Cymraeg 2050: Welsh language strategy, which aims to achieve a million Welsh speakers by 2050. We will treat the Welsh language no less favourably than the English language, and people in Wales should feel able to interact with us in their chosen language. We are developing a long term strategy that reflects this ambition, which includes aligning our education programme and graduate and apprenticeship recruitment policy to ensure we can meet the estimated future demand on these services in a sustainable way.



#### What does this mean and what is the obligation?

We are required to develop, implement and keep under review a Welsh language scheme which sets out how we will ensure both languages have equal status in the following areas:

- service planning and delivery;
- commitments when dealing with the Welsh speaking public; and
- the company's public face.

Compliance with the scheme is monitored through an annual audit process and periodic review by the Welsh Language Commissioner. Hafren Dyfrdwy have created a Wales coordinating committee under the chairmanship of our General Counsel and Company Secretary. This group acts as the Welsh language panel who are responsible for ensuring the scheme is implemented and kept under review.

#### Customers value and appreciate the service but want us to be proportionate

As well as through our day to day contact with our customers we have taken several opportunities to understand their views. The details of our customer engagement are included in annex 3.

There are four pieces of research that we have reviewed to understand customers' views about this service offering to help us decide how best to respond to our statutory obligation.

- qualitative research as part of the licence variation;
- qualitative research to understand customers' needs and expectations;
- customer tracker survey; and
- specific research on the proposed performance commitments, incentives and investment choices.

In the first three sources customers were asked a variety of questions aimed at understanding their expectations, priorities and how we could improve services. In each case customers indicated that they think it is important that we retain the Welsh identity and anecdotally people placed importance on small details like a bilingual greeting on all phone calls and bilingual branding on the company vehicles. The notion of a local business and how this improved trust was a common theme across the research packages and when prompted further for examples of what a local company does or means to them some respondents raised the importance of retaining the Welsh language services.

Through our performance commitments, incentives and investment choices research we specifically told customers what Welsh language services we are offering and then asked customers if they were acceptable or if they would prefer to pay for increased offerings (£1 more on bills) or receive a bill reduction (30 pence off bills), which reflects the minimum services that still enable us to meet our statutory requirements. 73% of respondents said the proposed offering was the most acceptable. There was a broadly equal split between those who would be happy to reduce to the statutory minimum and those who would like to enhance the offering further.

In the round, our research shows that customers do value and place importance on the Welsh identity and that it is important for them to have the choice to communicate with us in either English or Welsh. There was clear acceptance of the services but no compelling evidence to do less or go beyond the statutory requirements.

We have also considered the wider data and analysis that reflects broader views of people in Wales.

Initial analysis by Welsh Government estimates that within our region there are around 20% fluent Welsh speakers in the North Wales area (6,000), and 40% in Mid Wales (12,600). Around 53% of those fluent speakers will speak Welsh on a daily basis. The Welsh Government predicts this percentage will be higher in the future, primarily as a result of the changes that have been made to the national curriculum. The number of



Number of pupils in year groups 1-11 being taught Welsh as their first language			
	2007-08	2016-17	% increase
North Wales	1418	1832	29%
MidWales	2124	2312	9%
Total	3542	4144	17%

pupils (year groups 1 -11) who are taught Welsh as their first language has increased. The number of Welsh speaking schools has increased by 17% between 2007-08 and 2016-17.<sup>5</sup>

The number of customers currently engaging with us in Welsh is much lower than this evidence would suggest. Through our PR19 research, several participants talked to a researcher in Welsh when first discussing what the research was about, however, when it came to actually completing the research questions very few people elected to complete it in Welsh. Out of 500 willingness to pay surveys with household customers, two were conducted in Welsh.

Part of our legal requirement is to ensure customers are aware of their right to have access to information in the Welsh language. The new Hafren Dyfrdwy licence serving customers wholly in Wales is a great opportunity to reinforce our service offering and one of the reasons for proposing a specific performance commitment relating to these services is to raise awareness and report on our compliance with the scheme in a transparent way.

## **Best option for customers**

This section describes how customer insights have been reflected in our plan, it sets out the options that have been considered and the rationale for why we have chosen the proposed solutions. We also provide evidence to support the costing.

## Reflecting customer insights in our plan

Our customer engagement has shown us that customers place importance on having the choice to communicate in either Welsh or English and having a visible bilingual public face is an important part of what they think we should be doing as a local business in Wales. Based on the qualitative research findings there is little evidence that suggests customers want us to go beyond the statutory requirements (which do meet those expectations). We think this is supported by customers' actions - less than 50 customers currently choose to communicate with us in Welsh, although this may increase when we improve the visibility of the scheme during the launch of the new business.

However, when reviewing how the goals within the Well-being of Future Generations Act align with the rest of our business plan we considered there was an opportunity to support the goal of creating a thriving Welsh language and to contribute to the specific target of achieving one million Welsh speakers by 2050, by offering our educational materials in both English and Welsh. We think this is a cost effective way of ensuring our approach looks to the future and by reinforcing the wider Welsh language policies with the younger generation. This also has two-fold resilience benefits:

- Part of our educational programme goal is to inspire the next generation into a career in the water industry and this could help us increase the percentage of our employees who are bilingual.
- Bolstering our language scheme now will help us serve future customers, who are likely to want to access information in Welsh.

<sup>&</sup>lt;sup>5</sup> https://statswales.gov.wales/Catalogue/Education - and - Skills/Schools - and - Teachers/Schools - Census/Pupil-Level - Annual-School - Census/Welsh-Language/pupilstaughtwelsh primarymid dlesecondaryschools - by-localauthorityregion - year



We transparently showed customers the bill impact of this additional offering and tested if it was acceptable. All but 13% of household customers found this acceptable.



#### Customer support for Welsh language services

## Welsh language scheme offering

The full scheme is included in annex 1 and a summary is provided below.

#### New policies and initiatives

When we plan and formulate new policies or initiatives, we will assess the linguistic consequences to make sure that they meet the commitments given in our scheme.

#### Dealing with the Welsh speaking public

Through written and telephone communications and in public meetings our scheme aims to provide equality by:

- welcoming communication in either English or Welsh and responding in the language the customer has requested us to use;
- giving both languages equal prominence (for example bilingual telephone greetings and bilingual letter heads or meeting invitations); and
- ensuring our staff are trained to understand and implement the scheme.

#### The company's public face

The company's public image and corporate identity will be bilingual. Guidance on the use of the bilingual corporate identity will be issued to staff, designers, and others who reproduce the company's corporate image. The key public facing areas include signage for our sites and assets, our website, press releases, advertising, information leaflets, official and public notices and staff recruitment. Wherever possible we will:

- present bilingual information giving equal prominence to both languages;
- ensure customers are made aware of both English and Welsh language versions being available; and
- reserve the right to produce material in a single language if it is for a specialist audience or contains complex scientific or technical information.

#### Implementing and monitoring the scheme

Implementation of the scheme is largely outsourced. As a small company we currently have just seven Welsh speakers directly employed. Only one of these is in a customer service team, therefore it is not possible to



meet all of the commitments within our Welsh language scheme using in-house resource. Implementation will be achieved through a combination of sub-contract with Traveline Wales who provide a spoken and written translation service plus ad hoc translation of documents and IT translation services for use on the website.

As part of our review of the operation of the Scheme, we monitor the number of Welsh speaking employees, or those who are learning Welsh and their location within the organisation. We are committed to supporting all staff who wish to learn the Welsh language and are currently reviewing opportunities to partner with other organisations and Welsh language charities to enable us to do so in a cost effective way.

The existing scheme has been reviewed by the newly appointed Board of Directors. The Company Secretary has ultimate responsibility for ensuring the scheme's implementation and she will discharge this duty by the establishment of a Welsh Language Panel (called the Wales Coordinating Committee), which includes managers from across the business. This group will advise managers on the steps required to implement the scheme within their departments. All members of staff have been made aware of the requirements of the scheme and issued with appropriate guidance and instructions.

Our Welsh Language Panel will keep under review:

- **Future planning and procurement** ensuring that any new policies, procedures or publications and computer programmes are consistent with providing a bilingual service on the basis of equality.
- **Organising and delivering services** monitoring the implementation of arrangements made to deliver the company's services in Welsh and their effectiveness; monitoring how well the organisation is encouraging and facilitating the use of Welsh by other parties.
- **Dealing with the Welsh-speaking public** monitoring times for responding to Welsh correspondence, the quality of translation services and the arrangements for meetings.
- **Public face of the company** monitoring the implementation of the company's public image and introduction of bilingual publications, forms, signs, notices and other printed materials.
- Staffing monitoring the implementation of staffing and training measures included in the scheme.
- Agencies and contractors with the relevant manager, monitoring the provision and administration of services by the company's agents and contractors to ensure compliance with the Welsh language terms of their agreements or arrangements.
- **Complaints** monitoring the incidence and nature of complaints relating to the company's Welsh language service. Complaints will be dealt with in line with the company's complaints procedure.
- Service delivery opinion surveys may be held periodically, subject to available resources, to test the view of the Welsh speaking public and customers about the range of services and activities undertaken by the company.

#### Enhancements to the scheme

There are two areas where we have included enhancements to the Welsh language scheme. These two offerings go beyond the statutory minimum but reflect what we have learnt from our customers and respond to the broader ambition of the Welsh Government:

- For all customers who are on our Welsh language register we will ensure any communication during an incident is available in both English and Welsh.
  - We are not currently required to offer bilingual information during an incident. Anecdotally, through our customer engagement, we have learned that during an incident having information in their preferred language is important - perhaps more important than under normal, less stressful circumstances. For all customers who are on our Welsh language register we will ensure any communication during an incident is available in both English and Welsh.
- We will ensure our education material is available in both English and Welsh.



o Given the significant increase in school age children whose first language is Welsh and the long term aim of increasing the number of people who speak Welsh this is an important enhancement that is support by customers.

## Robustness of costs and demonstrating efficiency

We have reviewed historical costs where they are available and sought quotations for services where we don't currently have costs broken down in a way that enables us to build a robust cost. The costs and assumptions are set out below.

Service provision	Cost (£k)	Basis of the cost
Website and webchat costs	£100k	Cost of the google translate licence fee (£10k per annum) and £10kpa for webchat. The only compatible translation service for the website platform being used.
Translation of key customer facing documents:	£44k	Based on actual cost in 2015-16 and 2016-17.
<ul> <li>Annual performance summary report (APR)</li> <li>Customer summary of strategic plans</li> </ul>		Three quotes were obtained at time and we chose the cheapest.
		Equivalent amount used for documents produced once every five years.
Traveline Wales	£51k	Quote received
3 <sup>rd</sup> party translation service. Customer call back and translation of documents (letters and bills)		
In period customer research (tracker for CMEX)	£10k	£500 for a Welsh translator for a day to translate all requested surveys. Assumed one day per wave (four days per year = 20 days in total)
Staff training	£13k	This assumes we can get language courses free. Cost allows for five employees per year to have two days training, based on average salary and transport costs.
Maintenance/ replacement of branded/ translated items. Covers signage (for sites and traffic management), ID cards, PPE, standard letters	£5k	Total additional cost associated with translation incurred as part of the integration costs was £9,835. Assumed 50% of this cost will reoccur during AMP7 due to short life of these assets.
Administration, assurance and reporting against the scheme	£60k	£12k pa for governance, assurance, aligning to Welsh government's latest guidance/ information.
Education programme	£20k	Quote received for translation of educational material.
Total	£302k	

We do not have a sufficient number of Welsh speaking employees to carry out this work in house. Therefore we have obtained quotes to ensure we are getting competitive rates. We have compared them to the costs incurred in 2016-17 and 2017-18 where we have them.

The only other alternative would be to employ a full time translator, this is likely to cost the business around £80k per year (equivalent annual salary c £35k which is typical for translator salaries), which would equate to £400k (not including inflation) for the five year period. A translator would remove the cost for Traveline Wales



and translation of the regulatory documents and possibly the education programme activity, which equates to £114,000. This shows that the least whole life cost is the solution we have proposed above.

We are pursuing several areas of innovation in order to offer enhanced experience for lower costs. We have already incorporated innovation through our IT solutions for telephony services. Our customer service agents will hear a 'whisper' on the line before they accept a call to inform them that the customer is calling from Wales. This allows them to tailor the greeting and ensure they have the right information to help the customer. We are also investigating innovative technology that ensures automated call options and where relevant, answer phone messages, can be selected in Welsh, English or bilingual.

This legislation applies to all companies offering public services in Wales therefore we are looking for ways of working with others to enhance the service offering and look for efficiencies that could be gained through collaborative working or shared services.

This case relates to the activity needed to comply with the Welsh Language Act. The further changes and specifically the proposed introduction of Welsh language standards has been put on hold by the Welsh Government. Therefore, this case does not include any costs or activity associated with possible future changes to the legislative requirements.

## **Protecting Customers**

The legislation was enacted with the aim of protecting customers and their right to communicate in their preferred language. We have included a performance commitment that transparently demonstrates that we have heard the value our customers place on their Welsh identity by holding ourselves to account for complying with our approved Welsh language scheme. This will be monitored as part of our formal annual reporting and will be subject to the three lines of defence assurance process that we have in place. We are engaging with the Welsh Language Commissioner to see if there is an opportunity for them to carry out an independent review of the degree to which we are compliant with our approved scheme, at least once every five years.

We will also consider what information we can publish to help track our recognition of the wider ambition, as monitored through the 45 Well-being of Future Generations Act national indicators. There are two indicators that we consider are specifically relevant to this case:

- percentage of people who speak Welsh daily and can speak more than just a few words of Welsh; and
- percentage of people who can speak Welsh.

We are not proposing these as performance commitments due to the small contribution we can make to the overall ambition but we will look to report our contribution towards them as part of our corporate social responsibility (CSR) reporting.

We have demonstrated that we are taking this obligation seriously and value the importance customers place on it, as we have already invested around £15,000 above the assumed levels in the PR14 final determination as one-off investment to ensure these services were available for all of our customers when the licence changed (1 July 2018).

There is uncertainty about potential stretching of the requirements, but given the revised timeline and review by Welsh Government we do not think it would be appropriate to make any assumptions about increases in costs and we will manage this risk over the next five years.

## Affordability

Affordability has been a key consideration in forming our proposals. While there is little choice over investment to meet statutory obligations, we are seeking to strike the right balance between risk, action and affordability across all proposed investment.



We have reviewed willingness to pay research and tested the proposals with customers. The majority of customers found the proposals acceptable. Around 5% of the total costs are discretionary (driven by customers), the remainder is statutory, but we have kept costs to a minimum.

## **Board Assurance**

We recognise the importance of submitting well-evidenced, high-quality and consistent cases. We have an established risk-based, three-lines of defence assurance process that we use for regulatory submissions.

The Board has been engaged in the preparation of this proposal, carefully considering the contents of this enhancement case. They also agree with the withdrawal of this case as a cost adjustment (both on the grounds of materiality and because it is part of business as usual service).



## Annex 1: HD Welsh Language Scheme example questionnaire

Below is the questionnaire used to assess our compliance with our Welsh Language Scheme (this has been used to create the performance commitment, which is set out in Appendix 3 Bespoke PC Definitions):

## Functions / Activities / Areas audited:

Website, main reception area, Customer Services reception area, telephony, Network Operations Customer Delivery, Quality and Environment, company vehicles, presentations and key customer facing documents and reports (for example, our APR).

## 1.1 Web site

We have a single version of our company website, which has been implemented within the last 12 months. There is live functionality to translate pages between English and Welsh languages.

#### www.hdcymru.co.uk

The Welsh web site should reflect the content and functionality of the English version so that customers wishing to use our Welsh web site are treated no less favourably than those using the English version. The term `no less favourably` is a term used frequently in the Welsh Language Regulations.

Page	Subject matter	Is information available in both Welsh and English?
News		Yes / No
Media		Yes / No
Investors		Yes / No
About us		Yes / No
Careers		Yes / No
Library		Yes / No
Contact		Yes / No
Check my water supply		Yes / No
Online account log-in		Yes / No

The web-site has the functionality to translate individual pages into Welsh.

#### 1.2 Main Reception Area at Packsaddle

The main reception area has x notices for customers -

Notice	Bilingual or Welsh version?
No smoking	Yes / No
Information of testing of fire alarms	Yes / No
DVW Welsh Language Scheme	Yes / No
Subsidised leak scheme and information leaflets	Yes / No

The reception has an information panel with leaflets displayed.



If a customer came into our reception to raise an issue in Welsh our staff would be able / unable to conduct the conversation in Welsh beyond the initial greeting before either having to revert to English or pass on the customer to another Welsh speaking member of staff.

## 1.3 Customer Services reception area at Packsaddle

Include all leaflets (all surfaces)	Bilingual or Welsh version?
Need help paying your water bill – leaflet	Yes / No
Complaints – leaflet	Yes / No
Customer Water Quality – booklet	Yes / No

## 1.4 Telephone greeting

Telephone communication	Bilingual or Welsh version?	
Main telephone greeting is bilingual (846946)	Yes / No	
Customer Services (833200)	Yes / No	
Developer Services (833247)	Yes / No	

## 1.5 Network Operations - Written communication

See table below, detail the team and letter types issued over prior 12 months, issued through the CIS system.

Section	Letter	Bilingual / Welsh translation available	Number issued in 12 month period
FMO letters		Yes / No	
Traffic management MW & Project		Yes / No	
Network & Regs		Yes / No	
Developer Services		Yes / No	

#### 1.6 Customer Delivery - Printed material for publication

Forms	Welsh Translation available	Number issued in 12 month period
H2H Application Form	Yes / No	
WaterSure Tariff	Yes / No	
Additional Services	Yes / No	
Leak Allowance	Yes / No	
Direct Debit Forms	Yes / No	
Flush Allowance	Yes / No	
Leaflets	Yes / No	
Social Tariff	Yes / No	
Complaints Leaflet	Yes / No	



### 1.7 Customer billing

Number of customers requesting communications in Welsh:

Number of customers receiving communications in bilingual format:

Comments:

#### 1.8 Quality and Environment

There are no standard letters or leaflets that originate from this department and no customers have previously expressed a wish to this department to be communicated to in Welsh.

#### 1.9 Company vehicles

Review proportion of company vehicles with bilingual logos with both languages equally prominent.

#### 2.0 External Presentations and reports

Investigate/ review evidence of the number and types of external presentation, for example CCW, CAB and reports, for example customer facing annual performance report and key price review information.

#### 2.1 External signage

Investigate the presentation of external signage – standard is bilingual presentation with text side by side.

#### Conclusions

It would be reasonable to conclude that both languages are / are not treated the same at present and the Welsh language can be regarded as treated less / no less favourably than English

#### Actions

• Review of actions from previous audit

#### New actions

- Record and ensure ownership and clear accountability for actions
- Give a briefing to key stakeholders on the current Scheme and those likely to be involved in the application of the forthcoming Standards.
- Provide update at Internal Wales Committee

Signed:

Date:



# Annex 2: Customer insights in detail

In April 2017 we carried out qualitative customer research on the licence change in which customers expressed a view about the importance of retaining Welsh roots and services such as Welsh language services. The provision of Welsh language services is factored into notions of identity and meets functional as well as emotional needs. Customers demonstrated a fierce support for the need for these services to be continued, despite those participating in the research not being (fluent) Welsh speakers, and being unlikely to read bills in Welsh or to phone a dedicated Welsh speaking support line. Respondents couldn't reconcile the loss of dedicated, Welsh speaking employees with any monetary savings.

Between October and December 2017 we engaged with a further 50 customers through in-home depth interviews with customers who have health, wellbeing and financial vulnerabilities, along with two deliberative workshops. The key aims of this research were:

## To understand:

- our customers' needs and priorities as they relate to water;
- their current views and experiences of their water company;
- how well we are meeting customers' needs, and where we could do more to improve their services; and
- the views and particular needs of those with financial and health and wellbeing vulnerabilities and whether the support available to them is adequate.

#### To explore some specific themes:

- Are there any key differences between Welsh and English customers?
- Are there concerns about lead piping, and if so, how would customers like this to be dealt with?
- Do customers in North Wales see Dee Valley as a local company? If so, what are the benefits?

Through our research customers raised the importance of their services being provided by a local company. One of the key attributes that customers associate with being a local company is the connection to Wales and the opportunity to communicate in the Welsh language if they wished to.

Our customer tracker research in 2018 tells us that whilst customers do not think that the licence change will make much difference to them, some do not like the fact they perceive a small/local/Welsh company being lost. It is clear that we need to reassure customers that the licence change is in fact an opportunity to focus entirely on our customers in Wales.

In April and May 2018 we carried out qualitative and quantitative research on our cost adjustment claims (PCs, ODIs and investment choices research) and 73% of household customers, and 74% of non-household customers found the proposed Welsh language services acceptable.





# 4.2 Cost Adjustment claims

We welcome Ofwat's inclusion of a cost adjustment process at PR19 to reflect material and unique costs that are unlikely to be reflected in its cost baselines. We recognise the importance and emphasis that Ofwat places on well-evidenced claims. The approach we have taken to identify potential cost adjustment requirements is set out below. The proformas for our four cost adjustment claims are then included. Detailed business cases for each of the claims can be found in section 4.4.

# 4.2.1 Methodology followed to identify and evidence cost adjustment claims

We want to ensure that we submit well-evidenced cost adjustment claims. Claims are only required where we believe Ofwat's totex models are unlikely to reflect future investment requirements. We have used an approach to develop potential cost adjustment claims that allows us to challenge their validity and the robustness of our evidence at four stages.

## Four-stage approach



This staged approach is intended to not only ensure that we are tackling the challenges in the right order (i.e. starting with the need and not solution) but also to ensure we take a proportionate approach.

## The interaction with Ofwat's modelling approach

At PR14, the Dee Valley Water Final Determination included around £20 million of cost adjustment claims. This equated to 20% of totex. At an industry level, Ofwat adjusted the cost threshold by 3% for successful cost adjustment claims – Dee Valley Water was a clear outlier.

Following an initial review of the proposed range of models, we do have remaining concerns about the ability of an econometric modelling approach to satisfactorily reflect our unusual population density, economies of scale and topography. This is particularly the case for the waste water models. In our response to the econometric modelling consultation we provided further commentary to explain that in the round there is a systemic bias that underestimates the costs we will need to deliver all of our statutory obligations and the services and stretching performance that our customers expect. In each cost adjustment claim, we set out the specific areas of concern and implications of the modelling approach on the required expenditure.

## Learning from our experience at the 2014 price review

We developed our staged process based on learning from both Dee Valley and Severn Trent experiences of the PR14 process. The process embeds five elements.



- Start with the need, not the solution. Severn Trent's experience highlighted the importance of understanding the underpinning challenges and needs that could drive investment, as opposed to identifying specific solutions.
- **Consider the context of the wider plan (and Ofwat's methodology).** We've considered not just the need for investment, but also the need and appropriateness of a cost adjustment as well as other opportunities such as Direct Procurement for Customers (DPC) although we recognise that our claims would fall well below the DPC threshold.
- **Challenge at every stage, and from every perspective**. By taking a staged approach, with specific review criteria (including for rejecting potential claims) and inviting challenge both internally and externally, we've worked to make sure that there is a well-evidenced need.
- **Ensure effective governance.** Our executive team has challenged the development of our business cases at critical stages. Our cases have undergone further assurance and Board governance with the newly established Hafren Dyfrdwy Board.
- Understand risk and protect customers from uncertainty. The strategic nature of some of the investment we are proposing can create uncertainty for customers. We've worked to make sure we understand this uncertainty, and where appropriate, protect customers either through existing statutory processes or performance commitments.

## Identifying cost adjustment claims

Our process to identify potential cost adjustment claims began by understanding the big challenges we face. We've identified these challenges in three ways:

- **Inside looking out** what do our employees think are the biggest challenges that we need to meet to continue to deliver service to customers?
- **Outside looking in** how are statutory requirements changing and how well equipped we are to cope with any change?
- **Outside looking in** what are the key factors that are important to our customers and stakeholders and how well equipped are we to deliver those expectations?

## **Engaging our customers**

Whether driven by statute, or the needs of our customers themselves, our costadjustment claims are founded on customer engagement and insight.

In order to ensure that we have captured the needs of our customers, we have carried out innovative new research to identify what really matters to them. We have then built on those themes in deliberative workshops and co-creation sessions. We have also undertaken willingness to pay research to inform our costbenefit analysis.

Approach	Purpose
Customer needs research	Understand our customers' needs, how they might change and the role that we play to meet those needs.
Co-creation	To devise solutions to future challenges with customers – for example, how to encourage customers to play their partin a lead free Wales.
Valuation	Understand the value customers place on service attributes to inform cost-benefit analysis.
	Understand importance of improvements in the context of other areas of our plan.
Deliberative	To allow detailed, informed discussion on complex or future looking topics.

#### Different research techniques used to inform our cases



## Customer challenge group and other stakeholder challenge

Our independent customer challenge group (CCG) comprises members from our regulators, local authorities, customer interest groups and independent members selected for their specific experience and expertise. We have engaged our CCG on:

- Ofwat's expectations for cost adjustments;
- our approach to seeking customers views relating to our cost adjustments;
- our need cases for investment;
- the customer evidence underpinning this need;
- our approach to customer protection; and
- how we are reflecting and balancing stakeholder views; and
- whether our proposed solutions are the best option for customers.

We have also undertaken further engagement with our wider stakeholders to seek their views on both the investment and type of solution we are proposing. On the 10<sup>th</sup> April we held two stakeholder workshops covering catchment approaches and biodiversity and how to reduce lead in drinking water. More detail on these events are included in the respective business cases.

## **Challenging and finalising claims**

The progression of our claims has been overseen by our executive team using an evidence-based approach. Examples of the criteria relevant to assessing the strength of our need cases is set out below.

External challenge has been provided by our customer challenge group and through external assurance.

Criteria	Example considerations
	Has this type of investment already been delivered by the water sector over the last decade?
Need for adjustment to	Does this investment deliver frontier shifting performance?
costinouening	Does the investment meet Ofwat's materiality thresholds?
	Could this investment qualify for Direct Procurement for Customers?
Need for investment	Is the need customer driven?
Need for investment	Is there new or a change in legislation?

#### Example criteria for assessing need cases

This process of scrutiny and challenge has allowed us to refine the circa 50 challenges we identified to the four included in this submission.

#### Overview of cost adjustment need cases

Claim	Proforma reference	Price Control	Business case included
Reservoir safety	W01	Water Resources	$\checkmark$
Reducing lead in Wales	W02	Water networks plus	$\checkmark$
Supplyresilience	W03	Water networks plus	$\checkmark$
Biodiversity and well-being	W04	Water Resources	$\checkmark$



# 4.2.2 Cost adjustment claim summary forms

## Company: Hafren Dyfrdwy Name of claim: Reservoir Safety Claim identifier: W01

Name of claim	Reservoir Safety
Name identifier of related claim submitted in May 2018	W01 Reservoir Safety
Business plan table lines where the totex value of this claim is reported	WR8
	WS1, line 12 (£3.15m)
	WS2, line 14 (£0.5m)
	WS2, line24 (3.85m)
Total value of claim for AMP7	£7.5m
Total opex for AMP7	nil
Total capex for AMP7	£7.5m
Depreciation on capex in AMP7 (retail only)	n/a
Remaining capex required after AMP7 to complete construction	nil
Whole life totex of claim	£7.5m
Company estimated claim value covered by cost baseline	£0.42m
Materiality of claim for AMP7 as a % of the totex of the relevant controls	30%
Does the claim feature as a Direct Procurement for Customers scheme?	No

	Brief summary of evidence to support claim	List of accompanying evidence
	Through a detailed risk assessment process we have worked with Reservoir Engineers to establish the level of risk and the remedial actions that are needed to maintain the assets in a safe and serviceable condition. We have reviewed underlying asset health measures to validate the risk assessment.	Section B of 4.3.1
Need for investment	We have engaged customers to understand their views on asset health and resilience, which informed development of options and the decision on pace.	Annex 1 - Reservoir Portfolio Risk Assessment –
	Both the need for investment and customer research undertaken has been challenged by our customer challenge group (CCG) who support the approach taken.	November 2017
Need for a cost adjustment	There are two key reasons for a cost adjustment:	
	• Changes in legislation, specifically the phased introduction of the Flood and Water Management Act 2010 which amends the existing Reservoirs Act 1975. Within the Act is a legislative change unique to Wales to reduce the capacity of reservoirs falling under the Act from 25,000m <sup>3</sup> to 10,000m <sup>3</sup> hence increasing the number of reservoirs captured by changes in the legislation.	Section C of 4.2.1
	• We do not think the econometric models are able to robustly reflect the investment needs of this asset group, for three reasons:	Section C 01 4.3.1
	<ul> <li>There are currently no proposed model variables that reflect this requirement or asset group.</li> <li>We have a high number of impounding reservoirs relative to our population served due to of the particular rurality and topography of the area.</li> </ul>	



	<ul> <li>The extremely longlife and long replacement cycle of this asset group is difficult to model using a five year data series.</li> </ul>	
Outside of	The principal driver of this investment is compliance with the Reservoirs Act 1975, this is a mandatory requirement and is therefore outside of management control.	
	The mitigating actions that are identified through the statutory inspections are made by independent reservoir inspectors using a long established, independent code of practice.	Section B of 4.3.1
control	It is a management decision to identify the most cost effective way of managing these long life assets to deliver service now and in the future.	
	We are investing more than the PR14 planned investment to ensure we manage emerging risks appropriately.	
Best option for customers	We have carried out extensive optioneering and our plan balances risk and the pace of investment to make sure the overall investment package is affordable and the level of risk is acceptable, thereby ensuring we discharge our duties and behave as responsible asset stewards.	Section D of 4.3.1
	We have identified and included opportunities to find solutions that offer multiple benefits to our customers, such as improved biodiversity at these highly valued, legacy assets.	
Robustness and efficiency of costs	We have developed the scope and cost of the solutions with Reservoir Engineers and have undertaken cost benchmarking to ensure our costs are efficient. Using both contractor quotes and consultant costings.	Section D of 4.3.1
Customer protection	Our statutory obligations are monitored and enforced by Natural Resources Wales (NRW) on behalf of the Welsh Government. We therefore have not included an additional performance commitment (PC).	Section F of 4.3.1
	Whilst we have engaged customers on the pace of investment and the impact on bills, we know from our research that they are not necessarily interested in regular information on progress, or technical details of delivery.	
Affordability	Our plan balances risk and the pace of investment to make sure the overall investment package is affordable and the level of risk is acceptable, thereby ensuring we discharge our duties and behave as responsible asset stewards	Section E of 4.3.1
Board assurance	The Board has been engaged throughout the preparation of this proposal, reviewing the need for the case in line with Ofwat guidance and carefully considering the contents of this claim. The Board has given its approval on the final version of this cost adjustment claim following completion of the full assurance programme.	Section E of 4.3.1
	We have also kept our executive committee updated on compliance with the Reservoirs Act 1975. Through our robust governance process, the executive committee have signed-off additional investment, over and above the PR14 final determination, to address emerging risk.	



## Company: Hafren Dyfrdwy

# Name of claim: Reducing Lead Claim identifier: W02

Name of claim	Reducing Lead
Name identifier of related claim submitted in May 2018	W02 Reducing lead in Wales
Business plan table lines where the totex value of this claim is reported	WN6
	WS2, line 6
Total value of claim for AMP7	£2.9m
Total opex for AMP7	nil
Total capex for AMP7	£2.9m
Depreciation on capex in AMP7 (retail only)	n/a
Remaining capex required after AMP7 to complete construction	Ongoing programme to AMP11
Whole life totex of claim	£2.9m
Company estimated claim value covered by cost baseline	nil
Materiality of claim for AMP7 as a % of the totex of the relevant controls	2.7%
Does the claim feature as a Direct Procurement for Customers scheme?	No

	Brief summary of evidence to support claim	List of accompanying evidence
Need for investment	<ul> <li>The need is underpinned by four pieces of evidence:</li> <li>Meeting the Welsh Government's Water Strategy for Wales and prospective changes in standards (likely to be in place by 2030) and contributing to the Well-being of Future Generations (Wales) Act 2015.</li> <li>Independent evidence obtained confirming that there is no safe standard for lead in drinking water. This evidence has been the catalyst for other countries worldwide to tighten the lead standard in drinking water.</li> <li>Our customers' and stakeholders' support for this service enhancement.</li> </ul>	Section C of 4.3.2 Annex 1: Report by water health partnership Annex 2: Joint Customer research on supply pipe ownership
	Data to confirm that current treatment solutions will not be enough to meet the tighter standards.	
Need for a cost adjustment	<ul> <li>We do not think Ofwat's cost modelling approach will sufficiently cover this service enhancement for three key reasons:</li> <li>The Welsh Government is driving for greater ambition and speed of implementation in Wales compared to the drive in England.</li> <li>The proposal would achieve a higher standard of lead compliance than the standard already funded by all customers across the UK water industry (including former Dee Valley Water customers).</li> <li>The econometric cost models are likely to only include minimal expenditure for customer owned pipes and no model variables. To address this need, we need to consider the pipe network outside of our ownership.</li> </ul>	Section B of 4.3.2



Outside of management control	Management decisions have been taken to identify the most cost effective way of complying with the current lead standard. Both the decision to increase the standard, and the ownership of customers' supply pipes are outside of management control. However, the way in which we engage in the policy direction and seek cost effective solutions to achieve the ambition is largely within management control.	Section B of 4.3.2
Robustness and efficiency of costs	<ul> <li>We have used benchmarking with AMP6 projects and industry costs used as part of the health partnership to ensure that these costs are appropriate.</li> <li>The overall pipe renewal costs are reflective of; <ul> <li>the complex nature of customer pipework in schools and nurseries</li> <li>the rural nature of one of the three hot spot areas – where communication pipes and customer supply are long</li> </ul> </li> </ul>	Section D of 4.3.2
Best option for customers	<ul> <li>Reducing lead from drinking water is a long term problem and cannot be solved in an affordable way in the next five years. We will continue with the current mitigations to protect our customers to the existing standard and additionally we are developing proposals for a triple track approach to: <ul> <li>Increase lead communication and supply pipe replacement by taking action in the highest risk areas, focusing on schools and nurseries, and lead hotspot areas.</li> <li>Work collaboratively with others to drive multiple benefits and develop solutions to reduce the cost and inconvenience to our customers, such as our work with local councils.</li> </ul> </li> <li>Gather data and improve our toolkit so that we can identify a more affordable long term solution</li> </ul>	Section D of 4.3.2
Customer protection	We have taken steps to minimise the uncertainty of the scope of work by identifying the highest risk areas and learning from previous supply pipe trials across the industry. This has helped to inform us of the percentage of customers who are likely to agree to replace their supply pipes. We have tested a range of potential performance commitments with our customers and stakeholders. This is important due to the long term nature and degree of intrusiveness on customers lives. Our preferred performance commitment is to report on the number of lead communication and supply pipes replaced.	Section E of 4.3.2
Affordability	We have tested the overall plan affordability with customers and 85% of our customers find our plan affordable.	Section E of 4.3.2
Board Assurance	The Board has been engaged throughout the preparation of this proposal, reviewing the need for the case in line with Ofwat guidance and carefully considering the contents of this claim. The Board has given its approval on the final version of this cost adjustment claim following completion of the full assurance programme	Section E of 4.3.2



# Company: Hafren Dyfrdwy Name of claim: Supply Resilience Claim identifier: W03

Name of claim	Supply Resilience
Name identifier of related claim submitted in May 2018	W03 Supply Resilience
Business plan table lines where the totex value of this claim is reported	WN6 WS1, line 13 (£10.121m)
	WS2, line 14 (£1.15m)
Total value of claim for AMP7	£11.27m
Total opex for AMP7	£0m
Total capex for AMP7	£11.27m
Depreciation on capex in AMP7 (retail only)	n/a
Remaining capex required after AMP7 to complete construction	n/a
Whole life totex of claim	£11.27m
Company estimated claim value covered by cost baseline	£2.57m
Materiality of claim for AMP7 as a % of the totex of the relevant controls	10.6%
Does the claim feature as a Direct Procurement for Customers scheme?	No

	Brief summary of evidence to support claim	List of accompanying evidence
Need for investment	<ul> <li>The need for investment is driven by:</li> <li>Ensuring the structural integrity of the DSRs to maintain water quality, particularly to prevent water ingress (and therefore contamination), complying with the Water Supply (Water Quality) Regulations 2010.</li> <li>Reducing the risk of asset failure to prevent customer loss of supply and to prevent asset failure which could lead to flooding, for two assets this includes complying with the Reservoir Safety Act 1975 and the Flood and Water Management Act 2010.</li> <li>Maintaining sufficient storage in the distribution network for resilience purposes should upstream or downstream assets fail. This is particularly important in parts of the system where the distribution network has no or limited interconnectivity.</li> </ul>	Section C of 4.3.3 Annex 1 - Risk assessment of service reservoirs
Need for cost	<ul> <li>The requirement to maintain distribution service reservoirs (DSRs) and provide a resilient and reliable service is not unique to us, but there are three key reasons why we do not think the econometric modelling approach will reflect our investment needs:</li> <li>The econometric models are unlikely to reflect the disproportionately large asset stock due to rural, low density nonulation and topography characteristic of these parts of Wales</li> </ul>	Section B of 4.3.3
aujustment	<ul> <li>Due to the very small scale of the company, we are unable to absorb lumpy investment cycles as well as other larger companies can.</li> <li>The Flood and Water Management Act 2010, which amends the existing Reservoirs Act 1975, has increased the standard of safety</li> </ul>	



	required beyond that already funded by customers. Whilst the legislation was enabled in 2010, its enactment is being phased with Wales having to improve its resilience and move earlier than England. This legislation has increased the number of DSRs falling under the act by 2.4%.	
Management control	The need to act relates to both statutory drivers and the distinctive rurality and topography of the area. Both of these are outside of management control. However, the way in which we address the need is within management control and we have seeking the most cost effective options for our given circumstances.	Section B of 4.3.3
Best option for customers	We apply industry recognised good practice for establishing a prioritised ranking of the risk of water quality failures or supply interruptions across our asset base. We are seeking to find the most cost beneficial combination of solutions, identifying the optimum balance between risk and affordability. This includes identifying opportunities to deliver multiple benefits. Due to the distinctive rurality and topography of the company's location, in most cases the most cost beneficial way of ensuring appropriate resilience is to enhance DSR reliability. We have consulted with our customers to better understand their views on asset health and resilience and intergenerational fairness when trying to establish the optimum pace of investment.	Section D of 4.3.3
Robustness and efficiency of costs	We used Turner and Townsend to benchmark our internal 'target price' costing model. Their analysis concluded that our estimated costs are robust and compare favourably with wider industry. We also benchmarked against costs being seen in our current programme.	Section D of 4.3.3
Customer protection	<ul> <li>Our performance commitments include two measures that link closely to this investment:</li> <li>CRI (Customer risk index) which has a specific component in the calculation that relates to DSR performance.</li> <li>Interruptions to supply which reflects the level of resilience in our system.</li> </ul>	Section E of 4.3.3
Affordability	Our plan balances risk and the pace of investment to make sure the overall investment package is affordable and the level of risk is acceptable, thereby ensuring we discharge our duties and behave as responsible asset stewards	Section E of 4.3.3
Board assurance	The Board has been engaged in the preparation of this proposal, reviewing the need for the case in line with Ofwat guidance and carefully considering the contents of this claim. The Board will, however, reserve its final assurance until our full programme of assurance has been completed and the final version of this cost adjustment claim is submitted.	Section E of 4.3.3



Name of claim	Enhancing biodiversity and well- being
Name identifier of related claim submitted in May 2018	Revised claim adapted from May submission (WW01: NEP and Biodiversity) following Ofwat feedback.
Business plan table lines where the totex value of this claim is reported	WR8 WS2, line 1 (£0.522m) WS2, line 25 (£1.064m) WS2, line 35 (£0.182m) WS2, line 37 (£0.050m) WS2, line 59 (£0.072m)
Total value of claim for AMP7	£1.890m
Total opex for AMP7	£0.304m
Total capex for AMP7	£1.586m
Depreciation on capex in AMP7 (retail only)	n/a
Remaining capex required after AMP7 to complete construction	n/a
Whole life totex of claim	£9.75m
Company estimated claim value covered by cost baseline	nil
Materiality of claim for AMP7 as a % of the totex of the relevant controls	7.6%
Does the claim feature as a Direct Procurement for Customers scheme?	No

# **Company:** Hafren Dyfrdwy **Name**: Enhancing biodiversity & well-being **identifier**: W04

	Brief summary of evidence to support claim	List of accompanying evidence
Need for investment	This case includes our NEP obligation to enhance biodiversity through the Environment (Wales) Act 2016 and our responsibility to contribute to wider well-being goals in Wales. The contributions we are proposing are supported by our customers and stakeholders.	Section C of 4.3.4
Need for a cost adjustment	Investment relating to our new duty under the Environment (Wales) Act 2016, requiring companies in Wales to enhance biodiversity, which may not be covered sufficiently in the models. The investment includes our contribution to goals set and aspirations of the Well-being of Future Generations (Wales) Act 2015. This legislation only applies to 2 of the 11 companies and was introduced at the end of the time series used to create the	Section B of 4.3.4
	models, therefore it seems unlikely there will be any costs present in the expenditure data series and we do not think there will be any variables that reflect the drivers for this investment.	
Management control	Whilst the need is underpinned by statute, we have not been complacent or assumed costs will be 'mandated'. We have challenged ourselves and scrutinised both the scope and cost at a granular level.	Section B of 4.3.4



Best option for customers	We have considered a range of options to enhance biodiversity and well-being and have developed partnerships to drive the maximum benefit for our customers at a much lower cost than would otherwise have been possible. We have also identified opportunities to deliver multiple benefits covering both biodiversity enhancements, well-being and educational benefits from the same investment.	Section D of 4.3.4
Robustness and efficiency of costs	This programme will be delivered entirely through partnership working with local wildlife trusts and a Heritage Lottery Fund project with the RSPB, Welsh Government and United Utilities.	Section D of 4.3.4
Customer protection	We are ensuring that our customers are protected by making sure that investment is appropriate and supported by them and also by including a specific performance commitment relating to biodiversity.	Section E of 4.3.4
Affordability	We have tested the overall plan affordability with customers.	Section E of 4.3.4
Board assurance	The Board has been engaged in the preparation of this proposal, reviewing the need for the case in line with Ofwat guidance and carefully considering the contents of this claim. The Board will, however, reserve its final assurance until our full programme of assurance has been completed and the final version of this cost adjustment claim is submitted.	Section E of 4.3.4



# 4.3 Full business cases for the four cost claims

This section includes the full evidence base of the cost claims, building on the information provided to Ofwat in May 2018.

# 4.3.1 Reservoir safety cost assessment claim

## A. Overview

This business case relates to our long-term approach to managing our stock of 14 raw water reservoirs in Wales. A step change is needed to ensure that we remain fully compliant with the Reservoirs Act 1975 and meet the expected level of asset stewardship.

The required interventions, totalling £7.5m over the next five years (compared to the historical average £0.42m) have been identified and subjected to an extensive peer review process by qualified and internationally recognised reservoir engineers. The difficult issue we have carefully considered is the pace at which we address the risks that have been identified. We have identified the optimum balance between addressing the need to invest to reduce the increasing risk of failure, with the overall affordability of our plan.

This legislation covers England and Wales and is not unique to Hafren Dyfrdwy, but we set out the evidence to explain why we believe this is an appropriate cost adjustment claim. The reasons are based on three key considerations:

- Amendments to the Reservoirs Act 1975 (the Act), introduced by the Floods and Water Management Act 2010, have increased the safety standards required and number of reservoirs classified under the Act in Wales to levels greater than that already funded by customers. The legislation was enabled in 2010 but its enactment is being phased, particularly impacting in 2019, and these changes are being introduced more quickly in Wales than in England. Defra has not yet announced the phased start date in England. As part of the 10 yearly cyclic inspection process, 12 of the 14 reservoirs will have to have their Statutory (Section 10) inspection during the next five years.
- Ofwat's proposed econometric models currently do not reflect the disproportionately large asset stock or inherent risk level due to age and dam design, which we believe is greater than the rest of the water industry.
- Due to the difficult investment decisions around risk to service and pace of investment that the previous owners of our company had to make, these assets are operating at a higher level of risk than the average across the industry.

This business case sets out a long-term triple track plan of monitoring, refurbishing and rebuilding our reservoirs at a pace that balances risk with affordability. The need to take action is underpinned by legislation, need for improved resilience and our proposed approach and phasing of this investment has been discussed with, and is supported by our customers. We have considered several solutions and have a dapted our proposed approach to respond to our customers concerns about affordability.

The long-term plan set out in this case will deliver the following key benefits for customers:

- We will safeguard all of the communities in the vicinity of the reservoirs by fully complying with the Reservoirs Act 1975 and all subsequent amendments. This Act is a public safety statute and is designed to lower flood risk to people and property downstream.
- We will ensure that the reservoirs are upgraded and maintained to a safe and serviceable condition. This will enhance system resilience by increasing the reliability of this water resource and therefore maximise



the use of the lowest-cost sources to treat. There is strong overlap with our strategy for ensuring resilience in the round, which is set out in Chapter 5.

We've challenged ourselves to be ambitious against Ofwat's themes for PR19				
WE VE LIIdileligeu ouiselves lo de dilidilious agailist Olwal s liiellies loi PN13	Wo've challonged	ourcolves to b	a ambitique against	Ofwat's thomas for DD10
	we ve challengeu	ourserves to b	e annunuous againsi	Olmar Stillings In LUTE

Innovation	Resilience	Affordability	Great customer service
Benefiting from trials carried out in AMP6, we are proposing to use innovative remote monitoring together with non-invasive monitoring technology (e.g. networked piezometers, fibre optics, and inspections by drones) to allow us to better monitor the risk at our reservoirs. This is particularly useful to monitor risks during any remedial works. These assets gradually degrade	Our investment in restoring our reservoirs will allow us to more fully utilise them, creating the ability to use the maximum volume and reducing our reliance on our single large surface water abstraction. This investment is also a first step towards maximising the opportunities for our customers from being part of the bigger water resource challenges.	We will be seeking to ensure our costs are efficient and have also carefully phased our investment – striking a balance between peaks in investment and protecting our customers and communities from the risk of reservoir failure. We are seeking to share the cost in the fairest way.	These assets are critical to our ability to provide continuous supplies now and in the future. This proactive approach allows us to avoid any supply interruptions and time to identify and deliver the most cost effective solution – this would not be the case if we had to react to a Section 10 notice.
and appropriate monitoring allows us to intervene to avert failure.			amenities for our communities.

# We've reviewed, but not pursued, the opportunity for Direct Procurement for Customers (DPC)

We are supportive of Direct Procurement for Customers and recognise the potential to embrace markets in this way to deliver more benefits for customers.

We reviewed our proposed investment programme against the descriptive guidance published about potential DPC projects. It is not material enough to trigger the cost threshold and therefore it has been discounted.

## This business case is supported by technical annexes

In addition to this business case the following annexes provide further information to support the case. They have been provided to demonstrate the depth and breadth of analysis, but we do not expect Ofwat to search these reports for the evidence – they key points that are material to the decisions we have taken are summarised in this case.

Annex 1 Reservoir Portfolio Risk Assessment – November 2017


# B. Need for a cost adjustment

We've carefully considered whether the investment need (set out in section C below) would be sufficiently covered by Ofwat's cost modelling approach. Maintenance of reservoirs and compliance with relevant statute is not a new requirement and nor is it unique to Hafren Dyfrdwy. However, there are important differences in our circumstances that we believe Ofwat's models do not reflect.

There are three key differences that form the basis for our claim:

- The Floods and Water Management Act 2010, by amending the existing Reservoirs Act 1975, has increased the safety standards required and number of reservoirs classified under the Act to levels greater than that already funded by customers. The legislation was enabled in 2010 but its enactment is being phased, impacting particularly in 2019, and these changes are being introduced at an accelerated pace in Wales compared to England. Defra has not yet announced the phased start date in England.
- Ofwat's proposed econometric models currently do not reflect the disproportionately large asset stock or inherent risk level due to age and dam design, which we believe is greater than the rest of the industry.
- Due to the difficult investment decisions that the previous owners of Dee Valley Water had to make, assets inherited by Hafren Dyfrdwy are operating at a higher level of risk than the average across the industry. This was highlighted following detailed appraisal using Portfolio risk assessment and Failure Modes analysis conducted in 2017, overseen by our panel of experts.

# Statutory safety requirements have increased, and earlier in Wales than England

The Floods and Water Management Act 2010 - by amending the Reservoirs Act 1975 - increases both the standards of safety that reservoirs must reach, and the scope of reservoirs that these standards apply to. The relevant enforcement authority for these statutory standards in Wales is Natural Resources Wales (NRW). Welsh Government and NRW have chosen a different approach to implementation to Defra in England.

### **Existing legislation**

The Reservoirs Act 1975, makes provision against the escape of water from large raised reservoirs, i.e. structures capable of holding more than 25,000 m<sup>3</sup> of water above natural ground level in England and above 10,000m<sup>3</sup> in Wales.

To comply with the Act, we are required to have:

- a reservoir Supervising Engineer appointed "at all times" (Section 12 of the Act);
- an inspection at least every 10 years by an independent Inspecting Engineer (Section 10 of the Act); and
- essential safety works (termed "measures in the interests of safety") implemented within a prescribed timescale.

Inspecting and Supervising Engineers are appointed by the Secretary of State for a five year period before which time they are required to apply for re-appointment.

The 10-yearly inspection is a thorough and complete, safety review of the dam and its infrastructure, collectively termed the "reservoir", to current guidance and standards. The Inspecting Engineer is required to review the performance of the reservoir and the management regime (leakage monitoring, etc.) and can prescribe remedial actions, works or investigations as part of their inspection. These requirements are termed "measures in the interests of safety" and are legally binding on the owner. As illustrated in 2.2 below, the periodic nature of these inspections can influence the phasing of investment – for example, the discovery of an unforeseen issue can result in a 'peak' of investment in reservoir safety every decade.



NRW are the enforcement authority for reservoirs in Wales. They have extensive powers (both civil and criminal) to ensure that compliance with the 1975 Act is achieved.

### The Flood and Water Management Act 2010

Following the flooding of 2007, the government commissioned an independent review by Sir Michael Pitt. Of the 92 recommendations in his report, he identified two key initiatives to improve reservoir safety.

The first is improved emergency planning for reservoir failure. This comprises three components:

- an on-site plan (an emergency action plan) developed by the reservoir owner;
- inundation "Reservoir Flood Maps" detailing a worst case scenario following a dam breach; and
- an off-site plan managed by Local Resilience Forums (LRFs) to mitigate the impacts of a dam breach, from evacuation through to disaster recovery.

The second relates to safety standards and their application. They have been incorporated into the Flood and Water Management Act 2010, which in turn amends the existing Reservoirs Act 1975. The Act was enabled in 2010 with phased enactment varied between England and Wales. The changes include:

- reduced volumetric threshold (from 25,000 to 10,000m<sup>3</sup>);
- requirement for on-site plans (Emergency Action Plans);
- introduction of a risk-based approach to regulation;
- requirement for mandatory reporting to the relevant enforcement authority;
- enforcement of Supervising Engineer powers to require maintenance works to be undertaken; and
- introduction of charges by the relevant enforcement authority.

These changes have increased the number of our reservoirs falling under the 1975 Act (by 55%), the standards that must be achieved and consequently the costs of ensuring compliance. For example, we estimate this enhanced monitoring and reporting to cost an additional £9500 per year for each reservoir. For the five additional reservoirs which fall into this classification (between 10-25000m<sup>3</sup>) that equates to an additional £233,000 to cover resource costs and routine maintenance alone during 2020-25.

The relevant enforcement authorities in England and Wales have taken different approaches to the timing of implementation. In Wales, NRW have now introduced the above amendments and are currently carrying out the initial designation which NRW have informed us will be complete by October 2019 at the latest. However, Defra in England have initiated a review before they introduce the above changes.

Therefore, given that none of the companies used to create Ofwat's models had this requirement during the time series period (2011/12-17/18), we believe **the model is unlikely to reflect the future costs of achieving these higher statutory standards.** 

# The totex models are likely to underestimate our investment needs

The proposed econometric models for the water resource price control do not include any variables relating to the number of or size of reservoirs. This is a significant driver of cost and we think that we are impacted disproportionately due to the circumstances our asset base. Our asset base differs to the rest of the industry, particularly in terms of the number of assets (when normalised using appropriate scale variables). As part of our full early submission (May 2018) and modelling consultation response, we set out our views on the limitations of the totex modelling approach to satisfactorily take account of economies of scale. This is one area where we believe this issue manifests.



### Expenditure on this asset group is inherently cyclical

The table below splits expenditure between the routine administrative cost of the Reservoirs Act 1975, the routine maintenance of shorter life assets and then the periodic refurbishment or rebuild of the structures.

The table below shows that, due to the nature of the asset base, replacement/major refurbishment cycles are very pronounced. Routine maintenance relates to relatively simple maintenance such as making up crests and repairing pitches on the upstream faces of dams, whilst major refurbishment means the dam has to be taken out of service for a prolonged period in order to carry out extensive repairs.

Our estimate of the implicit allowance (£0.42m in 17/18 prices) covers the administrative and routine maintenance that all companies incur and the model is likely to implicitly allow for.

All in 17-18	1990-95	1995-00	2000-05	2005-10	2010-15	2015-20	2020-25
prices						(2018-20 forecast)	
Inspections			£0.2m	£0.02m	£0.02m	£0.02m	£0.03m
Routine			£0.4m	£0.4m	£0.4m	£0.3m	£0.47m
maintenance							
Major	£3.5m**	£0.5m**	0	0	0	£0.4m*	£7.0m
refurbishment							
Sub-total	£3.5m	£0.5m	£0.42m	£0.42m	£0.42m	£0.72m	£7.5m

#### Past expenditure on reservoirs

\*An additional £0.5m was included in the PR14 FD for DVW but this was for desludging tanks in England so has been removed from the analysis.

\*\* costs have been estimated based on records of work done.

As a proportion of total expenditure, investment on raw water reservoirs ranges between 0.4% and 5%, which demonstrates the materiality of the cyclic nature of investment on these long life assets.

#### Summary of the asset stock - reasons driving cyclical investment

This expenditure trend is applicable to all companies and a recognised cycle for long life assets, but we believe it is more pronounced for Hafren Dyfrdwy for the following reasons:

- As shown in the charts below, we have more reservoirs per population served than the rest of the industry this is primarily due to the undulating topography and the system design to capture water in the upland areas to allow gravity feed to the treatment works.
- Dee Valley was a recent conglomerate of 3 smaller water only companies which historically lacked a strategic approach to raw water storage. We have inherited this piecemeal approach.
- The average age of our reservoirs is 120 years, which is older than the industry average of 100 years.
- Traditionally there is a history of underinvestment.
- Whilst SVT have several reservoirs that were constructed at the same time and using similar design which has particular higher risk design features these are no longer used for water supply and subject to a phased exit / demolition strategy.



### Number of assets in our portfolio

This case covers the 14 raw water reservoirs in Wales that fall under the Reservoirs Act 1975. The following table sets out the make-up of the asset stock which has changed due to the combination of the licence transfer and the reduction in volumetric threshold being classed under the Act.

	Located in Wales – Hafren Dyfrdwy assets	Located in England – Severn Trent assets
Dee Valley reservoirs	9	3
Severn Trent reservoirs *	2	61
Additional reservoirs between 10,000m <sup>3</sup> and 25,000m <sup>3</sup>	2 (North Wales area of Dee Valley old licence) 3 (Mid Wales area of Severn Trent old licence)	n/a changes not yet introduced
Total covered by this business case	14	n/a

\* Vyrnwy and Clywedog do not form part of this case as this water does not serve Hafren Dyfrdwy customers

The graph below shows that we have the largest stock when normalised - using two typical denominators - compared to the rest of the industry.

#### Our normalised reservoirs stocks are one of the largest in the industry



Welsh Water, Yorkshire Water and United Utilities, also rural and hilly areas, also have more than the industry average, but proportionally, still less than us. We note that Yorkshire water have suggested a water resource model that reflects the fact that the number and size of the reservoirs is a driver of cost that they believe should be reflected in the model. It is also important to consider that these companies are larger, which means there is a greater chance that they can have already done so, since 1974 smooth refurbishment needs both within their asset group and across their wider programme.

### Characteristics of the assets in our portfolio

Not only do we have a disproportionately high number of reservoirs, but we also have a high proportion of reservoirs that are the same age. This has two implications that further explain why investment is so cyclical. The first is that these assets tend to deteriorate at the same rate, as they are exposed to the same conditions, so they are due for replacement/refurbishment at the same time. The second is that they have the similar design features with inherent flaws, which for a group of our reservoirs, is considered by reservoir safety experts to be one of the higher risk designs.

The average age of our reservoirs is 120 years compared to an industry average age of 100 years. Age alone is not a driver for investment but for large civil structures it is a good indication and is a factor that is considered in the risk assessment methodology set out in section C.



In March 2017 we commissioned reservoir experts at Mott MacDonald to carry out Portfolio risk analysis (an in depth risk assessment looking at potential failure modes) of our asset base. The results are set out in more detail in section C, but the following extract sets out some of the reasons why this asset stock are considered to be higher risk and therefore why investment might be needed:

"Dam category: 7 of the 9 (Dee Valley reservoirs in Wales) reservoirs are earth embankments with puddle clay cores, which are deemed to be one of the riskier types of dam construction".

"Age: More than half of the asset stock is over 100 years old (the average is 120). This increases the risk factor by a factor of 10 when applying the developed risk methodology."

# **Outside management control**

The need to comply with our statutory obligations is not driven by management decision, however, our approach to how we meet our obligations is. This business case sets out how we are ensuring we find the most cost effective way of managing these long life assets to deliver service now and in the future.

We have questioned whether DVW has historically under invested in this asset group. The DVW PR14 business plan, prepared by the previous company, sought to manage the impact on customers' bills by deferring expenditure on certain assets so that the highest risk assets (from both an operational and financial perspective) were focused on first. This saw the company concentrate its attention on the surface water treatment works, resulting in the renewal of one treatment works per five-year investment period over the last three investment cycles. At PR14, DVW presented evidence that demonstrated that there were emerging signs that increased investment would be needed in the short to medium term – when the next Section 10 inspection was due. Increased investment is being made at three reservoirs in the Chester area during AMP6, which lie in England, which resulted in the investment looking particularly high compared to historical levels of investment and therefore the business case was assessed and an adjustment made through the cost adjustment process.

We are investing beyond the levels assumed in the PR14 Final Determination to ensure we are managing risk effectively. We have invested thousands of pounds to carryout risk assessments and improve our understanding of the risks and where necessary we have invested to address issues that had not been anticipated in the PR14 plan. For example, we are investing an additional £90,000 in the next 18 months (this represents over 20% of the 5 year total for routine maintenance) to address emerging issues identified through the increased regular checks.

Finding the optimum intervention point is a challenge – bringing investment forward can lead to replacing assets before the end of their life which increases costs to customers. But delaying it, increases the risk of failure and can increase the cost of mitigation in the future. The degree of flexibility is also constrained by the timing of the Section 10 inspections, which are due at 12 of the 14 reservoirs in the next five years.

This demonstrates why we believe this is a valid cost adjustment claim - we have proportionately more reservoirs which are higher risk (as a result of the typical design at the time they were constructed), subject to a cyclical investment (due to the long life nature of these assets), with minimal investment being made since 1990 and Statutory inspections will take place at 86% of the reservoir stock. Our evidence for why the level of investment proposed is appropriate is set out in section D.



# **C. Need for investment**

This business case contributes to the 'Water always there' outcome. As set out in the overview, there are two key drivers for this investment. The proposed solutions and investment have been identified to find the most cost-beneficial solution to meet both needs, as shown in the table below:

Driver	Totex
Meeting our statutory obligation - Compliance with Reservoirs Act 1975	£7m
Enhanced resilience	£0.5m
Total investment	£7.5m
Cost adjustment claim (total minus our estimate of implicit allowance of <b>£0.42m</b> )	£7.08m

We have tested this investment case with stakeholders including through the customer challenge group (CCG), directly with our customers and through our Board challenge sessions. We present the evidence to demonstrate that all parties support the need for investment.

# Our investment needs are part of a longer-term plan

The long-term plan for this asset group is to have intensive and frequent site operator inspections supporting regular monitoring by our reservoir safety team of qualified engineers, technicians and surveyors. This risk-based regime allows us to spot emerging defects and undertake remedial works in a timely fashion.

Our people and processes are key to delivering our aspiration to be 'best in class' for the management of our reservoir assets. We have operator training that independent assessors have suggested is industry leading and we have a well-developed succession plan in place for all levels of the team and the benefit of Severn Trent's independent review panel.

By embedding our approach to risk based management of these assets, we have been able to develop a plan to stabilise the assets and achieve a tolerable risk level. Having best in class management of this asset stock will not in itself reduce risk, but it does mean we can make informed, deliberate investment choices to find the best balance between risk and cost.

# The need is driven by a thorough and systematic assessment of risk

# Portfolio risk assessment

As part of Severn Trent's acquisition process they commissioned a portfolio risk assessment to review potential failure modes and rank the relative risk for all of our raw water reservoirs. The risk assessment follows the same process and scoring as the annual safety inspections. In this case, Severn Trent used independent consultants to carry out the assessments which were subsequently reviewed by the Severn Trent independent review panel.

The review panel provides independent technical oversight and assurance of key reservoir related matters and annually reports to the Severn Trent Chief Engineer. The chair, Dr Peter Mason (Technical Director, International Dams and Hydropower - MWH) has been supported by Mr Jack Meldrum (Divisional Director of Mott MacDonald Group). They are each highly experienced Inspecting Engineers and both internationally respected. They are able to draw upon further specialist expertise if required.

The risk assessment considered information from a number of sources, the key ones being:

- Previous Reservoir Act Section 10 and Section 12 reports (to check all previous actions have been completed)
- interviews with the Supervising Engineer and Dee Valley staff (to re-assess the risk in a way consistent with the broader Severn Trent portfolio)



• Gap analysis (to identify gaps in our data, knowledge, component capability or specialist studies that would be needed/beneficial to have when the 10-year inspection is carried out.

Through this process they established a risk score, the priority interventions needed to mitigate the highest risks and identified gaps in our knowledge that would help reduce uncertainty. This review identified 83 interventions that can be summarised into the following categories:

- Immediate need to reduce risk interventions such as dropping water levels and clearing trees and vegetation these will all be addressed in AMP6.
- **Reduce uncertainty** a range of studies to better establish the risk. Part of the Act requires us to have up to date studies in the following areas:

Study	Available now and satisfactory	May be required under Section 10	Recommended to do before S10
Flood studies	0	0	8
Overflow Spillway study	0	8	0
Drawdown capability study	0	0	8
Seismic Assessment	6	1	1
Dam Break analysis	0	0	8
Emergency action plan	0	0	8
Quantitativeriskassessment	0	8	0
Stability review - embankment	0	7	1
Stability review - foundation	0	8	0
Stability review - structure	0	0	0
Seepage investigation	0	8	0
Ventilation	0	0	0
Reservoir Volume analysis	0	8	0
Hydro mechanical assessment	0	7	1
NDT	0	4	4

### Studies required to fully assess future risk

We have invested £30,000 more than included for in the PR14 final determination to carry out all of the tests listed in the recommended column. This demonstrates the level of commitment we have to ensuring we manage and understand the risks we face.

- Longer term risk mitigation covering various issues such as:
  - Four reservoirs have aging, castiron pressurised pipes running through the embankment, which significantly increases the risk and is wholly unacceptable with recommended reservoir design.
  - Five of the reservoirs cannot be safely taken out of service or accessed to carry out the full inspections.
  - o Emergency Action Plans are now all in place, they need to be exercised in AMP7
  - o Spillways are likely to be undersized (flood studies pending).
  - o The following table sets out a summary of the risk assessment.



ref	Name	Volume (m <sup>3</sup> )	Age (vears)	Date s10 due	Likelihood assessment	Consequence assessment	Overall rank (ST	Number of remedial
		. ,					group)	actions
1	[REDACTED]	175,485	142	2019	moderate	high	1 (11)	11
2	[REDACTED]	39,500	145	2022	moderate	high	2 (14)	9
3	[REDACTED]	101,200	115	2022	moderate	high	3 (16)	10
4	[REDACTED]	281,852	122	2019	moderate	high	4 (17)	7
5	[REDACTED]	102,967	146	2022	high	moderate	5 (19)	0
6	[REDACTED]	565,300	109	2019	high	low	6 (22)	8
7	[REDACTED]	114,000	124	2021	moderate	moderate	7 (26)	0
8	[REDACTED]	18,160	76	AMP7	moderate	high	8 (27)	8
9	[REDACTED]	281,100	143	2022	moderate	moderate	9 (28)	4
10	[REDACTED]	20,600	121	AMP8	high	low	10 (31)	0
11	[REDACTED]	102,967	146	2022	moderate	high	11 (32)	7
12	[REDACTED]	140,000	36	2018	low	moderate	12 (66)	5
13	[REDACTED]	18,182		AMP8	low	high	13 (74)	0
14	[REDACTED]	>25,000		AMP7	low	low	14 (75)	0

A summary of the risk assessment

Whilst the reservoirs are currently compliant with the Reservoirs Act, the risk of failure and extent of the necessary mitigations required have been steadily increasing for the last 10 years, and the indications from our independent risk assessment is that this trend is increasing at a much faster pace. Regardless of age reservoirs are assessed against current standards, it is to be expected that disproportionate investment is required on older reservoirs.

### Section 10 of the Reservoirs Act (10-yearly inspections)

Four reservoirs are due to have a section 10 (10-yearly inspection) during 2019-20. A further eight will have section 10 inspections during 2020-23. Following a section 10 inspection, a company has up to three years to carry out all of the remedial works. This means there are likely to be mandatory actions associated with 12 reservoirs during the 2020-25 period. These are being highlighted by our pro-active approach employing PRA.

It is good industry practice to carry out a pre-inspection up to 2 years ahead of the 10-yearly statutory inspection. This provides an indication of the potential findings and allows more time to gather any data necessary to carry out the work safely and to optimise and identify the best solutions. From Severn Trent's experience managing the dams in England, this process typically reduces the length of time the dam needs to be taken out of service / have restricted operational use and crucially overall cost, mainly due to efficiencies during the construction phase as a result of having better information. Section D includes an explanation for how we have factored this into the proposed costs.

### Our regulators support the need for this case

We have maintained a constructive dialogue with our regulator, Natural Resources Wales (NRW). They are supportive of our approach. We have also discussed this business case with representatives from Welsh Government in February 2018 and provided a further update in July 2018.

In addition to proactively supporting reservoir research, we have hosted informative site visits for their staff. The regulatory team from NRW visited Llwyn Onn Service Reservoir during construction.



# Asset health observations further demonstrate the need

The main asset is the civil structure, and asset health is measured through changes in the results of the studies set out in the table above. There are limited regular observations that can be made. However, the following data is one example of a shorter life asset which is also showing signs of requiring significant investment.

An important safety feature of a dam is the scour pipe and scour valve. In older dams the pipework is buried within the body of the dam, in the event of a pipeline burst in the dam structure, this could cause the whole dam to fail. The immediate safety response is to close the scour valve. Where upstream valves exist they are devastating unreliable. Our most recent annual testing revealed a 22% failure rate, which is unacceptable for a critical safety device - a reliable serviceable system upstream closure device is required. In the event of a device failure during testing we have to use divers to undertake repairs, however in the event of a mains burst, using divers would not be an option on health and safety grounds (due to the potential for the diver to be caught in the uncontrolled flow into the defective pipe).



### Asset health measure

### Using technology to reduce uncertainty

One of the most significant risks in our area of Wales is ground movements – in particular land slips. To better understand how this risk is changing over time we have installed new piezometers with facility for real time monitoring at Bwlch-y-Gle Dam. A comprehensive programme for remote monitoring of the main Clywedog dam is currently being installed. This includes 3D crack monitoring, under-drain flow monitoring and new survey stations. Comprehensive in-situ stress measurements are also being developed on the buttresses of the dam. This analysis is helping us to understand normal variations and then to assess any changes in the long-term trends. We are considering in which other locations we could install this technology to help us monitor the risk and develop a strategy for deciding when to intervene (i.e. to establish how much movement is safe/normal).

# Our customers understand this need and trust us to plan for the future

Compliance with the Reservoirs Act 1975 and amendments is a statutory requirement and as such is not optional. Therefore we have not discussed the details of the requirements or the risk assessments with customers. However, there are two key areas where our broader research approach has given us insight that relates to this investment:

• through our customer tracker 88% of customers trust us to plan for the future. In particular they trust us to balance monitoring and looking after our assets in the shorter and longer term, whilst keeping bills manageable; and



• in our initial customer needs research, customers told us, unprompted, the importance they place on the natural environment and having access to green spaces. Our impounding reservoirs contribute to their lives by offering them such access. We will also look at how we can further meet their needs in the business case by enhancing access and the facilities at the sites where it is appropriate and cost effective to do so.

In addition to this we have undertaken specific research on this topic with two complementary approaches:

- we have used a deliberative to raise awareness of these more complex investment decisions, and to get more informed views on the pace at which we should proceed. In deliberative workshops in both North Wales and Mid Wales, we have discussed with our customers the idea of asset health and resilience and then specifically how they see that in the context of intergeneration fairness (who pays for what, and when). These workshops included both current and future customers, and were supported by a series of telephone depth interviews with non-household customers; and
- in our quantitative research with customers on the choices in our plan (performance commitments, areas of investment choice and incentives) we are asking customers about the pace of investment, in the context of bill impacts.



Our research finds that the majority of customers, whether household or non-household, either support the proposed option, or a faster pace of intervention (carrying out significant maintenance on all reservoirs, including those due their statutory inspection in 6 to 10 years' time). Very few customers did not wish to express an opinion on this choice.

These results from the quantitative research are consistent with the broader insight from our deliberative research. Customers generally felt that water companies should be taking a proactive to mid-ground approach in regards to asset maintenance, especially as water is seen as an essential service. A reactive approach is unacceptable as it could lead to a spiral of assets falling into disrepair that would eventually impact on all customers, both in terms of safety and cost. At the same time the current experience of good service means that bringing investment forward isn't deemed necessary, especially if this would cost more.

When discussing reservoir safety more specifically, customer appreciated the need to act on these assets. A reactive approach would be considered irresponsible, as well as leading to future disruption and billincreased. Customers expect us to maintain and spread the cost of investment over time. Customer views did not change if we were discussing assets in close proximity to themselves, or a neighbouring area – they expected that eventually they would feel the impact. Some customers, particularly in Mid Wales, questioned why shareholder profits were not being used to bring forward investment in these assets.



It's interesting to note that the future customers in our workshop felt more disconnected with these choices they could really understand why a faster pace of intervention was an option, and were content as long as water is coming out of the tap. Anecdotally, some customers were sceptical about why we were consulting them on such topics, rather than relying on our internal experts.

Whilst we have engaged customers on the pace of investment, and the impact on bills, we know from our research that they are not necessarily interested in regular information on progress, or technical details of delivery.

# D. Best option for customers

# We have considered a wide range of options, seeking counsel from experts

We have taken the results of the portfoliorisk assessment (see Annex 1) and worked with an independent engineering consultancy to develop the options and then more detailed solutions and costings for all of the issues that have been identified as being required under a Section 10 inspection.

We are not just looking at the civil structures and have considered a broad range of options that could be used to both meet our statutory obligations but also deliver wider benefits. To identify the best combination of options for customers now and in the long term it is important that we consider the costs and benefits over the long term. The figure below illustrates the range of costs and benefits that we are evaluating to enable us to simultaneously take account of the short and longer term benefits, whilst ensuring the degree of uncertainty in some of these benefits does not overly bias the selection.



# Range of options and associated costs and benefits



The curved line illustrates the transition between the traditional solutions adopted to meet our legal requirements (below the curve) and the wider solutions which provide much broader and long term benefits (above the curve).

When carrying out investment on assets that typically last 100 plus years it is more important than ever to consider resilience in the round. In Chapter 5 we set out our overall approach and the table below describes the practical changes we have made to ensure we identify the best long term solution.

Risk management	Resilience in the round
Condition inspections	Talked to our customers about resilience but also affordability to help us find an intergenerational compromise
Tests/investigations (such as flood tests and embankment stability tests)	Talked to our Board about the risks we are managing
Considered post intervention risk for different options	Reviewed the balance of water resources and the risks and opportunities facing the alternative sources
Prioritised based on number of people or area that would be affected if failure occurred	Identified trigger points for needing to adapt our plan if the future is different to our predictions based on the past
Updated the What If documents that ensure we are able to respond effectively in the event of a failure	Developing more active relationships with the Local Resilience forums (LRFs)
Monitored results of increased monitoring (such as piezometers to monitor ground movement)	Carried out an assessment of risks and opportunities under well-being of future generations – specifically looking at the role of our sites as an amenity to offer well-being activities
	Carried out an assessment of risks and opportunities for our sites to enhance the environment – specifically biodiversity.
	Considered other risks such as SEMD and climate change impact on future quantity and quality of source water

# We have identified the most cost beneficial solutions

For each site we have reviewed the risk assessments, the pre-section 10 documents and the Atkins peer review, which sets out the likely actions that will become mandatory obligations when the Section 10 inspection is carried out. Atkins then carried out initial feasibility of options to sufficient detail to allow costings to be produced.

The most material risk that has been identified is present at four reservoirs, each having a pressurised pipe running through the body of the dam. In the initial risk assessment, this was given a risk weighting factor of 10 meaning that it is a factor of 10 more risky that modern designs which would not be constructed in this way. The figure below illustrates the design risk.



#### Through-dam draw off pipework risk



We first considered if these reservoirs are needed at all and whether it would be possible to replace the capacity e.g. through increased abstraction elsewhere or increased storage at other sites or through a water trading option. Due to the location and strategic importance and cost of the alternative infrastructure (pipelines and pumping costs) this was discounted.

Option	Initial capex at 4 reservoirs	consideration	Whole life cost at 4 reservoirs
New dam to modern design and standards	£60m	Biggest reduction in risk and remove the need for any significant maintenance for c80years. All routine maintenance could be carried out easily and would be minimal	Not assessed as clearly too expensive
Replacement valve tower	£20m	Reduce the pressure in the pipe and therefore the likelihood of failure of the pipe and improve isolation. But the pipe would still be operational and inspection not possible without complete draw down	£23m
Siphon solution to enable decommissioning of pressurised pipe	£2.8m	Removes the need for and therefore risk of the pressurised pipe. Reduces construction risk as no modifications would be required to the body of the dam.	£8.5m

Engineers then considered three types of solution at all 4 reservoirs where this design feature exists:

The siphon solution has been chosen on the grounds of whole life costs (over 50 year horizon) and lower construction risk. In addition to this design feature the other risks identified have been reviewed and options considered. The mitigations are site specific, but have been summarised into the following categories.



	March- wiel	Cae Llwyd	Ty Mawr	Pend- inas	Penycae Lower	Penycae Upper	Llyn Cyfynwy	Nant- y- Ffrith	Pant Glas	Other sites*	Total
Valves, tower, siphons	50	450		630	660	710	1,200	810	90		4,600
Spillway		700					30	650			1,430
Access	56	59	255				200	330	231		1,131
Embankment			73	80	120	130	70	163	40		676
Toe drainage	50	50	110	160	40	90	50	50	40		640
Studies	12	58	18	6	21	18	62	21	59		275
Sub-total construction cost	168	1,317	456	876	841	948	1,612	2,024	510	-	8,752
Total Cost	196	1,558	555	1,109	1,058	1,197	1,932	2,642	616	84	10,948

### Summary of the Construction costs per site from initial assessment (£k)

\* Reservoirs in Powys; Nant-y-Geifr, Esgairerira and Pen-y-gwely

We have then overlaid the reservoir safety plans with other aspects of the plan – specifically:

- The security requirements under SEMD.
- Property portfolio and potentially partnering organisations to understand scope for visitor experience improvements.
- Catchment solutions to better manage surface water run-off into the reservoirs.

This has enabled us to identify around £200k of synergies where the investment delivers multiple benefits, reducing the total costabove to £10.7m.

This was significantly higher than the original estimate that was used to discuss the proposals with customers and whilst 16% of customers thought we should do more to reduce risks faster, it was also clear that the bill impact of £10.7m of investment would not be acceptable to the majority of our customers.

Therefore we carried out two further reviews:

- Consider drawing down reservoirs that are not critical to operations in the next five years to reduce the scope of work that would be required under Section 10.
- Identify the areas in our assessment where there is some uncertainty about whether the work would be mandated under Section 10.

We have considered the risks and opportunities associated with these options and have identified £1m that can be saved by drawing three reservoirs down to reduce the scope. Two of them are already non-operational sites, the third is operational but provides limited storage and is only needed under drought conditions.

There are two sites where we believe some of the likely Section 10 requirements are uncertain. We think this because the items were only raised in one of the two independent reviews and the risk relate to features that relate to the original design and none of the previous Section 10 inspections have flagged this as a required mitigation or action. The cost estimate for the uncertain elements across these two sites is £2.3m. We have excluded this cost from the cost adjustment claim.



However, it is possible that a statutory obligation could be mandated and we are therefore proposing to include this as an uncertainty mechanism that will be administered through ODIs. This means that if the inspecting engineer deems the work is necessary then the mitigations will be put in place but the costs won't be recovered from customers until the true up in year 1 of AMP8. This minimises impact on customer bills in the short term and provides us with an incentive to identify more efficient solutions to mitigating the risk that has been raised to prevent it becoming a formal obligation.

Therefore, we have reduced the cost adjustment claim from £10.9m to £7.5m by identifying the least whole life cost solutions, identifying synergies and balancing the risk between current and future customers and customers and shareholders. We think this represents the optimum scope of work to meet the needs of all stakeholders.

# We have benchmarked our costs to ensure we have identified efficient solutions

The next step is to demonstrate that the estimate costs of the agreed scope are efficient. We do not have a large cost database for these long life assets and due to the variety of designs and specific circumstances therefore the only approach that can be taken to get a robust cost is by carrying out individual scoping and costing for each site. As we develop the robust estimates we are also seeking to benchmark the costs against the consultants cost database and that of Severn Trent to ensure savings resulting from the pre-inspection approach are also factored in. This will enable us to challenge and then ensure that the costs represent efficient costs.



# **E.** Customer protection

# How we will hold ourselves to account

We have carefully considered the need for a performance commitment to protect customers from nondelivery or uncertainty in the need or scope. Given the level of detail in which we have reviewed the reservoirs and how closely our assessment follows the formal statutory inspection approach, we believe the interventions will become mandatory at the time the Section 10 inspection and this activity will represent the vast majority of the investment. Other than the reduction in risk of a supply interruption there are no other service outcomes that customers will experience as a result of this investment. Given our management of these assets is heavily regulated and closely monitored by NRW, on behalf of Welsh Government, we do not think there is a need for an additional performance commitment. We have tested this with customers and have learned that 88% of customers trust us (and expect us) to plan for the future. In particular they trust us to balance monitoring and looking after our assets in the shorter and longer term, whilst keeping bills manageable. Whilst we have engaged customers on the pace of investment, and the impact on bills, we know from our research that they are not necessarily interested in regular information on progress, or technical details of delivery.

# Affordability

Affordability has been a key consideration in forming our proposals. While there is little choice over investment to meet statutory obligations, we are seeking to strike the right balance between risk, action and affordability across all proposed investment.

We have reviewed willingness to pay research and tested proposals with customers, specifically to understand their views on intergenerational fairness and resilience.

Following acceptability testing it was clear that we needed to rebalance our plan to reduce the impact on bills. This is particularly challenging here due to the fact that the activity will become part of a compulsory statutory undertaking. However the uncertainty mechanism that we have set out above has enabled us to reduce the impact on bills in the short term, whilst incentivising us to manage the risk and identify suitable mitigations. This mechanism has been discussed with our CCG.

# **Board assurance**

We designed a bespoke assurance framework to support the development of our plan to the highest quality. This Board-led framework builds upon our robust annual assurance processes. Each building block within our plan was assessed for risk to include the individual components, for example data, methodology, judgements and assumptions, against our likelihood factors (level of change, complexity, roles and responsibilities and subjectivity) and our impact factors (financial value, customer impact, competition, statutory / regulatory requirement). The level of risk determined the type and level of assurance required with significant or high risk building blocks allocated to an independent third line assurance provider depending on the particular expertise required. This framework was applied to our cost adjustment claims and have been assured through all three lines of assurance.

For this cost adjustment, third line assurance was undertaken by Black and Veatch using a two staged approach; 1) an initial review of our methodology and 2) a final review of our processes and data. Black and Veatch found that;

"An effective process was used to identify potential challenges justifying Cost Adjustment Claims (CACs) which met Ofwat criteria and were material. These were challenged internally, by customers and by other stakeholders. The proposed CACs were justified, supported by customers and had been robustly costed" and;



Costs had been assessed for each CAC at an appropriate level of detail, based on similar work carried out by the company or estimates provided by others, and were as robust as possible at the planning stage. A proper assessment of options had been carried out and steps taken to optimise work scope and cost" and;

"The **Reservoir Safety CAC** is justified on the grounds of the faster pace of implementation of mandatory reservoir safety legislation in Wales, the age and design features of the company's dams and the likely spike in PR19 investment, compared with previous periods, given the company's limited ability to absorb peaks in spending. Costs have been estimated using appropriate methods, based on a detailed assessment of the work required at each site and including cost-effective options. Measures to reduce and defer expenditure have been included following a risk-based assessment"

For more information on how we developed and applied our framework to our cost adjustment claims and the findings of the assurance, please read our 'Securing Trust, Confidence and Assurance' Chapter 10.



# Annex 1: [REDACTED]



# 4.3.2 Reducing Lead in Wales cost assessment claim

# A. Overview

Every day our customers trust us to deliver safe, clean drinking water to their taps. This is the most fundamental aspect of the services we provide and as such it is heavily regulated. This business case relates to the vision and ambition of the Welsh Government regarding water quality - specifically the risk of lead in water. Our customers support us taking action to work towards a lead free Wales, and that the ambition in Wales is greater and more immediate than in England.

We have a good track record and Hafren Dyfrdwy (HD) has one of the highest levels of lead compliance in the industry. However, in response to the growing evidence of the negative health impact of lead, the Welsh Government, through the Water Strategy for Wales has increased its ambition and set a clear expectation that we should "aim to keep exposure to lead as low as reasonably practicable". This is emphasised through the well-being of Future Generations (Wales) Act 2015 and this need contributes to four of the seven well-being goals.

Research has shown that there is no safe standard for lead and that young people (particularly those under six years old) who are exposed to lead in drinking water at the current 10ug/l standard have shown increased behavioural problems and lower IQ. The statutory standards we are required to meet are likely to change as a result of this evidence – the European Commission is currently consulting on a further tightening of the lead standard to 5ug/l (from 10ug/l) which could take effect from 2030. Other countries, such as Canada, have already adopted the tighter standard on the strength of this evidence. The DWI have signalled that they are minded to track performance against the tighter standard through AMP7. We cannot achieve the Welsh Government's challenge to do more nor the prospective 5ug/l standard unless we do something different.

Currently, we have two principal options to tackle lead: either replace the pipework or seek to mitigate the risk through phosphate dosing at our treatment works. The first of these options is challenging as water companies do not own the last section of pipe, and we cannot insist a customer replaces or lets us replace their pipework. It is also very costly and disruptive for customers to replace the pipework entering their homes. As a consequence, we, like other companies, have focused on the second option - mitigating the risks through treatment at our works. Investment has been made over the last 10 years to install and optimise phosphate dosing at all but one of our treatment works. However, as our analysis demonstrates, treatment solutions alone will not be sufficient to meet the future standards in the short term and in the long term, chemical treatment is not the most sustainable solution because of the environmental impacts.

In response, this case sets out a twin track approach to increase lead pipe replacement: taking action in the highest risk areas now, while working collaboratively with others and developing solutions to reduce the cost and inconvenience to customers. Customer engagement is critical given the direct impact it will have on them - we've therefore developed our proposals through several stages of engagement and drawn insight from third party research. We believe that both the need to take action, and our proposed approach, is supported by our customers.

The investment proposed in this business case will be the start of a longer term strategy – we need to work towards a financially and environmentally sustainable solution. That means removing lead pipes so that chemical treatment is no longer needed (therefore removing the adverse impact and increased cost of removing these chemicals from our environment) but also identifying innovation to reduce the cost of pipe replacement. We cannot solve this problem in an affordable way in the next five years, or by ourselves. At the current estimated average cost of £2,000 to replace the entire service pipe (company and customer owned sections), it will take hundreds of years to remove all lead pipes, based on the current willingness to pay value. This is not acceptable to our board, our customers or our regulators.

The Welsh Government is also currently considering the case for supply pipe adoption by water companies in Wales. This case does not assume a decision either way, but we are carefully considering how it might change the costs and benefits of the possible options under consideration. This will enable us to make a best first step



until there is more certainty about this potential change in legislation. A change in ownership can change the costs of the solutions (as it removes the costly need to negotiate with each customer) but it doesn't change the fact that even if we owned the pipes, the current technology and solutions mean that we are a long way off meeting the tighter 5ug/l standard or removing lead entirely unless we find innovative solutions that reduce the cost- that is the challenge our regulators and customers are setting us and this case seeks to respond to.

Innovation	Resilience	Affordability	Great customer service
Market innovation to get plumbers involved – competition law limits the scope of work we can do on the customer owned section of pipe. Technology – relining trials, geospatial mapping to get better information to target and prioritise replacements. Researching technology to make it easier/more reliable to take samples. Enhanced process optimisation of plumbosolvency treatment.	A strategy that solves the problem, not just treats it, is more resilient – this removes reliance and cost of treatment in the long term. It also removes a dverse impacts on the environment. As pipes age the chance of lead dissolving into the water is higher. Communication and service pipes won't last forever (at current replacement rate the inferred asset life is over 2000 ye ars) – this strategy helps with phased replacement and better monitoring of the risks. We lsh Government are particularly concerned about the lack of resilience as a result of the current ownership model.	This is one of the key considerations in this case and what makes it so hard to solve. In the short term we have sought to find the right balance between action and affordability. Our work in the next five years is aimed at finding a more affordable solution to this need that will underpin a longer term strategy. Otherwise it would take 112 years to solve the problem using current WTP and approaches.	Our cus tomers will benefit from improved lead compliance. Particularly the young who are most effected. But-just as importantly - we will be talking to them and working with them to a ddress the issue in a way that takes account of their circumstances and minimises the dis ruption to their lives (ultimately digging up pipes in drive ways can be
			very menosive/.

# We've challenged ourselves to be ambitious against Ofwat's themes

# This business case is supported by technical annexes

In addition to this business case, we have included further supporting information in the following annexes.

Annex 1	Lead in Water in Wales report by Water Health Partnership for Wales
Annex 2	Joint research on customer views on supply pipe ownership in Wales



# B. Need for a cost adjustment

We've carefully considered whether this service enhancement would be sufficiently covered by Ofwat's cost modelling approach. We do not believe it would be on the basis that:

- the legislative driver is more ambitious and immediate in Wales;
- the standard required is greater than that already funded by customers; and
- we need to take an approach that looks beyond the pipe network in our ownership.

# The legislation has changed and is more ambitious and immediate in Wales

The details of the statutory obligations are set out in more detail in section C. The table below illustrates the degree to which the obligations are only applicable to companies in Wales. Only 2 out of 17 companies operate in Wales and this obligation was not in place when prices were set in 2014, therefore there is no (or very little) expenditure included in the historical base used to create the expenditure models.

### Statutory drivers and areas of discretion

Statute	Area	Scope	Timing	Change / who affected
Water Strategy	Reducing lead in water	Mandatory	Discretionary	Yes / companies in Wales
	Supply pipe adoption	Not in place, but we need to inform this decision	Not confirmed	No / companies in Wales
Drinking Water Directive	Reduce lead standard to 5ug/l	(under consultation)	If enacted, standard would take effect from 2030.	Yes / all companies
Well-being of Future Generations Act (2015)	Contribute to : A healthier Wales A more equal Wales A resilient Wales A more prosperous Wales	Mandatory for Ofwat and Natural Resources Wales – discharge their duties through the companies they regulate	Mandatory for public services from 2015	Yes / companies in Wales

### The cost adjustment delivers an improvement in water quality and public health

The current industry standard, as set out in the Water quality (water supply) regulations, is to ensure lead levels of no more than 10 ug/l at customers' taps.

In 2016, all regulatory samples in both Mid Wales and North Wales were 100% compliant with the current 10ug/l standard. This proves that any improvement would be over and above the current standard and **that this case is not about achieving a level of compliance that customers have already funded** and which would be covered by Ofwat's totex models.

More detail on our current performance is set out in section C to demonstrate that we are already doing as much as we can to mitigate the risks through treatment solutions and that our phosphate optimisation analysis demonstrates that we have already maximised the protection that can be offered through phosphate dosing and that it is not possible to use treatment as a way of reducing to 5ug/l or beyond.

# To solve this problem we have to go beyond the current legal ownership

Compliance is measured at customers' taps. The current legal ownership is split for different sections of pipe, as shown in the figure below:



### Illustration of the ownership split



In order to meet the statutory obligations, we will either need to work more closely with customers and encourage them to replace their lead pipes as we replace our communication pipes, or we need to replace the pipes for them. These costs are not part of the historical cost base as very few customer side pipes have been replaced by any company.

To estimate how many customer owned pipe replacements may have been carried out by water companies in the past (and therefore the costs that are likely to be included in the basic cost threshold) we have reviewed the number of lead communication pipes replaced for quality reasons (using the December 2017 cost assessment data submitted by companies). In the last six years, the industry has replaced a total of 128,458 lead communication pipes, which represents 0.5% of the total properties served.<sup>6</sup> The chart below shows that across the industry the current replacement rate is a very small proportion of the total lead communication pipe asset stock.



Percentage of lead communication pipes replaced in last 5 years

Based on the experience gained by Severn Trent in previous years, around 5% of all lead communication pipe replacements the customer side is also replaced. This translates into around 6,423 customer owned pipes. Using the average unit cost to replace supply pipes used in the CCWater / water company joint research of £1,000 per customer pipe (based on an estimate of £2,000 which is split equally between customer owned supply pipe and company owned communication pipe) this suggests that £6.4 million is included in the historical baseline. At PR14 Ofwat's industry total determination was £42 billion, which means even if we round the estimate up to £10 million, this equates to 0.024% of totex. Therefore we have assumed that the

<sup>&</sup>lt;sup>6</sup> Based on the 2017 number of household and non-household properties reported in the 2016-17 cost assessment submission.



implicit allowance for this cost adjustment claim is 0.024% of the total totex included in our plan. This means the implicit allowance to 3d.p is zero.

In conclusion, this is a valid claim because it represents an enhanced service that will go beyond the current legal standard and to target the customers most at risk from lead exposure means going beyond our ownership boundary. The costs of this are largely not included in the historical base from which the models have been made. Based on a review of the econometric models published in March 2018 there are no proposed model variables that reflect this requirement or service enhancement.



# C. Need for investment

Our proposals are underpinned by four pieces of evidence that demonstrate the need for this investment:

- meeting the Welsh Government's Water Strategy for Wales, the Well-being Wales Act 2015 (and prospective changes in standards);
- independent evidence that there is no safe standard for lead in drinking water;
- our customers' and stakeholders' support for this service enhancement; and
- data to show that current treatment solutions will never be enough to meet the tighter standard.

### Driven by Welsh Government water strategy and future change in standards

This case is underpinned by the Welsh Government's vision and ambition that requires us to keep exposure to lead as low as reasonably practicable. In 2016, the Welsh Government published their <u>Water Strategy for</u> <u>Wales</u>. A key theme of the Welsh Government Water Strategy for Wales is protecting and improving drinking water quality recognising the public health risk presented by lead:

"We must aim to keep exposure to lead as low as reasonably practicable therefore we will consider management options to reduce exposure to lead and related health effects.

Water pipes and fittings containing lead have been used for plumbing purposes until relatively recently. The health impacts of lead in drinking water, in particular for children, have been the subject of international research. Currently, these risks are managed through the dosing of drinking water with phosphate, which prevents lead dissolving into the water. Although this is the most economic means of controlling the risk from lead, it does not remove the long term risk from lead pipes and fittings. In addition, phosphate resources are limited and its use in drinking water has consequences for sewage treatment and water pollution. We will work with the Drinking Water Inspectorate, water companies and others to investigate best practice and options for addressing the risk of lead leaching into water supplies."

The Welsh Government are currently considering the costs and benefits of the transfer of ownership of supply pipes to water companies. We have worked with them to better inform this decision, and are supportive of this as it will make achievement of leakage lead compliance targets more straightforward and therefore more efficient.

This expectation is also echoed in the Welsh Government SPS to Ofwat (<u>link</u>):

"Ofwat must work with the Drinking Water Inspectorate to regulate companies to encourage and incentivise them to maintain the current high standard of public drinking water quality for the long-term. This should include customer acceptability as well as wholesomeness."

#### Wider legislation in Wales

The Well-being of Future Generations Act (Wales) 2015 applies principally to public bodies, but through the Welsh Government's SPS to Ofwat and Natural Resources Wales, we are obligated to work in a way that is cognisant of this Act. There are several aspects of this business case that relate to the well-being goals and sustainable development principles.

- A healthier Wales A child will absorb about 40-50% of ingested lead, compared to an adult at 3-10%. Ingested lead at this level has been shown to result in cognitive and behavioural problems.
- A more equal Wales A child with blood lead around 10 µg/dl will lose around 5 IQ points and a loss of one IQ point can decrease average lifetime earnings by approximately US\$18,000 or €12,000. Lead is also more likely to be present in poorer communities due to older housing stock and lack of upgrading.



- A resilient Wales removing the lead from the environment is a more resilient solution than treatment, which is not sustainable and has an adverse impact on the environment. It also would lead to a more resilient society as the impact on IQ will be remedied allowing for greater potential for higher earning careers.
- A prosperous Wales both in terms of longer term reduction in costs because of avoided treatment costs and in the shorter term the increased work for local plumbers.

### DWI as enforcers of Water Supply (Water quality) Regulations

The fact that the ambition is stronger in Wales is also recognised by the DWI, who include the following expectation in the **guidance note to companies**, **September 2017**:

"4.8.5 Companies in Wales need to have regard to the specific requirements of Welsh Government on lead matters in their SPS advice to Ofwat; to deliver the requirements of the Wales Water Strategy; help deliver the goals of the Well-being of Future Generations (Wales) Act 2015; and to liaise with the Water Health Partnership for Wales on the development of policy in this area."

In addition, as part of changes in the Drinking Water Directive, the European Commission are currently consulting on the future legislative change which will be written into UK law through the Water Quality (Water Supply) regulations and could further reduce the standard to 5ug/l and any legislative changes are likely to be enabled from 2030. The DWI have confirmed that they intend to start tracking performance against the tighter standard as early as 2020 (10 years before official enactment), a similar overlap period was also applied leading up to the reduction to 10ug/l in 2013.

The future standard change to 5ug/l is equally applicable to companies in England and Wales, but the historical base used by Ofwat to create cost models does not include any investment to go beyond the current standard of 10ug/l. Defra have not challenged companies in England as explicitly as Welsh Government has. While this standard is not yet in place, we need to be preparing for it and considering the most affordable way of balancing the costs over the required time period.

# Further reductions in lead will benefit customers

There are known adverse health effects of excessive, long-term lead exposure. Lead is a cumulative toxin that affects multiple body systems and prolonged exposure can, in extreme cases, have serious consequences such as a reduced IQ and behavioural problems. Children and expectant mothers are particularly vulnerable.

Most customers experience no issues with drinking water quality, and we complied with World Health Organisation drinking water standards 99.71% of the time in 2016, but as researchers investigate the impact of lead it is becoming clear that there is no safe level of exposure. There is extensive evidence to demonstrate the public health impact of lead exposure. We have not sought to confirm or otherwise this evidence. We believe therefore, that there are direct benefits to customers measured by a performance commitment based on the number of issues resolved.

# Our customers support - and are willing to pay for us to do more

We have sought to tackle this difficult conversation with customers in several ways to get a broad range of views. We have also drawn on the joint research that was conducted in 2017 as a joint research project between all parties affected by the Welsh Government's desire to better understand the costs and benefits of supply pipe adoption.

Unprompted, this is not an issue that customers raise – this is because safe drinking water is a fundamental expectation and a major part of the core service we provide. However, to meet this ambition, customers have an important role to play – they own and are responsible for the supply pipes. Therefore we have initiated conversations with them about lead in drinking water, the current level of compliance and the reasons to work towards complete eradication of lead in drinking water.



We have drawn on the following pieces of research to understand how customers feel and what they expect.

Approach	Purpose
Willingness to pay research (with 500 household customers split evenly between Mid Wales and North Wales and non-household customers)	To understand if customers value us funding customer owned lead pipe replacement rather than just the company owned part.
Customer needs research - deliberative workshops in Newtown and Wrexham (with around 35 household customers)	To establish if customers' views change when they have more time to discuss, and greater information about, the topic.
Customer needs research - in-home, detailed interviews with customers in vulnerable circumstances (with around 15 customers)	To understand if customers in vulnerable circumstances have different views.
Co-creation session in Wrexham	To seek views on how customers want us to engage them on this subject. It is a notoriously difficult subject to engage on and in many cases the barrier to solving the problem.
Asset health and resilience deliberative research	To explore in a deliberative approach how we should tackle the issue of lead in drinking water
PCs, ODIs and investment choices	To explore in a quantitative way what investment choice on lead customers would prefer
Joint CCWater and company research from 2017	To understand views on supply pipe ownership.

The complete research findings will be set out in Chapter 2 and Appendix 1, but the key findings are:

- Tackling lead pipes emerges as a top three (prompted) priority for both the household and nonhousehold sample in our **willingness to pay research.** Household customers in Mid Wales were willing to pay £0.60 per year for financial support to deal with lead pipes, compared to £1.78 in North Wales.
- Our **customer needs research** found that while some customers are aware of historic issues with lead pipes, most are unaware that they are still present in the water system or could be in their home. There is also mixed awareness and/or confusion over who is responsible for water pipes. Customers are unaware that they own their supply pipes or of the health issues associated with lead pipes. When prompted, customers tend to be shocked and concerned. This concern does diminish once customers' questions had been answered with more reassuring information. The cost of replacing lead pipes can also be seen as prohibitive.
- **Our co-creation** with customers has provided insight about how to most effectively engage on this issue including audience segmentation, tailored messages, and ideas for working with third parties.
- Our PCs, ODIs and investment choices research found that the majority of household customers (61%) supported our proposed approach, whilst 26% were willing to pay for a "do more" option with increased activity. Only 8% of customers wanted us to invest less to reduce lead in drinking water. Fairly similar results were obtained from non-household customers, with 54% supporting the proposed approach and 35% supporting the "do more" option. Only 10% of customers supported the "do less" option. Our research into asset health and resilience provides more depth of understanding, but in general supports this finding.



Other research:

- Joint CCWater/industry research showed that customers are not well informed or clear about ownership of supply pipes, but after information was shared customers were supportive of the transfer of ownership of the pipes to water companies. They felt companies were best placed to manage the risk and deal with any issues and to maximize the benefits through lead pipe removal and leakage benefit. This study showed that there is a range of willingness to pay to transfer ownership of between £7- £10/year on bills. More information is provided in annex 2.
- Lead task and finish group (Water health partnership for Wales) have been trialing various solutions and, in particular, a pilot in Conwy to offer free lead tests to registered childminders found that a high proportion of those contacted refused to have the free lead test. More information is set out in Annex 1.
- Severn Trent trials targeting two areas where there is a high density of lead pipes found that, even after identifying a positive lead detection, and having the disruption of the company replacing the communication pipe, very few customers chose to also replace their supply pipe even after the risks were explained. The reason given was a combination of the cost which can be significant (>£2000) depending on the location complexity, length of pipe and the disruption it would cause.

Overall, when asked, customers do support reducing lead in drinking water, but in reality the cost and disruption can deter people from replacing their pipe even if we have confirmed test results showing the presence of lead pipes.

# **Understanding current compliance**

### Levels of compliance fall to 98% at the tighter standard of 5ug/I

The chart below shows that compliance with the lead standard has significantly improved over the last 20 years and is now between 99.5% and 100% at the current 10ug/l standard. The tables and charts below show that compliance would have reduced to 98% at 5ug/l and 71.5% at 0ug/l.

DYFRD



### Lead compliance at various standards



Average since 2010	10µg/l	5µg/l	0μg/l
Compliance (reg samples) - Powys	99.7	98.2	66.5
Compliance (all samples) - Powys	tbc	tbc	tbc
Compliance (reg samples) - Wrexham	99.3	98.8	62.2
Compliance (all samples) - Wrexham	97.4	96.6	57.8
Wales (Reg Samples)	99.5	98.4	64.6
Wales (All samples) (based on data available only)	97.9	96.9	59.5

2016 performance	10µg/l	5µg/l	0μg/l
Compliance (reg samples) - Powys	100.0	98.0	73.7
Compliance (all samples) - Powys	N/A	N/A	N/A
Compliance (reg samples) - Wrexham	100.0	99.0	69.2
Compliance (all samples) - Wrexham	98.3	98.0	71.1
Wales (Reg Samples)	100.0	98.4	71.9
Wales (All samples) (based on data available only)	98.6	98.0	71.5

### Treatment solutions alone cannot improve compliance at these tighter levels

Since 2012 we have been assessing the need for, and where beneficial installing and optimising, phosphate treatment processes.



Lead compliance before dosing was introduced



14.00 Current dose rates 12.00 10.00 Lead ug/l 8.00 6.00 5%ile 4.00 2.00 Mean 0.00 95%ile Innou Boughton Plemstall Pendinas Oetob Legacy тw

Lead compliance following introduction of phosphate dosing

The charts above show the comparison between the results from the phosphate dosed works before dosing commenced (1998-2002), compared to the overall performance of the other three works (1998-2014). This demonstrates the increased risk at Llywn Onn, Boughton and Plemstall and illustrates why they were selected for phosphate dosing. The chart above shows the same statistics on the current phosphate dose rates, when comparing to the pre-phosphate dose figures **it is clear that the dosing has had a considerable impact**.

We now have phosphate dosing at all but one site and have established the optimal dosing regimen to offer the best protection in the network. This optimisation is important to ensure we are providing the maximum possible protection but not over dosing unnecessarily to prevent unnecessary cost or environmental impact.

In the example of Llywn Onn in the chart below, phosphate dose changes leading up to 1.1 mg P/l show continuing improvements to the mean and 95% ile lead results. However, a reduction in dose to 1.0 mg P/l results in a slight increase in lead levels and led to reverting back to 1.1 mg P/l which is showing a slight reduction in 95% ile lead. The dose rate of 1.1 mg/l appears to be the optimum level for this site and beyond this optimum point, increased dosing has no further impact on its performance.



Example of how we are optimising the dosing regime



So, while we are managing the risk well, our approach does not remove the lead but just manages the risk of it dissolving into the water. Even though we are optimising the phosphate dosing process, it shows that further dosing would not result in an improved compliance at the tap. We cannot achieve a standard of 5ug/l or lower through treatment solutions alone.

# Assuring the need for investment

We have taken multiple steps to challenge our view that there is a need for investment over and above the current level to deliver improved service (i.e. deliver water that meets a tighter lead standard). These include:

- Testing with stakeholders through the Wales Water Forum (February 2018 and planned for May 2018), which is made up of members from Welsh Government, local government, CCWater, DWI, NRW and our CCG.
- Testing with stakeholders at a co-creation workshop in Mid Wales (10<sup>th</sup> April 2018).
- Iterative testing through the CCG meetings.
- Bilateral meetings with DWI.
- Three lines of assurance and Board assurance.

To explore the opportunities around how we can support the ambition of the Welsh Government, we held a stakeholder workshop in Welshpool, Powys on 10 April 2018. We were keen to hear a broad range of views at the workshop so a number of different stakeholder organisations were invited to attend. The workshop included representatives from Welsh Government, Drinking Water Inspectorate (DWI), Powys County Council, Wrexham Borough Council, the WRAS (Water Regulations Advisory Scheme) and a representative from our Customer Challenge Group.

To set the scene, the DWI representative provided an oversight on the public health issues associated with lead and the role of the Lead Task and Finish group that is part of the Water Health Partnership for Wales in addressing these issues. We then provided information on the scale of the issues in our area. We also shared the results of our customer research showing the level of support to address the lead issues in Wales along with opportunities we have identified and how results could be measured. Workshop participants were asked to share their views and ideas on how the ideas could be implemented and to discuss any opportunities for collaborative working.

A wide ranging discussion took place amongst workshop attendees that included debates on:

• How to interpret the statement in the Water Strategy for Wales "...aim to keep exposure to lead as low as reasonably practicable...".



- Identifying lead pipes and utilisation of sampling results.
- How to raise the profile and awareness of the public health issues with lead.
- The costs associated with reducing lead in customer properties.
- How the legislative framework could help reduce the amount of lead still being used.

Workshop attendees supported our approach to work towards the tighter standard and were keen to work in partnership to not only have a better understanding of the situation across the region but also to maximise investment opportunities to the benefit of Wales.

The range of options on how to measure improvements over 2020-25 were discussed in depth with the consensus reached that the proposed measure to track "number of lead communication pipes replaced/relined" would be most appropriate - this is discussed in more detail in section E.

We have discussed with and incorporated feedback from our CCG about how we are talking to customers to understand their views and there are no outstanding challenges about our engagement approach. It is not yet possible to say they are supportive of the proposed solution because we are developing detailed costings and cost benefit analysis in order to establish the best package of interventions that demonstrate leadership and ambition but carefully balance the bill impact and affordability for customers.



# **D. Best option for customers**

Rounds of internal and external challenge and refinement are both challenging the need and resulting in consideration of broader options, while adding multiple benefits for our customers and the wider communities.

We have developed a robust approach to understand the size of the problem and have considered a broad range of solutions, with appropriate input and challenge from experts and customers. We have incorporated learning from other companies where they have replaced customer pipes during AMP6.

There are a number of challenges and uncertainties that we have had to consider as part of our strategy;

- we do not know precisely which company communication pipes or customer service pipes are made of lead;
- the rural nature of a lot of our region and the increased risk from long communication and service pipes;
- the timing of future legislative changes, regarding both water quality regulations and supply pipe ownership, and the aspirations of the Welsh Government and people;
- we cannot force customers to replace their pipes and there is some evidence that even after being informed of health risks customers choose not to replace their pipes; and
- customer attitudes around affordability

We have had to make judgements in our strategy to account for the above uncertainties which influence the pace at which we need to eradicate lead from our drinking water systems. The figure below sets the approach used to determine the best option for customers.

### Approach to identifying the best option for customers



The results of this process are detailed below.

# Identifying the location of lead hot spots

Data on the location and material company owned communication pipes and customer owned supply pipe largely non-existent as there has never been any statutory requirement to hold such data. We also do not fully understand which customers share supply pipes, and therefore to the degree to which resolution of a lead issue might require separation of supplies.

We have therefore assessed the most likely locations by analysing sample data (regulatory and non-regulatory) in combination with factors that indicate the presence of lead, specifically property age.

Properties built before 1970 are considered to have a high risk of having lead pipes. We have mapped the results geospatially alongside water sampling results to help us determine potential hot spots. The maps below



shows the sample results with failures over 5ug/l for the North Wales and Mid Wales areas. There appear to be three clusters or hot spots in rural Mid Wales, Wrexham town and Llangollen. This is where we will focus our attention in AMP7.



### Geospatial identification of potential lead hotspots

Although targeted action will be taken in the 'hot spot' areas we will also need to respond to isolated failures of the 5ug/l trigger point with localised sampling and removal of lead pipework where confirmed.

In Autumn 2018, the Welsh Housing Condition Survey is due to be published, which will contain a stock take of lead pipes and solder across the housing stock in Wales. This information will be hugely valuable in assisting with the targeting.

However to develop a long term strategy for the removal of lead pipe we need be more certain over the number and location of lead communication and customer service pipes. We have therefore included investment to survey and record pipe locations, material and configuration. This work will be of great use to understand the risks of liabilities of potential supply pipe adoption and aid leakage reduction and pressure management efforts.

Our assessment on the location of primary schools and nurseries where there is most likely to be lead has indicated that there are 30 such establishments in the hot spot area. We will prioritise proactive action at these sites protect the customers who are most vulnerable to lead exposure (young children).

# **Investment options**

We have considered a range of options so that we can address the lead issue at every opportunity, for example by reviewing and enhancing polies to accelerate the removal of lead pipework over the long term.

Our initial analysis of the broad range of options depicted in the figure below was used to shape our strategy. The size of the circles represent the relative cost of the options. We have sought a wide-ranging and balanced approach to move towards our goal of a lead free Mid Wales and North Wales at every opportunity.



### Range of options considered



The list of below confirms the range of solutions that we have included as part of the long term solution. In our analysis we considered both the long and short term benefits and the degree of certainty the benefits will be achieved to help us identify the best package of solutions.



### Summary of proposed AMP7 activities

Activity	AMP6 policy	AMP7 Proposal	AMP8 and beyond
Phosphate dosing to control plumbosolvency	Optimise dosing level	Continue to optimise	Eventuallyphaseout
Customer a dvice and communications	Broad a dvice and targeted communications to vulnerable groups	Target hotspot a reas and high risk customer groups with improved advice Promote knowledge of WaterSafe plumbers scheme	Continue AMP7
Increased sampling over and above regulatory sampling	None	Enhanced water quality survey in top three hot spot risk areas to identify lead risk faced by customers	Extension to other areas
Hotspotarea renewal	No proactive targeting or pipe replacement	Renewal of failing and high risk company and customer side pipework in top three areas prioritised (estimated 300 pipes) Adoption of renewal customer pipes	Extension to other areas AMP8: 1,500 AMP9: 3,000 AMP10: 5,000 AMP11: 10,000
Vulnerable groups (schools and nurseries)	Initials urvey of schools and nurseries in Wrexham Replacement of 5 comm pipes	Targeted survey and renewal of internal and external pipework at schools and nurseries (estimated 60 pipes)	Further role out to school and nurseries across mid and northeast Wales
Collaborative working	None	A multi-year infrastructure replacement housing scheme in Wrexham (estimated 100 pipes)	Continue a pproach
Mains renewal	Renew comm pipes as part of mains renewal programmes	Offer to replace customer service pipe in hot spot are then adopt supply pipe as company asset	Extend AMP7 policy to all a reas
Fix on fail policy	Renew comm pipe as if fails part of	Renewal of communication pipe and/or service pipes on failure of the 5µgl lead standard.	Continue AMP7 policy
Service pipe survey to confirm location of all lead pipes	None	Supply pipe survey, mapping and systemisation.	Use information gathered inform replacement and adoption strategies
Developinnovative piperenewaloptions	None	Facilitate trials of new techniques	Implement new techniques



# Cost

The cost of our lead strategy is summarised below. These cost are shown below and set out in Table WN6.

### Estimated lead strategy investment

Investment area	AMP6	AMP7
	Totex £k	Totex £k
Customer protection measures and water quality surveys		520
Proactive pipe replacement in hot spot areas and at schools (460 pipes)	44	1,490
Step up in opportunistic comm pipe replacement		400
Long term planning including supply pipe survey and mapping and research	-	520
Total	44	2,930

The overall pipe renewal costs are reflective of;

- the complex nature of customer pipework in schools
- the rural nature of one of the three hot spot areas where communication pipes and customer supply are long

We have used some benchmarking with AMP6 projects to ensure that these costs are appropriate.

# The next 5 years will be part of a long term plan

It is clear that we cannot solve this problem in the next 5 years and that part of the benefit of taking action now is to improve our data and understanding of both the scope of the problem and costs for solving it. This will enable us to better define the long term strategy and contribute to the debate on associated policies (such as supply pipe ownership).

As part of our cost benefit analysis we are trying to establish the full cost associated with the current solution of phosphate dosing. We will work with the DWI who have recently commissioned a research project with WRC (Water Research Council) to look in detail at the costs and benefits associated with treatment and the alternative options to achieving the tighter lead standard. We will engage fully to this research to develop the robustness of our understanding of the full costs and therefore develop the most cost beneficial solution for the long term resolution of this public health risk.


# **E.** Customer protection

#### **Performance commitments**

We have considered how best to monitor the outcomes associated with this investment. Primarily to hold ourselves to account but also to ensure we are quantifying the costs and benefits to further inform the Welsh Government's decision on the transfer of ownership of supply pipes.

We considered a wide range of potential options before selecting option 3, *number of lead issues resolved for highest risk customers based on >5ug/l standard*, after thorough consultation and challenge with customers, our Customer Challenge Group and other stakeholders.

Ref	PC option	Logic/why it's worth considering
1	Resolve lead issue (communication and supply pipe replace/reline up to property (not internal)) i dentified by free lead test, based on 5 ug/L limit (re 10ug/l legal standard)	Tracks resolution not just i dentification. Set threshold at 5ug/l to control the pace
2	Number of proactive lead tests and advice given to customers most at risk to lead exposure	Part of the case (and investment) is a bout getting better information to target and prioritise lead replacement. This PC would track the effort we are making to encourage customers to have free lead tests and simultaneously our a bility to identify and target customers most at risk.
3	Number of lead issues resolved for highest risk customers based on >5ug/l standard	Variant on option 1 to just target resolution for vulnerable customers
4	Number of complaints a bout lead replacement work (or customer s a tisfaction for lead replacement s chemes)	To reflect the fact that whilst this is a bout public health it is also hugely disruptive for customers and we want to work in a way that keeps them safe but also with a good experience.
5	% compliance at 5ug/l	To show progress towards the target of 0 and the 2030 proposed standard
6	% reduction in cost to solve	Tricky one, but the whole premise of the Wales case is that we have to change the economics to really drive the price down, so we will end up with an average unit cost to replace in the PR19 plan, this PC would then incentivise us to get it down.
7	Number of plumbers/ third parties active on the portal	To address the competition issue we need to find ways of putting plumbers in contact with customers and also introducing competition to keep the price down. We could complete a HD quote and post it on a plumber portal and then others could bid against us and on this site we should also post customer satisfaction scores.
8	Number of lead communication pipes replaced/relined	Activity all within our control. Allows comparison with rest of industry and historical levels (old June Return data line)

The feedback that we received from stakeholders is that whilst many of the options would provide interesting information, most of them may not be affected by the interventions that we are likely to take in the next 5 years. Specifically all measures that are based on random sampling at the tap may not be on properties where replacement is taking place in the next 5 years. The consensus was that a count of the number of lead



communication and supply pipes is both simple, easy to understand, would clearly show how much of the overall size of the problem we are tackling. Performance commitment reference A3 includes the detail of the proposed performance commitment.

#### **Board Assurance**

We designed a bespoke assurance framework to support the development of our plan to the highest quality. This Board-led framework builds upon our robust annual assurance processes. Each building block within our plan was assessed for risk to include the individual components, for example data, methodology, judgements and assumptions, against our likelihood factors (level of change, complexity, roles and responsibilities and subjectivity) and our impact factors (financial value, customer impact, competition, statutory / regulatory requirement). The level of risk determined the type and level of assurance required with significant or high risk building blocks allocated to an independent third line assurance provider depending on the particular expertise required. This framework was applied to our cost adjustment claims and have been assured through all three lines of assurance.

For this adjustment, third line assurance was undertaken by Black and Veatch using a two staged approach; 1) an initial review of our methodology and 2) a final review of our processes and data. Black and Veatch found that;

"An effective process was used to identify potential challenges justifying Cost Adjustment Claims (CACs) which met Ofwat criteria and were material. These were challenged internally, by customers and by other stakeholders. The proposed CACs were justified, supported by customers and had been robustly costed" and;

Costs had been assessed for each CAC at an appropriate level of detail, based on similar work carried out by the company or estimates provided by others, and were as robust as possible at the planning stage. A proper assessment of options had been carried out and steps taken to optimise work scope and cost" and;

"The CAC for **Reducing Lead in Wales** is justified due to Welsh Government's policy to reduce lead exposure as far as reasonable practicable, a legislative driver which is more ambitious and immediate in Wales than in England. This is a new obligation and the required standard is more rigorous than currently funded by customers. Customers have indicated support for lead reduction through the willingness to pay research, but further customer research is continuing. Ofwat's Totex model is unlikely to reflect the cost of this obligation. Costs have been estimated using unit costs for inspections and lead pipe replacements, together with increased sampling, quality modelling and communication with customers"

For more information on how we developed and applied our framework to our cost adjustment claims and the findings of the assurance, please read our 'Securing Trust, Confidence and Assurance' Chapter 10.



Annex 1: Lead in Water in Wales report by Water Health Partnership for Wales



# Lead in Water in Wales

Produced by the Water Health Partnership for Wales

# Lead Task and Finish Group

May 2016



#### 1. Purpose

A key theme of the Welsh Government Water Strategy for Wales is protecting and improving drinking water quality. It recognises the public health risk presented by lead and the strategy states:

"We must aim to keep exposure to lead as low as reasonably practicable therefore we will consider management options to reduce exposure to lead and related health effects"

The WG strategy recognises that phosphate resources are limited and that it "does not remove the long term risks from lead pipe and fittings" and that it has "consequences for sewage treatment and water pollution" and therefore WG will "work with DWI, water companies and others to investigate best practice and options for addressing the risk of lead leaching into water supplies"

The main purpose of this report is to provide Welsh Government with the latest information on the issue of lead in drinking water in Wales and initiatives undertaken by the Water Health Partnership for Wales (WHP) Lead Task and Finish Group. It is hoped this paper will inform any policy development on lead to meet the objectives for drinking water quality given in the Water Strategy for Wales.

For the purposes of this report the term drinking water encompasses both public and private water supplies unless otherwise stated.

#### 2. The Lead Task and Finish group

This group has been meeting on a regular basis since 2011 and consists of the following participants:

- o Ronnie Alexander Consumer Council for Water (CCW)
- Huw Brunt Public Health Wales (PHW)
- Simon Cottrill Conwy CBC
- Anthony Davies Monmouthshire CC
- Emma Hawkes Severn Trent Water (STW)
- Sian Hobson Caerphilly CC
- Susan Holt Dee Valley Water (DVW)
- Andrew Kibble Public Health England CRCE Wales (PHE CRCE Wales)
- Catherine Osborne Welsh Government (WG)
- Steve Simonds Conwy CBC
- Steve Tuckwell Water Regulations Advisory Scheme (WRAS)
- Oliver Twydell Dee Valley Water (DVW)
- Carol Weatherley Dwr Cymru Welsh Water (DCWW)
- Frank White Drinking Water Inspectorate (DWI)
- Naomi Willis Dwr Cymru Welsh Water (DCWW)

Agreed aims for the group are:

- Increase the stakeholder and the public's awareness of the risk of lead in drinking water from lead pipes and solder.
- Develop a consistent message about potential, associated health risks and how exposure can be reduced.
- Develop an algorithm for a multi-agency response to managing lead failures to ensure a consistent and appropriate approach is taken.
- Generate a map for Wales and Hereford indicating the probable location of lead pipes to identify potential hotspots



#### 3. Lead standard

The current standard for lead in the Water Supply (Water Quality) Regulations Wales 2010 and the Private Water Supply (Wales) Regulations 2010 is  $10 \mu g/l$ .

With rare exception source waters will have negligible levels of lead, the presence of lead in tap water is due to the corrosive effect of the water on household plumbing systems where lead is present in pipes or solder. The amount of lead that dissolves is dependent on a number of factors including pH, temperature, water hardness and the time the water has been in contact with the lead. Soft, acidic water is the most plumbosolvent and in Wales this water type is a significant proportion of the source waters used for public water supplies.

#### 4. Current status of lead in water in Wales

#### Public Water Supplies

- Water companies are responsible for the statutory monitoring programme to assess lead concentrations in water. This is measured at the customers' taps and addresses are randomly selected for monitoring from the customer database. The required annual frequency of sampling for lead is specified in the regulations. The tap sampled should be one that is normally used for drinking or cooking purposes and so is usually in the kitchen. The regulations require that a lead sample is taken from the first one litre of water drawn from the tap to monitor for potential accumulated lead. Customers' taps will be sampled at various times of the day so may or may not have been used by the customer before the sample is taken.
- The mains water supply area in Wales is divided between 3 water companies and the population served by each is given below.

Company	Population served
DCWW	3,102,860
STW	61,500
DVW	164,406

#### Population served with water by each water company in Wales

- Where water is assessed to be plumbosolvent, pH can be adjusted and phosphate dosed at the treatment works to reduce plumbosolvency. In Wales, this assessment of plumbosolvency has resulted in phosphate dosing of the majority (79%) of the water supplied. Phosphate acts by converting lead carbonate in the corrosion film to lead phosphate which is less soluble and forms a barrier layer. This is an equilibrium reaction so continuous phosphate dosing at approximately 1 mg/l is needed to maintain the barrier layer.
- Phosphate dosing has led to clear and measurable improvements in the level of lead in mains drinking water. For some DCWW supplies, lead failure rates (> 10 µg/l) were in the region of 18.7% in samples taken prior to phosphate dosing. The introduction of phosphate dosing has resulted in a greater than 99% overall compliance rate with the lead standard in Wales as measured by the statutory monitoring programme. Phosphate dosing plants were installed in a large number of WTWs in DCWW in 2002 but additional plants and further optimisations of the existing processes continued in sub sequent years.





(Courtesy of DWI: CIR 2015: Drinking Water 2014: Public water supplies in Wales) - Percentage of tests meeting the standard of 10  $\mu$ g/l for lead between 2005 and 2014 (includes statutory monitoring sample results only)

Water Companies take additional samples for lead analysis i.e. more than is required for statutory monitoring purposes, in areas where there have been previous lead failures, this is known as risk based monitoring. As might be expected, the rate of compliance with the standard is lower when these data, customer request and failure investigation sample data are included in performance charts. Localised conditions such as long customer lead supply pipes, mechanical disturbance or deteriorating lead pipes related to property age will affect lead levels. This indicates the limitations of a central conditioning process such as phosphate dosing to reduce plumbosolvency. Furthermore, lead solder is regularly responsible for a number of lead failures and it is known that phosphate is less effective at protecting the water supply against lead in lead solder.



Percentage of samples meeting the 10  $\mu$ g/l lead standard in Wales from 2011 to 2015 (includes statutory monitoring, risk based monitoring, customer request and investigatory sample data).



#### Private Water Supplies

There are approximately 14,396 private water supplies (PWS) in Wales of which approximately 2,154 are required to be risk assessed and monitored under Regulation 9 of the Private Water Supply Regulations 2010. In 2014, seven out of 413 samples (1.7%) taken for lead analysis from PWSs that fall under Regulation 9 failed to meet the standard. There were an additional 22 lead failures reported in Wales in 2014 for smaller PWS that are excluded from Regulation 9.

#### 5. Health Effects

Lead is a poison. The adverse health effects of lead exposure, whether through air, food, soil or drinking water, are well documented. It is a cumulative toxin which accumulates in the body especially the teeth and bones. A high level of exposure from, for example, ingestion of lead paint can cause nausea, vomiting, diarrhoea and kidney damage. While long-term exposure can affect reproduction and delay and stunt growth. There is also growing evidence of a link between lead exposure (as measured by the level of lead in blood) and increased blood pressure in adults.

The developing foetus and child are more sensitive to lead than adults because of increased gastrointestinal absorption (a young child will absorb about 40-50% of ingested lead, an adult 3-10%), the immaturity of the blood-brain barrier and behaviours such as hand to mouth, bottle feeding etc. Dietary deficiencies including deficiencies in iron and calcium can increase absorption.

The susceptibility of children to lead is especially important since low level exposure can have subtle but serious consequences. There is compelling evidence of the cognitive effects of childhood lead exposure and low level exposure to lead in early life can result in reduced IQ and behavioural problems. Such effects can be permanent and can result in reduced academic and economic achievement which can have substantial long-term societal and economic effects (2, 3). For example, it has been estimated that each loss of one IQ point can decrease average lifetime earnings by approximately US\$18,000 (based on 2008 currencies) and that in the USA the annual costs of childhood lead poisoning are around \$50 billion (4). A similar study in France estimated that IQ losses may exceed €20 billion per year (5). To put this into a wider context, there is strong evidence that average IQ scores is correlated to gross domestic product and therefore poverty (6). This correlation may be causal in both directions, that is poverty is related to low IQ but low IQ can also linked to poverty.

Although exposure to lead has declined significantly over the years, due in part to substantial improvements in drinking water quality. Current evidence suggests that there is no safe level of exposure to lead and that the effects mentioned above may occur a low levels of exposure. This coupled with the fact that lead will accumulate in the body and is also a probable human carcinogen means that every effort should be made to reduce exposure as low as reasonably practicable.



#### 6. Lead pipes

Until the 1970s, lead pipes were still being used in some areas in the UK to connect properties to the mains water. The responsibility for lead pipes on public water supplies is shown below:



Specific terms are used to demarcate the ownership of sections of pipework:

Communication pipe: owned by the water company

Supply pipe: owned by the property owner

Service pipe: the complete section of pipe from the mains to the property.



Typical water service connection showing supply pipe and location of stop valves (courtesy of WRAS)

In accordance with the regulations, where a lead failure occurs in a public building the water company is able to enforce the removal of the lead pipes. A public building is defined as a premises where the public has access to potable water. For private home owners, the water companies will recommend removal of the lead pipe and give advice to run the tap to flush lead from the system before use.



For private water supplies, the responsibility for pipework lies with the 'Relevant person' which is usually the property owner. A local authority can serve notice on the Relevant Person under the PWS (Wales) Regulations 2010 where the water is considered to be a potential danger to human health.

#### 7. Lead solder

Another source of lead in drinking water is the use of lead based solder to join together sections of copper pipe. Lead solder has been banned for use on drinking water systems since 1989 but is still sold for use on closed central heating systems. Lead solder is occasionally mistakenly or deliberately used by plumbers or householders on drinking water pipes contrary to the law. Mistakes are made as lead solder and lead free solder are visually indistinguis hable. In addition, there is inconsistency in the labelling of lead solder, many brands do not indicate on the product its restrictions in use or lead content.

Two sets of data held by DCWW indicate that lead solder continues to be a significant issue:

- Water fittings inspections: in DCWW all routine water fittings inspections of commercial and newly built private properties test for the use of lead solder where copper piping has been used. In 2015, out of the 302 premises where lead solder tests were done, lead solder was detected in 7 newly built properties.
- Investigations of lead failures: in 2015, 7 out of 42 (16%) lead failures were attributed to lead solder.

When lead solder is found to have been illegally used, water companies will enforce removal on the property owners and this includes both private home and public building owners. The expense associated with the removal of lead solder can be high requiring, in most cases, the stripping out of pipework. For a private homeowner in particular this may be a significant financial burden particularly as the use of lead solder is generally associated with the installation of a new kitchen.

#### 8. Response to lead failures

#### Public Water Supplies

A multiagency protocol has been produced by the Lead T&F group to deliver a coordinated response to lead failures for public water supplies. The aim of the algorithm was to:

- develop a standard approach to managing lead failures at consumer taps and ensure the early involvement of public health agencies in the response and communication with the public,
- ensure consistency in response and intervention across Wales,
- improve the health messages to the public, reduce the effects of anxiety and stress,
- where there are multiple failures, the algorithm will also help initiate multi-agency incident management teams to risk assess and manage any public health issues.

The algorithm has been developed based on experiences with notable lead failures such as the presence of lead pipes in a housing estate in North Wales.

#### Private water supplies

For private water supplies, the approach taken to lead failures will be site and local authority specific and take into account:

- the concentration detected;
- why the supply has failed;
- who is responsible for the supply; and
- who is consuming the supply.



This will inform the decision on the most appropriate course of action to take to deal with the failure. Local authorities will liaise with Public Health Wales to offer advice and to inform what level of action is appropriate.

#### 9. Lead Pipe Replacement

Water companies in Wales will typically perform lead pipe replacement under the following circumstances:

- Replacement of lead communication pipes on an opportunistic basis e.g. if revealed during repairs or meter installation.
- In the event of a lead failure, lead communication pipes are replaced if present.
- Lead communication pipes are replaced when a customer replaces their supply pipe and informs the water company.

#### **10.** Lead pipe occurrence

Despite considerable efforts to reduce and mitigate exposure to lead from drinking water, there are still a substantial number of homes in Wales that have lead pipes. A statistical review of service pipe material in DCWW supply zones was conducted to develop a model to predict the number of properties likely to have lead service pipes in Wales and Hereford. Two sources of data were used to develop the model:

- Valuation Office Agency (VOA) data: summarised the typical property type and age at post code level throughout Wales;
- Service pipe data: information on individual properties collated during opportunistic operational activities, for example, meter reading, investigating suspect leak, and stop tap replacement. This included property type and age, and service material.

The model gave an estimate of the probability of a particular pipe observed in a post code area. Using the available property type data in the VOA data set the model was able to calculate the probability of finding a lead pipe in any given post code. For the three possible outcomes the model predicted the following probabilities of finding lead pipes throughout Wales:

- Communication pipes (water company responsibility)-15%;
- Supply pipes (customer responsibility) 21%;
- Service pipes (both service and communication pipe) 25%.

A similar observation was made by Hayes *et al.* (2008) that approximately 30% of houses connected to water mains in the DCWW area are supplied by lead pipes  $^{(1)}$ .

The model was also able to provide insight into the type of properties likely to be supplied by a lead service pipe. It was predicted that terraced or semi-detached properties built prior to 1939 had a higher probability of being supplied by a lead service pipe. These findings mirrored those of observations made from a review of 2004 and 2008 Living in Wales Surveys, which indicated that pre 1940 houses are more likely to have lead pipe work (S. Jones, pers. comm.).

#### 11. Consumer awareness and response

• It is the typical experience of water companies that the public are generally unaware that lead pipes are still a risk to drinking water quality. This could, in part, be the result of the high levels of compliance with the lead standard achieved by the water companies over the past decade. However, consumers who are made aware of the issue following a lead failure or the detection of lead solder at their property can become quite anxious about potential health effects particularly when children live in the property.



- Lead failures, in private landlord or social housing properties in particular, have the potential to escalate and become quite an emotive issue with tenants who have entrusted the safety and wholesomeness of their water supply to their landlord.
- Some consumers are unable to afford the cost of replacing their lead pipe which can cost several hundred pounds. Water companies will test if flushing the tap reduces the lead to an acceptable level and then advise consumers with lead pipes to run their tap before use to flush through the lead. Sample results verify that this intervention is almost always sufficient to reduce lead to an acceptable level but relies on the consumer to maintain flushing.

#### 12. Lead Task and Finish Group Initiatives

#### **Consumer Communication**

One of the main objectives of the T&F group was to raise consumer awareness of the risk associated with lead pipes and solder. To this end the following has been carried out:

- Water Health Partnership Lead Factsheet was produced for consumers and is available on organisations websites
- Developed a Lead solder poster to raise awareness
- Participation in the WHO Lead Poisoning Prevention week on 25 31 October 2015. The main purpose of this week was to raise awareness to eliminate lead paint but WHO were keen to include a campaign from the UK on the issue of lead pipes. In this week the T&F group:
  - Held a social media campaign raising awareness of lead pipes and the lead testing service offered by water companies
  - Distributed the lead solder poster to DIY stores
  - The Water Regulations Advisory Scheme (WRAS) prepared a leaflet for the national Home Builders Federation (HBF) to alert its members to the problems arising from the illegal use of leaded solder in domestic plumbing.
  - The water industry's registration scheme for competent plumbers, WaterSafe, prepared a lead news release for use by water suppliers with local news media and social media, and directly contacted national media and trade journals.

#### Vulnerable groups

#### Childminders survey

A scheme to offer childminders and day care facilities in Wales a free lead test would target a substantial number of those most vulnerable to the effects of lead. A pilot study was conducted in the Conwy CBC area to test the viability of such a scheme. As there is no legislation requiring child care facilities to test for lead in water, participation in this pilot trial was on a voluntary basis.

Conwy CBC wrote to 30 child care facilities offering them the free lead test through DCWW. Initially the response was very poor and required further phone calls to the facilities by Conwy CBC to encourage them to take up of the offer. However, 13 facilities still declined to take part for reasons such as:

"Considered having a test. However, as it is not mandatory would not be going ahead as already governed by so many rules and regulations"

"The upkeep of the property to maintain the required standards is already causing a significant financial strain and the potential for any further costs would be unmanageable"

All water tested at these premises passed the lead standard. A poster was produced on the pilot trial at the CIEH Public Health Sustaining Communities Conference on 20 - 21 April 2015 to promote the initiative with other local authorities.



#### Schools survey

In 2012, Caerphilly CC and Conwy CBC undertook sampling at primary schools in their areas to test for lead. DCWW supported this by analysing the samples collected. All samples taken passed the lead standard but some contained traces of lead. A number of years ago DCWW replaced any lead communication pipes that supplied schools and so lead detections would be associated with lead pipework within the school premises. This initiative has been promoted in a number of meetings with local authorities to encourage participation.

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# Lead in drinking water



There are strict regulations<sup>(1)</sup> governing the maximum amount of lead allowed in drinking water. The existing limit for lead in drinking water in the UK is 10 microgrammes per litre (that is 10 parts per billion). Water leaving water treatment works will contain little, if any lead.

Where lead is found in tap water, it usually comes from old lead pipework connecting the property to the water supply or in the internal plumbing of the property. Up to the 1970s, lead was a widely used material for making water pipes and tanks and so can still be found in properties built before 1970 that have not been fully modernised.

Lead may also be present in water if lead solder has been used for jointing copper pipes in internal plumbing. The use of lead solder on drinking water plumbing has been illegal since 1988. If it is found that lead solder has been used illegally the water company will require the person responsible to remove all affected pipework which can be extremely expensive.

We hope that the following information will answer some of the questions you may have about lead and water.

#### Who is responsible for the pipework to my house?

If your water is supplied by a water company a small diameter service pipe will connect your home to the water main in the road. The section of the service pipe from the water main to the boundary of your property is known as the communication pipe and is the responsibility of the water company

There will be a stop top on this pipe in a chamber near the boundary of your property, if you have a water meter this may also be in this chamber.

The section of pipework that leads from this stop top into your property is known as the supply pipe and is the responsibility of the property owner. If you rent your home the supply pipe and internal plumbing are the landlord's responsibility (unless your rental agreement states differently).

For some older properties, especially terraced houses, a common supply pipe provides water to several houses from a single connection to the water main (as shown in the picture below). In this case the property owners have joint responsibility for the supply pipe.

For properties served by a private water supply the property owner is usually responsible for all the pipework from the supply point<sup>(2)</sup> to the top.



The Water Sounds (Matter Country) Regulators 2000. The supply point is ather at the source or a Sorehold or if you don't near the source, the point where it is append that resumptibility for the population is common from the camer of the source to the property name



#### How do I know if I've got lead pipes in my house?

If your house was built before 1970 and it has not been modernised since it is possible that it may have lead pipes. If you are unsure, you can make a few simple checks:

- Find where the water pipe runs into your property; this is normally at the internal stop tap which is usually under the kitchen sink.
- Check along as much of its length as possible.
  - Unpainted lead pipes are dull grey in colour and soft.
- If you gently scrape the surface with a knife, you will see a shiny, silver, coloured metal beneath.
- Lead pipes often have swallen joints.

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But the only way to be absolutely sure that lead levels in your water are eliminated completely is to replace any lead pipes in your property with copper or plastic pipes that are approved for use with drinking water and by making sure that you or your plumber uses lead-free solder. If you decide to replace the lead pipework to your property, please contact your water company who will ensure that the section of the service pipe that is their responsibility (communication pipe) is replaced if it is found to be lead.

How do I know if

in my house?

test on the solder.

out a test.

I've got lead solder

between lead solder and non-

If you are concerned you can

contact your water company and

Prevention is best, always use a

reputable plumber and check that

they are using non-leaded solder

on your water system.

they will visit your property and carry

It is impossible to tell the difference

leaded solder on pipework joints just

be done is to carry out a specialised

by looking at it. The only way it can



#### What can I do to reduce levels of lead in my tap water?

If you are concerned about the lead pipes or lead solder, you may wish to have your water tested for lead content. Please contact your water company if you have a mains water supply, or your local authority if you have a private water supply. Some water companies, for example Dwr Cymru Welsh Water, offer free lead tests to customers on request.

If you do find lead pipes in your property it is possible to reduce lead levels in the short term by following some simple precoutions before using the water for drinking or cooking.

- Don't drink or cook with water that has been standing in pipes for a few hours such as overnight ar if the house has been empty for the day. Run water from the cold top used for drinking water until a washingup bawlful of water is collected. This should be enough to clear around 40m of pipe so if your house is more than 40m from the street then you may need to run the water for a little longer. This water need not be wasted, for example you could collect it for watering your plants.
- Always use water from the cold water tap for drinking water or cooking. Hat water dissolves lead more quickly than cold water and is therefore more likely to contain greater amounts of lead. If hat water is needed for drinking water or cooking, water should be drawn from the cold water tap and heated. Use only thoroughly flushed water from the cold water tap for drinking and when making baby milk formula.



#### What are the health effects?

The health effects associated with exposure to lead are well known and understood. Lead is a harmful taxic heavy metal; its taxicity most frequently results from ingestion ar inhalation. Exposures to high levels of lead can have adverse effects on human health.

Short-term exposures to high levels of lead can cause a metallic taste in the mouth and symptoms of abdominal pain, sickness, loss of appetite, low blood pressure, kidney and liver damage.

Longer-term exposures can cause headaches, irritability, tiredness, muscle fatigue and can damage a child's developing brain. Pregnant women and young children are more sensitive to lead than adults.

Lead is a cumulative toxin meaning that concentrations of lead within the body, especially the teeth and bones, can build up over time. It is therefore sensible to ensure that exposures to lead are kept to a minimum.

If you are concerned about the health impacts associated with lead exposure and would like further advice, residents in Wales should contact your local Public Health Wales Health Protection Team.

Contact details can be found on the following website: publichealthwales.wales.nhs.uk. Residents in Hereford and the Chester area should contact: gav.uk/government/organisations/ public-health-england.

# What are water companies doing?

Water companies have spent considerable sums of money to install additional treatment at water treatment works to help minimise the amount of lead dissolving into water from lead pipes at customers' properties.

- They take thousands of samples of water at customers' taps to test for lead. Only a few fail the lead standard due to the condition or length of the lead pipe or the presence of lead solder.
- They are working with health professionals and local authorities to raise awareness of lead pipes with their customers.
- They offer lead testing of tap water to customers on request.

#### Where can I get more advice about lead?

Further information about lead can be found by:

- Visiting the website of your water supplier.
- Contacting your water supplier or local authority.
- Visiting the Drinking Water Inspectorate website at dwi.gov.uk.
- Visiting the Water Regulations Advisory Scheme website wras.co.uk for advice on the use of acceptable solders and fluxes and approved pipe materials.
- Visiting Public Health Wales publichealthwales.wales.nhs.uk.
- Residents in Hereford and the Chester area should contact: gov.uk/government/organisations/ public-health-england.
- Also, have a look at the publication from Water UK called 'Looking After Water in Your Home' which can be found at this link: water.org.vk/ looking\_after water in\_your\_home.





Annex 2: Joint research on customer views on supply pipe ownership in Wales



# Piping Up: Customer views on the transfer of water supply pipe ownership in Wales





# Foreword

#### Piping Up – Consumers' views on water supply pipe transfer in Wales

There is some considerable confusion over water supply pipe ownership and unfortunately a lot of home and business owners only discover the extent of their responsibility for repairs when something goes wrong.

Water companies have provided discretionary help to customers but the extent of this help varies from company to company. For example, in Wales, some companies offer free leak repairs whilst others have removed that offering in recent years, and many customers have now opted to take out insurance which covers their water supply pipe against leaks and damage. However, the split of water pipe ownership and responsibilities between water companies and property owners has meant that problems related to older private supply pipes and those that pass through third party land have not been addressed in any systematic way.

Shared water supply pipe ownership is another grey area where there is confusion over maintenance responsibilities and allocation of costs between property owners when problems arise and repair or replacement is required. The formal transfer of ownership of these pipes from the property owner to the local water company could be one way of achieving a more coherent approach to manage water quality and leakage issues associated with the condition of these pipes.

Although the formal transfer of supply pipe ownership is not being pursued in England, the Welsh Government made a commitment in its Water Strategy for Wales to further consider the potential for transfer. The Consumer Council for Water is therefore pleased to have been able to undertake this collaborative research with Dŵr Cymru, Dee Valley Water/Severn Trent (the companies operating in Wales) to explore these issues and their implications with customers.

Customers' views will clearly be an important factor in the next stages of Welsh Government's policy development. Other factors will also need to be taken into account. Should the transfer of ownership go ahead, an important issue will be the high expectations of property owners for the service provided by water companies when there is a problem with their water supply pipe. If things are to stay as they are, consideration should be given to alternative ways of raising customer awareness of their responsibilities for water supply pipes and alternative strategies for tackling the underlying problems that Welsh Government want to address.

Mike Keil, Head of Policy and Research Consumer Council for Water

Mike Davis, Director of Strategy and Regulation Dŵr Cymru Welsh Water

Shane Anderson, Head of Economic Regulation Severn Trent and Dee Valley Water

November 2017

In August 2015, the Welsh Government published its Water Strategy for Wales, setting out its vision, priorities and the principles which would continue to ensure a thriving water environment to support people, communities and businesses in Wales. This included a commitment to explore the costs and benefits of transferring ownership of private water supply pipes which are pipes which cross privately owned land within the boundary of homes and businesses from land/property owners to water companies in Wales. These are the section of water pipes which cross privately owned land within the boundary of the property in order to supply the property. The policy would see the ownership of these pipes transferred from the property owner (whether a homeowner or a business) to the relevant water company in Wales.

A discussion paper followed in November 2016, in which the Welsh Government set out its thinking on a potential transfer in more detail.

The Consumer Council for Water (CCWater) is the statutory body which represents the interests and views of water and sewerage customers and consumers in England and in Wales. In its response to the discussion paper, CCWater highlighted the importance of taking customers' views into account when making the final policy decision on this matter.

Therefore, this collaborative research was developed by CCWater, Dŵr Cymru Welsh Water (DCWW), Dee Valley Water (DVW) and Severn Trent (SVT)<sup>7</sup> with the overarching aim to identify and explore the views of customers who would be potentially affected by this policy change.

The views of respondents reported here are based on the best information on costs and transfer options available at the time of the research. Due to the constraints of the research process, only partial information on the implications of the transfer could be shared with customers. Acceptability results may be different should different or additional information be provided to customers particularly on costs and transfer options. The results of this research should be accorded appropriate caution by policymakers given these limitations.

Throughout this executive summary whenever a finding is described as 'significant' it is referring to it being statistically significant.

#### Key findings and observations

The research consisted of a qualitative (focus group) and quantitative (survey) element. Some of the key findings are as follows, with the statistics drawn from the quantitative results.

- 1. Spontaneous awareness of current supply pipe ownership and responsibilities was generally high (70%+) for households (HHs) and non-households (NHHs)
  - Except for the underground pipe within the property boundary where awareness that the owner is responsible falls to around 50%.
- 2. Around seven inten respondents (75% of NHHs and 63% of HHs) found the current water supply pipe ownership arrangement acceptable once their full responsibilities were explained.
- **3.** Before being informed of the implications of the policy, nearly nine out often respondents found a proposed supply pipe transfer acceptable in principle.
- 4. When informed of some of the wider implications of a transfer, a cceptability fell to just under eight in ten.8
- 5. When presented with three options for the extent of the supply pipes to be transferred, the most popular option was the transfer of pipes up to the internal stop tap with just over half of all customers

<sup>&</sup>lt;sup>7</sup> At the time of this research in August 2017, three companies operated in Wales, Dŵr Cymru, Dee Valley and Severn Trent. Dee Valley was taken over by Severn Trent earlier in 2017 but still operated under a separate license when the research took place.

<sup>&</sup>lt;sup>8</sup> In order not to overload and confuse participants, only a few of the most salient implications of a transfer were presented to them, such as the potential effect on water quality and co-ordination of repairs, and the possibility that water companies would need stronger rights to manage and repair assets on private land.

favouring this.

- 6. When asked about the standard of service that they would expect from water companies when repairing or replacing supply pipes on their property, customers, particularly NHHs, said that they would expect high levels of service from water companies. For example:
  - In a perceived emergency, around half of all customers would expect their call to the water company to be answered within a minute and 50% of NHHs and 38% of HHs would expect a visit within an hour of contact.
    - More than eight out of ten NHHs would expect their issue to be resolved within 24 hours of the company arriving on site in both an emergency and non-emergency.
    - Following a repair, around half of all customers would expect their property/landscaping to be restored to its former state so they are happy with it.
- When asked how much they would be willing to have added to their annual bill to pay for the costs associated with the water company owning and maintaining additional pipework, the average figure is £9.54 for HHs and 3.6% for NHHs. This is specifically for a transfer up to the internal stop tap.
  - Note that customers were not asked about other potential service improvements that would also have implications for customer bills. The amount they were willing to pay would likely be lower if considered as part of a package of service improvements. Note also that people who had supply pipe insurance tended to say that they were willing to pay an amount similar to the value of the insurance premium that they would save.
- 8. Around seven in ten respondents were not willing to pay more to secure the highest level of service of the options with which they were presented.
- 9. For HHs, acceptability once informed about some of the implications of the transfer and the costs involved was 81% (compared to 63% acceptability of the current arrangements).
  - Acceptability was consistently lower amongst older respondents, lower socio-economic groups (SEGs)<sup>9</sup> and HH tenants (compared to property owners).
- 10. For NHHs, acceptability once informed about some of the implications of transfer and the costs involved was 75% the same as for acceptability of current ownership arrangements.
- 11. When asked about the perceived benefits of the transfer, customers do not automatically recognise benefits such as helping address water quality problems and facilitating the gradual replacement of lead supply pipes.

#### Wider recommendations

The next stages of consultation for a potential transfer of supply pipe ownership should bear in mind that any subsequent changes to the costs, transfer scenarios and service levels from what was shown to participants in this research could lead to changes in acceptability levels.

Leaving aside the issue of the potential transfer of supply pipe ownership to water companies, careful consideration should be given to the wider implications of these findings, which lead to the following recommendations:

• There remains a need to educate customers about their responsibilities under the current arrangements. The current ownership arrangements are acceptable to most, but a significant minority (46% of HHs and 44% of NHHs) did not know the full extent of their responsibility for the maintenance costs of the part of the pipework they currently own. This leaves them vulnerable to a situation where they

<sup>&</sup>lt;sup>9</sup> Socio-economic group is a way of classifying participants in terms of the occupation of the main income earner in the household A = Higher managerial/professional, B = Intermediate managerial/professional, C1 = Supervisory/junior managerial/professional, C2 = Skilled manual worker, D = Semi and unskilled manual worker E = Student/Unemployed



only find out that they are responsible for both the repair and the cost when there is a problem. (Note that this applies to owner-occupiers and landlords but not tenants). This may leave certain customers, who would otherwise have bought insurance, liable for considerable unexpected costs.

- The willingness to pay for a transfer would ideally be tested in the context of other service improvements as part of water company business planning processes to find out how customers prioritise it within the bigger picture. The maximum willingness to pay of c.£9 for HHs and 3.6% for NHHs is specifically for transfer of pipework up to the property stop tap. This level of willingness to pay would cover the additional costs associated with water company ownership based on the initial estimates of DCWW and SVT/DVW. However, willingness to pay would likely have been lower had the bill impact been considered alongside bill increases for other service improvements that customers would like to see.
- Ensuring that customers are aware that water companies own and are responsible for water supply pipes would be essential after any transfer to avoid prolonged confusion over new responsibilities. For most customers, it is logical that water companies should own water supply pipes.
- It would be very important to be clear and transparent about the levels of service that customers could realistically expect should a transfer go ahead. Customers, especially NHHs, have high expectations of the service levels associated with water company repair of supply pipes on their property (e.g. full reinstatements vs partial reinstatements).
- Should the transfer go ahead, clarity around what rights water companies would have to access property is essential particularly for the NHH audience. There are fears, particularly from NHHs, that the water company could do whatever it wanted, whenever it wanted, on their property.

#### Methodology and sample<sup>10</sup>

An initial qualitative stage was conducted in various locations in North and South Wales with 9 focus groups between 13th June and the 29th June across the three water company areas.



In addition, ten face-to-face depth interviews with vulnerable customers were carried out along with four faceto-face depth interviews with large non-household customers (NHH) in the Dŵr Cymru (DCWW) area, and four

<sup>&</sup>lt;sup>10</sup> Terminology: HH = Household customers; NHH = Non-household customers; LL = Landlords

face-to-face depth interviews with small or medium NHH customers equally in the Dee Valley (DVW)/Severn Trent (SVT) (Wales) area.

In total, 1,071 surveys were conducted between 28th July and the 11th August 2017 across the companies using a combination of online panel, Computer Aided Personal Interviewing and Computer Assisted Telephone Interviewing.

	Approximate sampling tolerances applicable to percentages at or near these levels		
Base size	10% or 90%	30% or 70%	50%
1,071 (full sample)	±1.75	±2.67	±2.91
906 (DCWW)	±1.91	±2.92	±3.18
71 (SVT)	±6.97	±10.64	±11.61
94 (DVW)	±6.05	±9.24	±10.08
165 (SVT/DVW)	±4.56	±6.96	±7.6
43 (Landlords)	±8.96	±13.68	±14.93
300 (Tenants)	±3.37	±5.15	±5.62

The sample is representative of the demographics for the customer bases of DCWW and SVT/DVW, based on regional census data from the Office of National Statistics. The findings represent the views of those who were willing to take part in the research; there is potential for the findings to have been different had the views of those who were unwilling to take part in the research been included.

It would be helpful for companies to further consider additional research targeted at non-respondents to understand the views of their whole customer base and whether any additional insight can be drawn. This is particularly important where non-responders account for a significant portion of the survey base.

#### Findings

#### Awareness of supply pipe ownership

The quantitative research found that spontaneous awareness of current supply pipe ownership and responsibilities (Showcard 1) was generally high (70%+) for HHs and NHHs. However, this falls to just over half who correctly identified Pipe C as being the property owner's responsibility.

#### Household customers

% Awareness of responsibility for each section of pipe by water company		SVT/DVW
The pipe under pavement	88%	81%
The pipe outside and up to the property boundary	86%	78%
The pipe underground within the property boundary	54%	53%
The pipe inside property up to the stop tap	75%	66%

#### Non-household customers

% Awareness of responsibility for each section of pipe by water company	DCWW	SVT/DVW
The pipe under pavement	83%	86%
The pipe outside and up to the property boundary	79%	83%
The pipe underground within the property boundary	52%	62%
The pipe inside property up to the stop tap	71%	83%

#### Acceptability of current ownership arrangements

Around seven in ten respondents found the current ownership arrangements to be acceptable. Amongst households, older participants and metered participants were more likely to find the current arrangement acceptable.

	% acceptable	DCWW	SVT/DVW
HH customers	68%	69%	66%
NHH customers	75%	77%	73%

#### Current supply pipe repair policies

At the time of this research, DCWW, SVT and DVW had quite different policies for repairing leaks on supply pipes which customers are responsible for; DCWW offers a free repair at least once (under certain conditions), DVW offers to meet some but not all repair costs and SVT does not meet any costs unless the customer is in financial hardship. Customers were asked for their views on the acceptability of the company policy which was relevant to them. The results are shown below:

% acceptable	DCWW	SVT	DVW
HH customers	80%	78%	55%
NHH customers	74%	62%	72%

In relation to the finding that current supply pipe arrangements are largely acceptable there are two points worthy of note. Firstly, there was a lack of awareness about responsibility for the underground supply pipe within the property boundary (46% of HHs and 44% of NHHs did not identify that they were responsible) and those who were unaware were less likely to find the situation acceptable. Secondly, participants had not yet seen any information on any potential transfer of ownership/responsibility, so they were not judging the 'acceptablity' of the arrangements in relation to any alternative.

#### The transfer in principle: customers' initial views (uninformed)

Nearly nine in ten found the idea of transfer acceptable in principle. Less than one in ten found it unacceptable (5% of HH; 9% of NHH). Similarly, just less than one in ten (7%) HH and (9%) NHH customers weren't sure.

%	НН	NHH
acceptable	customers	customers
Overall	89%	86%
DCWW	90%	88%
SVT/DVW	80%	82%

= Sig diff to SVT/DVW



The main reasons for finding this acceptable in principle were that it would clear up any uncertainty about responsibility and because water companies are perceived to know more about these pipes than anyone else.

#### The transfer in principle: Customers' initial views of transfer scenarios

Participants were shown the three potential transfer scenarios<sup>11</sup> below and a no change scenario without any costs.



Scenario	% HH ranking 1st	% NHH ranking 1st
	DCWW (64%)	DCWW (47%)
Scenario 3 – transfer shared pipework and all	SVT (61%)	SVT (58%)
pipework up to the stop-tapinside the property	DVW (61%)	DVW (48%)

Scenario 3 was particularly preferred by those living in detached (66%), semi-detached (65%) and terraced (64%) housing (cf. flats 51%), property owners (67% cf. 56% tenants) and those with supply pipe insurance (67% cf. 59%).

The 'no change' scenario had most appeal amongst the older age groups, those living in flats or bungalows and those of SEGs D and E. There is a degree of overlap with these demographics e.g. older people are also more likely to live in bungalows. Should the transfer go ahead, customers in these demographics may have more concerns and be more sensitive to this change than others.

#### Informed views on acceptability of transfer

Acceptability fell significantly once participants had been made aware of some of the wider impacts <sup>12</sup> of a transfer, from 89% to 85% for HHs and from 86% to 80% for NHHs. This is still a large majority who find the idea of a transfer acceptable.

% acceptable	HH customers	NHH customers
Overall	85%	80%
DCWW	86%	84%
SVT/DVW	80%	74%

The main reasons for the fall in support were a view that customers shouldn't have to 'pay for other customers' faulty pipes' and uncertainty around costs.

<sup>&</sup>lt;sup>11</sup> Scenario 1: transfer shared water supply pipes only; Scenario 2: transfer all pipework up to the outside wall of the property; Scenario 3 transfer all pipework up to the internal stop-tap.

Blue = water company responsibility, yellow = property owner responsibility and participants were also given an option for 'no change' to be their preference

<sup>&</sup>lt;sup>12</sup> Examples include the potential effect on water quality and co-ordination of repairs, and the possibility that water companies would need stronger rights to manage and repair assets on private land.



#### Willingness to pay estimates: Household customers

As noted above, when considering the level of willingness to pay, it should be borne in mind that:

- This value was derived in isolation, and would likely have been lower if customers were asked about their willingness to pay for other service improvements at the same time.
- The qualitative research found that the value of the willingness to pay stated by customers who had insurance covering supply pipe repairs was influenced by the value of the premiums.

Overall, the average value that HH customers were willing to pay for Scenario 3 (a transfer of pipework up to the internal stop tap) was £9.54 per year.

DCWW customers were willing to pay up to £9.72 and SVT/DVW customers £8.57 per year (not significantly different). Household willingness to pay falls to £5.32 for Scenario 2 and £2.34 for Scenario 1. Willingness to pay for Scenario 3 is shown below:

Current HH Bill Payers	Average WtP estimate	Range <sup>13</sup>
Whole sample	£9.54	(£8.92, £10.17)
Dŵr Cymru Welsh Water	£9.72	(£9.07, £10.38)
Dee Valley Water & Severn Trent	£8.57	(£6.68, £10.46)

- 16% of HHs were not willing to pay anything on top of their current bills towards the cost of transfer. These are significantly more likely to be:
- Low incomes of less than £20,000 a year
- Living in bungalows (correlates with older age groups who are most likely to find the current arrangement acceptable)
- Tenants

#### Willingness to pay estimates: NHH customers

Overall, the average value that NHH customers were willing to pay was +3.6%<sup>14</sup> per year on top of their current annual bill. DCWW are willing to pay +3.1% per year cf. NHH customers of DVW/SVT +4.2% per year.

Current NHH Bill Payers	Average WtP estimate	95% confidence interval
Whole sample	+3.6%	(3%, 4.1%)
Dŵr Cymru Welsh Water	+3.1%	(2.4%, 3.6%)
Dee Valley Water & Severn Trent	+4.2%	(3.4%, 5.2%)

#### Service level expectations after transfer

Customers were asked about the level of service that they would expect of the water company when responding to a situation in which the supply pipe on the customer's property was in need of repair. In both perceived supply

<sup>&</sup>lt;sup>13</sup> The range refers to the confidence interval meaning that we can be 95% certain that the true WtP value should we ask the whole population would lie between these two values.

<sup>&</sup>lt;sup>14</sup> A percentage was given rather than an amount in pounds for NHH customers as their bills will vary greatly between business to business so it was simpler for them to envisage a percentage increase rather than a monetary amount.

pipe emergencies<sup>15</sup> and non-emergencies, NHH customers generally have higher service level expectations than HH customers.

In a perceived emergency:

- Half of all NHHs (50%) compared to nearly two in five HHs (38%) would expect their company to visit within an hour of contact.
- A third of NHHs (32%) would expect their initial call to report this to be answered in 30 seconds compared to 16% of HHs.

The views of HHs and NHHs on the time taken to resolve were more similar, with 40% of HHs and 46% of NHHs expecting resolution within 4 hours of the company arriving on site.

After an emergency repair, 56% of HHs and 63% of NHHs would expect all landscaping to be restored to its former state and to a standard they are happy with.

In a non-emergency situation, both HH and NHH customers were prepared to wait a little longer for a visit:

	Household	Non-household
expect a visit within an hour	11%	21%
expect a visit within 2-3 hours	24%	31%

However, they have similar expectations for speed of telephone in a non-emergency as for an emergency.

Once the company is on site, 20% of NHHs and 14% of HHs expect a non-emergency resolution within 4 hours, and 57% of NHHs and 52% of HHs expect all landscaping to be returned to its former state following a non-emergency repair.

Should a transfer take place, SVT customers have higher service level expectations in both an emergency and non-emergency than DVW and DCWW customers.

#### Willingness to pay an additional amount for top levels of service

Most customers – at least seven in ten (75% of HHs and 72% of NHHs) – were not willing to pay more in addition to what they had already offered for their preferred transfer scenario to guarantee top levels of service (with various service levels being shown within the survey).

Among the 25% of HH respondents who were willing to pay more, the mean average additional amount they would be willing to pay was £8.69. Notably, 69% of socio-economic groups with higher household incomes (SEG groups AB) were in this group which were willing to pay more, indicating that the highest levels of service are particularly important for them.

Willingness to pay an additional amount rose to £18.55 amongst the 28% of NHH customers who were willing to pay more.

#### Preferred scenario once informed of estimated annual bill impacts

Respondents were shown the actual estimated annual bill impact for each scenario, and then asked again which scenario they would prefer. The preference for Scenario 3 was unchanged across both HH (64% before cost reveal cf. 61% following cost reveal) and NHH audiences (50% before cost reveal cf. 47% following cost reveal).

<sup>&</sup>lt;sup>15</sup> Respondents were not given a definition of what would count as an emergency as their initial reaction to a supply pipe issue will be guided by their immediate perception of the situation



Scenario	% HH ranking 1st	% NHH ranking 1st
Scenario 3 – transfer shared pipework and all	DCWW (61%)	DCWW (39%)
pipework up to the stop-tap inside the property	SVT (65%)	SVT (58%)
	DVW (59%)	DVW (55%)
	SVT/DVW (61%)	SVT/DVW (57%)

Scenario 3 was particularly preferred amongst higher SEGs, those living in detached and semi-detached housing particularly, property owners and those with water supply pipe insurance. Older age-groups and lower SEGs were more likely to prefer no change.

#### Final informed acceptability for transfer in principle

Customers were asked one final time, in the light of all the information provided, whether they considered the transfer of supply pipes from property owners to water companies to be acceptable in principle. Just over four-fifths (81%) of HH customers indicated that a transfer was acceptable as did three-quarters (75%) of NHHs.

% acceptable	DCWW	SVT/DVW
нн	82%	78%
NHH	78%	70%

Acceptability was particularly concentrated amongst higher SEGs, those in detached or semi-detached dwellings, property owners and those with water supply pipe insurance.

#### How acceptability varies with amount of information provided

Acceptability of the transfer in principle was highest when respondents were aware of current ownership responsibilities but uninformed about the wider impacts that a transfer could have. Whilst acceptability falls as more information is presented<sup>16</sup>, a transfer is still appealing to the majority as shown overleaf for HH and NHH respondents:

<sup>&</sup>lt;sup>16</sup> Qualitative research showed that the additional information raised concerns with some customers and this was the reason for the fallin acceptability. These concerns included the standard of repair offered and how would the property be left along with concerns over whether water companies could come and build in their gardens/on their land as well as whether it may limit what they can build on their own land.



#### Views on alternatives to statutory transfer of ownership to water companies

Finally, customers were asked whether they would prefer a transfer of ownership compared to other measures that could achieve some of the same benefits while retaining the current ownership arrangements. For example, companies could extend their leakage repair policies so as to address the risks of customers being hit with unexpected costs. Almost two-thirds (63%) of HHs prefer a transfer compared to these alternatives. Only around one in ten (12%) opposed the transfer.

Over half (56%) of NHH's supported a legal transfer.

16% of HHs felt it was important for them to retain legal ownership of their water supply pipes (more likely to be those who already had insurance and homeowners) compared to 31% of NHHs (increasing to 45% of those NHHs which have in the past had a problem with their supply pipe).

HAFREN



# 4.3.3 Supply Resilience cost assessment claim

## A. Overview

Every day our customers trust us to deliver safe clean drinking water to their taps. This is the most fundamental aspect of the services we provide. This business case relates to our long-term approach to managing our stock of 87 treated water distribution service reservoirs (DSRs). A risk-based refurbishment programme is needed to ensure that we remain fully compliant with the Water Supply (Water Quality) Regulations 2016, the Reservoirs Act 1975 and Floods and Water Management Act 2010.

DSRs are used to balance and store treated water to enable us to maintain supply to our customers. After many years where investment has not been keeping pace with the rate of deterioration, AMP6 has seen an increase in investment in this asset group and the assets that were posing the greatest risk to water quality have been upgraded. The evidence set out in this business case demonstrates the need to maintain the focus on them into the future and the current rate of improvement (3 or 4 per AMP) means the inferred asset life of these reservoirs is around 150 years, which is unsustainable. We have talked to our customers about asset health and resilience and intergenerational fairness. This case presents the optimum balance between addressing the need to invest to reduce the increasing risk of failure, with the overall affordability of our plan.

This business case sets out the evidence for £11.3m (£8.7m is being requested as a costadjus tment) which will deliver the following benefits for our customers:

- Reduced risk of a water quality failure contributing to our industry leading CRI score of 0.
- Reduced risk of a supply interruption (both long and short duration) contribute towards the 38% step change improvement in interruptions to supply.

We will achieve these benefits through the following key activity:

- Carry out an inspection and repair programme in line with best practice and the latest DWI expectations .
- Rebuilding the two DSRs in the poorest condition.
- Decommissioning DSRs with significant water quality and structural integrity risk that are uneconomic to rebuild. We will only do this after making the necessary upgrades elsewhere to maintain resilience.
- Increasing storage and upgrading other assets in the network so that essential maintenance of DSRs can be carried out without increasing the risk of a supply interruption.

Maintenance of DSRs is not unique to us, but we have set out the evidence to explain why we believe this is an appropriate cost adjustment claim. There are three key reasons:

- Ofwat's econometric models are unlikely to reflect the disproportionately large asset stock due to the low population density and topography characteristic of these parts of Wales, which we demonstrate is unique to us.
- Due to the very small scale of the company, we are unable to absorb lumpy investment cycles as well as larger companies are able to do.
- There is small impact resulting from the enactment of the Floods and Water Management Act 2010 which amends the existing Reservoirs Act 1975. This means one additional DSR will require increased safety monitoring and reporting, beyond that already funded by customers.

This business case sets out our long term plan of monitoring, refurbishing, rebuilding, and in some cases decommissioning our DSRs at a pace that balances risk with affordability. We have applied industry recognised good practice assessment methodology for establishing a prioritised ranking of the risk of water quality

failures and supply interruptions across our asset base. Our proposed approach and phasing of this investment has been discussed with our customer challenge group (CCG) and the Drinking Water Inspectorate (DWI) who both support the need for investment. We have also discussed this directly with our customers and 94% supported this proposal.

Innovation	Resilience	Affordability	Great customer service
We have worked with a specialist research agency to design research that seeks to explore the views of both future and current customers on the difficult subject of asset health and resilience. Specifically to tease out views on intergenerational fairness when seeking to balance short term affordability with long term service.	We have fully embraced the cabinet office guidance on resilience and have considered a wide range of options to ensure we identify the most cost beneficial resilience response. We have also considered DSRs as part of a full system to ensure the proposed activity when considered across the rest of the programme doesn't impact resilience in the short term	Affordability is being considered at a plan/billlevel but we have asked customers' views on pace of investment through our research on asset health and resilience. This is our biggest challenge as we develop the long term plan – replacement at the current rate implies these tanks will last for 150 years; we need to find a lower cost way of mitigating these risks.	DSRs are an important part of managing our systems, they offer a buffer for peaks in demand and provide redundancy in our system. This programme will contribute to the very ambitious 38% improvement in supply interruptions and is needed to maintain water quality performance at 100% (i.e. CRI of 0)

#### We've challenged ourselves to be ambitious against Ofwat's themes for PR19.

#### We've reviewed, but not pursued, the opportunity for Direct Procurement for Customers

We are supportive of Direct Procurement for Customers (DPC) and recognise the potential to embrace markets in this way to deliver more benefits for customers.

We have reviewed our proposed investment programme against the descriptive guidance published by Ofwat about potential DPC projects. We have concluded that this business case is not appropriate for because it is not material enough to trigger the cost threshold.

#### This business case is supported by technical annexes

In addition to this business case further supporting information can be found in annexes :

Annex 1

Risk assessment of service reservoirs



# B. Need for a cost adjustment

We've carefully considered whether the investment need set out below would be sufficiently covered by Ofwat's cost modelling approach. Maintenance of DSRs is not a new requirement and nor is it unique to us. However, there are three important differences unique to our business that we believe Ofwat's models are unlikely to reflect.

We believe there is a need for a cost adjustment because:

- Ofwat's econometric models are unlikely to reflect our disproportionately large asset stock which is predominantly driven by our distinctive rural location and topography.
- The small scale of our business makes it very difficult to absorb any lumpy investment in the same way larger companies are able to do so.
- The Floods and Water Management Act 2010 which amends the existing Reservoirs Act 1975, has increased the safety standards required beyond that already funded by customers. Commencing in 2019, the Act is being implemented at an accelerated rate in Wales compared to England. The legislation now means that one of our DSRs will fall under the act. Whilst this only represents 1% of the asset base, it does increase the regulatory burden as well as the standards that we must now comply with.

Some of the investment will be covered by the models and we have estimated that an implicit allowance of £2.6m might be included for this type of activity in the top down modelling approach. Our cost adjustment claim is therefore for £8.7m.

Each point is discussed in more detail below.

#### The totex models are likely to underestimate our investment needs

We recognise that this business case relates to activity that is common across the industry, however the analysis set out below demonstrates that the totex modelling approach is likely to underestimate the investment needs for three key reasons:

- We have the most DSRs per population served due to the distinctive rural location and topography.
- The number of DSRs is only proposed as a variable in four of the eight proposed Ofwat's cost models. (This was recognised at PR14 for DVW when DSR maintenance was treated as a cost adjustment claim).
- Aside from the impact on the asset base, the day to day costs associated with running a network in such a rural location are higher due, for example to the travel time between assets.

As part of our May 2018 submission to Ofwat, we set out our views on the limitations of the totex modelling approach to satisfactorily take account of economies of scale. We believe this is one area where the issue manifests. This case, therefore, should be **read in conjunction with the model adjustment claim.** 

#### The size of our business means it is difficult to absorb lumpy investment

#### Summary of the asset stock - reasons driving 'lumpiness'

DSRs provide storage to meet customers' normal daily variations in water usage and provide resilience in the case of asset failure. We operate a total of 87 sites, though some are made up of two adjoining cells.

We have significantly more DSRs per population served than the rest of the industry. This is primarily due to the rural nature of our area, which means we need significantly more DSRs to ensure the same level of storage per customer as companies serving more highly populated area. The charts below shows we have the lowest weighted average population density, i.e. we are the most rural.



#### Number of reservoirs per population served and weighted average population density



(Data based on the 2017 industry cost assessment submission to Ofwat with latest amendments from March 2018)

The table below sets out the historical expenditure on this asset group by DVW.

Dee Valley costs only	AMP4	AMP5	AMP6	AMP7
Routine inspections	£0.15	£0.16	£0.17	£0.07 <sup>1</sup> + £0.05 <sup>2</sup>
Material refurbishment	£1.4	£0.7	£7.8 (FD) £11.5m (actual)	£6.02 <sup>3</sup>

#### Summary of historic expenditure for DVW on DSRs (all figures £m)

<sup>1</sup> Inspection costs for AMP7 proactive programme for north east Wales DSRs (formerly DVW)

<sup>2</sup> Monitoring, inspection and reporting costs for our new Statutory DSR plus enabling works to pumping stations

<sup>3</sup> Projected costs for replacement/abandonment of worst condition/ highest risk North Wales DSRs, plus repairs and enabling works for proactive programme

The expenditure trend shows the significant increase in investment in DSRs by DVW in AMP6, enabled by their PR14 costadjustment. The necessary step change in investment in AMP6, driven by a commitment to improve water quality, suggests that DSRs have typically received under-investment in previous AMPs.

This lumpy expenditure profile is likely to only be applicable to small companies, as larger companies (as we see in our group company, Severn Trent) tend to have a continuous rolling programme of refurbishment and maintenance. The graph below shows the lumpy DVW investment cycle in the past.



Service reservoir historic lumpy investment profile



The DSRs in Mid Wales accounted for 10% of the DSR assets in the Severn Trent (SVT) area, but only 1% of the total storage capacity across the company (again highlighting the small size/rurality of these assets). Had the SVT DSR capital maintenance budget been apportioned to Mid Wales on this basis, between £324k and £3.1 million would have been available in AMP5, and £643k and £6.2 million in AMP6. However, as DSR capital maintenance in SVT in previous AMPs was partly prioritised using population served, replacement of Mid Wales DSRs was restricted.

Aside from inspection, repairs and abandonment works, the only significant investment undertaken to replace a DSR between AMP3 and AMP5 was £1.2 million spent at the end of AMP5 to replace the steel DSR at Bryngwyn. This scheme was only prioritised for investment at this time as it also addressed a hydraulic capacity issue (i.e. the DSR was judged significantly undersized for the population it supplied).

Investment in the Mid Wales DSRs has increased in AMP6, primarily due to the repair works required from the proactive inspection programme, but is also at a rate that is not keeping pace with the deterioration rate.

There is insufficient information to identify the level of investment made by the other regulated water companies and it is therefore not possible to forecast an implicit allowance that is predicted by the models. We have instead reviewed the DVW implicit allowance assumed by Ofwat at PR14 of £2.38 million and inflated it to 17/18 prices; this equates to £2.57 million (using CPIH year average). Our final cost adjustment claim is net of this amount.

#### The legislation has changed and is more immediate in Wales

The details of the statutory obligations associated with the Reservoirs Act 1975 and changes associated with the Floods and Water Management Act 2010 are set out in more detail in the Reservoir Safety business case.

In summary, the Floods and Water Management Act 2010 will lower the threshold of standards and inspection requirements of the Reservoirs Act 1975 to apply to raw and treated water reservoirs storing 10,000 m<sup>3</sup> or more rather than the previous threshold of 25,000 m<sup>3</sup>. Furthermore, new requirements for emergency planning will also apply to all reservoirs storing 10,000 or more cubic metres. Whilst the legislation was enabled in 2010, it has not yet been enacted. In England, Defra has initiated a review and plans a phased introduction of the legislation. However, Welsh Government plans to implement it without delay for reservoirs in Wales commencing in 2018.

Previously none of our DSRs in Wales fell under this legislation, but going forward, one asset will need to be inspected and maintained to the standards required by the Act and consequently will increase the costs of ensuring compliance. We estimate the enhanced monitoring and reporting will cost an additional £53,000 to cover the Section 10 costs (fees to a third party Panel Engineer for an inspection every ten years) during the 2020-2025 period. This figure does not include any significant maintenance that may be required at this site.

#### **Outside management control**

The need to comply with our statutory obligations is not driven by management decision, however our approach to how we meet our obligations is. This business case sets out how we are ensuring we find the most cost effective way of maintaining water quality compliance and continuous supplies, whilst also seeking to optimise system design to ensure the most appropriate resilience response for our given geographical area and customer base. During AMP6 two DVW DSRs and four SVT DSRs were decommissioned, which reduced the long term cost of maintaining them whilst also reducing water quality risks driven by low water turnover in reservoirs that feed a very small number of properties. We are continuing to look for opportunities to reduce the number of reservoirs without impacting on network storage or resilience.

We have questioned whether DVW has historically under invested in this asset group. The DVW PR14 business plan sought to manage the impact on customers' bills by deferring expenditure on certain assets so that the highest risk assets, from both an operational and financial perspective, were prioritised. This saw the company concentrate its attention on the surface water treatment works, resulting in the replacement or renewal of one treatment works per five-year investment period over the last three investment cycles. At PR14, DVW presented evidence that demonstrated that investment in DSRs was also needed in order to manage the long term water quality risk. This resulted in the investment looking particularly lumpy compared to historical levels of investment and therefore the business case was assessed as a cost adjustment claim.

This shows that we are continuously challenging ourselves to find the optimum balance of risk and affordability.



# **C. Need for investment**

This business case contributes to two of our customer outcomes, 'Water always there' and 'Good to drink'. This investment is driven by the need to:

- Reduce the risk of a water quality failure contributing to maintaining our CRI score of 0.
- Reduce the risk of a supply interruption (both long and short duration) contributing towards the 27% step change improvement in interruptions to supply.

It is not meaningful to try to disaggregate expenditure by those two customer outcomes as the same activity often drives improvements in both. However it is possible to split investment into the main groups of activity – which is what we present in the table below.

Component of investment (all figures £m)		
Driver	Totex	Data table reference
Proactive inspection programme (including subsequent repairs to protect water quality)	2.710	WS1 Line 13
Significant refurbishment, abandonment or replacement of poorest condition/highestrisk DSRs	7.358	WS1 Line 13
Enhanced resilience (network reconfigurations and enhancement, monitoring and control and costs associated with lowering the volumetric threshold falling under the Act.	1.203	WS2 Line 14 WS1 Line 15
Total investment	11.271	
Cost adjustment claim (total minus our estimate of implicit allowance of £2.571	8.700	WN6 line 3

To establish the investment needs we have gone through several steps, which are explained in more detail in turn:

- Reflected on past performance to understand the context and the degree to which the current approach is working.
- Applied best practice risk assessment for this asset group risk assessment already exist but separately for North and mid-Wales. This is important to give us a companywide comparable view of risk.
- Challenged ourselves to look at this problem through the resilience in the round lens.
- Talked to our customers to get their view on the need for investment.

#### We have considered past performance to frame the need

During the 2010-2015 period, both SVT and DVW experienced an increase in the water quality failure rate of service reservoirs leading to DWI improvement programmes put into place for both. We have since worked with the DWI to improve our risk-based approach. This was recognised with a cost adjustment for DVW at PR14 but not for SVT, who, given their much larger size, are better able to balance lumpy investment across their wider programme. The AMP6 programme represented a step change in both the approach and level of investment needed to maintain these long life assets to ensure they continue to deliver service.

The water quality performance of our DSRs since 2011 by material type and original company (SVT or DVW) is shown below.



Coliform detections at our service reservoirs by material type



Our asset stock varies significantly in capacity - ranging from  $4m^3$  to  $18m^3$ , and age - from newly constructed to the year 1868. There is consequently a wide range of construction materials and designs. Steel and glass reinforced plastic (GRP) tanks are the worst performing assets, with 33% of failures occurring on 26% of assets. The evidence does not indicate a strong correlation between failures and asset age, however, the sample size is small and they are maintained in order to prevent failure. The expected asset life for GRP and steel tanks is 20 - 25 years, and concrete DSRs would typically now be designed for a 60-80 year design life. At our current replacement rate (of three per AMP) the implied asset life is 150 years; we believe that this is unsustainable. A summary is set out in the table below that shows the step change is needed and that this is going to be a multi-AMP programme of work to better align the replacement rate to the deterioration rate.

Highest risk assets				
Construction material	Proportion of stock in each material	Average age	Proportion of coliform or E.coli detections 2011 onwards	Yearly failure rate for this material type
Concrete / brick	74%	52	67%	4.17%
Steel	16%	29	20%	5.71%
GRP	10%	34	13%	5.93%

### We have followed a risk-based approach to prioritise the need

We have prioritised risks by comparing and contrasting risk assessments approaches used by the former DVW and SVT produce a combined robust approach. We recalibrated risks across the 87 DSRs in mid and north east Wales to produce an improved prioritisation. In summary, both assessments included the following steps:

- Collation of asset data from SAP (SVT) and central spreadsheet (DVW).
- Review of available condition/inspection reports.

- Meetings with the Reservoir Safety Team, asset owners, key stakeholders from our engineering, water quality and operations teams.
- Discussion to assign a grade for asset condition including the existence and height of any part height dividing walls, and a separate grade for ease of isolation.
- Collation of a qualitative comment, typically recording local knowledge regarding previous inspection dates, ease of isolation or other site risks such as access.
- Interrogation of realised risk data from DWSP (Drinking Water Safety Plan) for bacteriological and chlorine risks.
- Ranking of the DSRs, and cells within them if they have multiple compartments, based on the criteria above, weighted in order of: 1) condition, 2) realised bacteriological risk, 3) realised chlorine risk, 4) ease of isolation and 5) age.
- Comparison of the combined risk with individual risk to understand any dominant driver.

There is no formal standard for undertaking these risk assessments, however this approach is consistent with UKWIR Report Ref. No. 17/RG/05/48, 2017; Treated Water Storage Assets: Good Practice for Operation and Management.

The assessments have resulted in a prioritised list for all 87 DSRs. The results of the risk analysis are set out in Annex 1. Section D below sets out how we have balanced these risk against the DWIs views and affordability.

#### We have considered the need through 'resilience in the round'

When considering the maintenance needs of this asset group, we have the opportunity to evaluate the level of system resilience to ensure they are designed and maintained to a sufficient standard to respond to the shocks and stresses we would expect to see in the medium and long term.

Our full approach to resilience is set out in Chapter 5, where we set out our approach and a summary of the key shocks and stresses. The table below is an extract to illustrate some of the thinking we have done to consider how different shocks and stresses might affect this asset group.

Shock / stress theme	sub-theme	Water storage considerations
Climate change	Tidal changes	Storage is not designed for extended periods without abstraction from River Dee
	Flooding	No DSRs identified as being at risk in a 1 in 1000 year flood return period
	Increased temperatures	In creased temperature would increase demand thereby reducing storage and in creasing risk of supply interruptions
	Reduced temperatures	Increased Health and Safety (H&S) and increased risk of supply interruption due to more difficult access to remote, rural sites during prolonged bad weather
Deterioration	Land/ground conditions	H&S for coll eagues and public if ground conditions make structures unsafe A lot of our region is on land that is at high risk of land slip.
	Short life assets ICA	Poor/ variable communication services - diverging service levels being experienced between rural and urban areas.
	Long life assets	As sets deteriorating at faster pace than renewal rate. Is olation to allow inspection/maintenance not always possible.
	Population density	Ma king it even more difficult to make cost beneficial case to maintain smaller reservoirs in rural areas and creating divergence in service between rural / urban areas

#### Resilience in the round water storage considerations


	Aging population (affordability)	Increases importance of storage to ensure we can continually improve performance and reduce supply interruptions. Simultaneously pressures on bills limit the amount of maintenance that can be afforded.
Customer expectations	Increased performance expectations	The volume, condition and location of these assets closely links to water quality compliance, supply interruptions and low pressure. These assets will need to meet increased expectations on these levels of service.
	SEMD	Increase in assets classed as high priority. Due to large number of a ssets any changes to s e curity s tandards can have a large financial impact.
Policy& regulatory	Renewables	Need to consider the energy costs of alternative pumping a rrangements if DSRs are decommissioned.
change	Welsh legislation	Floods and water management means smaller DSRs now fall under Reservoirs Act and the thre shold could be lowered again.

In section D below we set out how these considerations have influenced the solutions.

## Our customers understand this need and trust us to plan for the future

Our customers typically take their water supply for granted, and ensuring a resilient water supply is a fundamental need that once met, is not given much further thought. We have sought to build up an understanding of what our customers think and expect through a variety of research and analysis of day to day contacts. There are two key areas where our broader research approach has given us insight that relates to this investment:

- through our customer tracker we know that 88% of customers trust us to plan for the future. In particular they trust us to balance monitoring and looking after our assets in the shorter and longer term, whilst keeping bills manageable; and
- from our initial customer needs research a key theme is that of resilient and dependable supplies, backed up by infrastructure investment, being valued and important to customers. Whilst in our willingness to pay research reducing short term interruptions to supply emerges as a low (relative, and prompted) priority, customers take their current resilient supplies for granted, and in general do not wish to see services deteriorate.

In addition to this we have undertaken specific research on this topic with two complementary approaches:

- we have used deliberative research to raise awareness of these more complex investment decisions, and to get more informed views on the pace at which we should proceed. In deliberative workshops in both North Wales and Mid Wales, we have discussed with our customers the idea of asset health and resilience and then specifically how they see that in the context of intergeneration fairness (who pays for what, and when). These workshops included both current and future household customers, and were supported by a series of telephone depth interviews with non-household customers; and
- in our quantitative research with customers on the choices in our plan (performance commitments, areas of investment choice and incentives) we have asked customers to make choices on the pace of investment, in the context of bill impacts.





Our research finds that the majority of customers, whether household or non-household, either support the proposed option, or a faster pace of intervention (bringing forward investment required in AMP8). Very few customers did not wish to express an opinion on this choice.

These results from the quantitative research are consistent with the broader insight from our deliberative research. Customers generally felt that water companies should be taking a proactive to mid-ground approach in regards to asset maintenance, especially as water is seen as an essential service. A reactive approach is unacceptable as it could lead to a spiral of assets falling into disrepair that would eventually impact on all customers, both in terms of safety and cost. At the same time the current experience of good service means that bringing investment forward isn't deemed necessary, especially if this would cost more.

It is interesting to note that the future customers in our workshop felt more disconnected with these choices they could really understand why a faster pace of intervention was an option, and were content as long as water is coming out of the tap. Anecdotally, some customers were sceptical about why we were consulting them on such topics, rather than relying on our internal experts.



## **D.** Best option for customers

This business case has been developed iteratively. We have shared lessons learned and good practice between the approaches used by our group company (DVW and SVT) subject matter experts and have developed the following combined approach.

- Understand the current level of service and risk.
- Understand how this might change under different investment options (e.g. do nothing, maintain current renewal rate, extend renewal rate, optimise the system design).
- Understand how this might change if subject to different shocks and stresses.
- Understand our customers views on pace.
- Apply governance process and challenge.
- Identify the optimum maintenance strategy that balances risk and affordability.

We have worked through the above steps to identify the options and costs, in order for us to identify the most cost effective solution.

## We have considered a wide range of options

We are not just looking at the civil structures, we have considered a wide range of options that could be used to reduce the risk of water quality or supply interruption failure and also to offer wider benefits. The figure below illustrates the range of options we have considered.



To identify the most cost beneficial suite of solutions the rest of this section is s plit into two sections:

• The scope and evidence to demonstrate efficient costs of an inspection and repair programme.



• The scope and evidence to demonstrate efficient costs of the refurbishment/ replacement programme.

## Scope – inspection and repairs

Prior to AMP6, inspections at DSRs in rural locations were undertaken using short term isolation as there was typically less network redundancy to sustain a medium term isolation without impacting customer supplies. Typically this activity used:

- installation of overland temporary pipes;
- manual operation of fixed speed booster pumps to allow flows to bypass the DSR; and
- venting any excess pressure this caused by discharging water to adjacent land.

Whilst this approach avoided the need for significant capital enabling works, it was resource and OPEX intensive, and presented risks in terms of operational flexibility, security, and the relationship with customers and neighbours.

In order to reduce these risks, it was necessary to return the DSRs to supply as quickly as possible. This approach had the potential to reduce the thoroughness of inspections and testing, and some minor defects (those with the potential to affect water quality, but not an obvious and active point of ingress or contamination) may have been noted but necessarily repaired at that time.

The step change in inspection and repair investment undertaken in AMP6 was in response to previous water quality performance not meeting expectations. For SVT, a step change was necessary to comply with a Notice from the DWI, which in particular required:

- operation of all service reservoirs in accordance with Industry best practice;
- inspection of DSRs within a maximum frequency of ten years (moving to a risk based approach where some might be inspected more frequently than this); and
- rectifying any deficiencies affecting water quality before returning the DSRs to supply.

In response to this Notice, and to ensure water quality performance at DSRs meets or exceeds expectations, SVT standardised and centralised their DSR inspection and repair procedures, and entered in to a companywide framework with industry leading contractors to ensure the consistency of both the inspection methodology and subsequent disinfection, and the quality of repairs.

Additionally, recent clarifications on the interpretation of Regulation 31 of The Water Supply (Water Quality) Regulations 2016 (as amended) has resulted in DSRs being isolated for longer, to allow the necessary curing time for repair materials. The extra heating and dehumidification costs associated with this work has meant that whilst SVT were now addressing less complex defects as they moved in to the latter half of AMP6, the average repair costs remain significant.

To ensure SVT could consistently undertake robust inspections and testing, and make all necessary repairs during the isolation, enabling works were undertaken (on sites, and in the wider network) to allow the DSRs to be isolated for longer periods of time without an unacceptable risk to customers' supplies.

As a result of the above activities, all DSRs in Mid Wales (formerly SVT) have now had an internal inspection within the last ten years. We are anticipating investing a further £950k in years 4 and 5 of AMP6 on repairing DSRs in Mid Wales, as a continuation of this programme.

At PR14, DVW committed to an AMP6 performance commitment to undertake a service reservoir water quality risk management scheme, consisting of the replacement of three DSRs, and installation of new roof membranes at a further eight DSRs. In parallel to this, DVW instigated a programme of DSR roof inspections to ensure that all DSRs had been tested within the lastten years.

All North Wales DSRs now have a roof membrane applied, and have been inspected within the last ten years. However, particularly for those DSRs last inspected prior to AMP6 the thoroughness and robustness of the inspection and any subsequent repairs may have been limited by the allowable period of isolation.

## Cost – inspection and repairs

We want to build on the recent improvements in our DSR water quality performance by continuing to thoroughly inspect our DSRs at a maximum frequency of ten years, and immediately rectifying all defects.

In order to ensure inspections and repairs procedures remain robust, we anticipate having to invest in further enabling works at some DSRs. This will allow a longer term isolation for those DSRs which were previously only able to be isolated for a short term.

The costs of undertaking enabling works will be site specific and dependent on levels of risk to supplies at the time of isolation. Factors will include; the condition and age of the pump assets, the time of year, weather conditions, the vulnerability of pipes to bursts and power supply reliability. Based on our AMP6 programme we estimate the average cost of enabling works to be £50k per site. Our analysis also indicates that 23 out of 51 DSRs will require enabling works to allow their robust isolation for inspection and potential repair.

This investment will result in a more cost efficient programme in future and also ensure that we are better able to respond to any water quality failures by being able to quickly isolate the DSR for investigation so and maintain customer supplies.

We have assumed inspection costs of approximately £7k per DSR, which includes a payment to our inspection and disinfection contractor, remote operated vehicle inspection if necessary, and internal staff costs.

In AMP6 approximately 63% of DSRs inspected required repairs. We expect this rate to continue in AMP7 as we work through the ten year inspection cycle. We also expect the scope and costs of any repairs to be broadly similar to those undertaken in AMP6 in rural areas, £73k. Focussing on examples of smaller, more rural repairs, ensures a more realistic cost is estimated for our DSRs. For comparison, the average repair costs across all SVT DSRs from 2016 onwards has been approximately £84k, with 11 of the larger, more complex sites costing in excess of £250k.

The anticipated costs of our inspection and repair programme is summarised in the table below:

Activity	Mid Wale	es (was SVT)	North Wale	es (was DVW)	TOTAL		
	Number	Cost (£k)	Number	Cost (£k)	Number	Cost (£k)	
Enabling works	13	650	10	500	23	1,150	
Inspection	40	270	11	74	51	345	
Repairs	25	1,855	7	510	32	2,365	
TOTAL		2,775		1,084		3,860	

#### Costs for enabling works, inspection and repairs

Note: exclude DSRs identified for replacement or abandonment in AMP7

### Scope – abandonment, refurbishment or replacement

A risk assessment based on condition, water quality performance, chlorine performance, ease of isolation and age, undertaken for the Mid Wales DSRs, identified Welshpool Yr-Allt and College Aberhafesp as highest priorities for replacement in AMP7. Both of these DSRs are constructed from non-preferred materials which are now considered to be at the end of their asset life.

Deterioration of **Welshpool Yr-Allt** DSR (steel) may be contributing to discolouration in the network, and has attracted DWI interest. The roof presents an ingress risk, and the part height dividing wall makes it currently impossible to isolate for thorough repairs without further enabling works.

**College Aberhafesp** DSR (GRP) is one of our smaller DSRs and has required interim repairs in the past following a collapsing roof. Isolating the DSR for inspection and repair is impossible at certain times of the year, due to a relatively high seasonal demand from caravan parks.

A separate study of Mid Wales steel and GRP DSRs, undertaken by Jacobs, also concluded that Welshpool Yr-Allt and College Aberhafesp are high priorities for investment in AMP7, and that these DSRs would need replacement rather than abandonment. This study also concluded that **Berriew-Bryn** and Llanrhaeadr DSRs (both GRP) were also a high priority for investment, but that these should be abandoned, with upgrades instead made to their supplying pumping stations.

**Llanrhaeadr DSR** is in very poor condition, with a collapsing roof, and Berriew-Bryn DSR is in poor condition, has suffered from water quality failures in the past, and will be difficult to isolate due to the relatively high occasional agricultural demand it supports (hence replacing and upsizing the pumping station, and abandoning the DSR, is likely to be the best TOTEX solution).

An assessment of the North Wales DSRs concluded that the highest priorities for replacement are Higher Berse and Hope Mountain.

**Higher Berse** is the largest DSR in North Wales. Repeated (temporary) repairs have been made in the past but the structure is of unconventional construction, and continues to deteriorate with additional repairs required at every inspection. This DSR has a part height wall, so repairs have had to be undertaken whilstrunning on less than 1/4 of the normal storage – which increases supply risk to customers, and prevents more thorough refurbishment / repair.

Previous inspections of **Hope Mountain** DSR have noted the condition of the roof to be very poor and continuing to deteriorate, due to significant degradation of the concrete internal to the roof. Further deterioration is putting water quality at risk, and will ultimately lead to structural failure. Options to replace the roof shall be considered, but it is likely that the least risk and most cost beneficial solution will be to replace the DSR.

The PVC pipe which supplies Hope Mountain DSR has to run at high pressures due to the topography, and has been subject to bursts previously. As part of our optioneering for Hope Mountain, we will consider if more mains replacement activity and changes to the pumping station to reduce pressure surges, and subsequent bursts, would result in less storage required at Hope Mountain, or even negate the need for a DSR here.

Upgrades to the pumping station, and relaying of mains, is likely to have a broadly comparable CAPEX to replacing the DSR, so we will undertake additional feasibility early in AMP7 to select the best balance of TOTEX and risk for our customers.

The above assessments have been consolidated in to a central risk assessment for all our DSRs (see Annex 1). This concludes that the above mentioned DSRs remains the highest priority across our complete estate for significant capital maintenance investment.

## Cost – abandonment, refurbishment or replacement

Costs for the above activities have been estimated using the Severn Trent Unit Cost Estimator (STUCA), which is based on costs data from previous projects, inflated accordingly, including the AMP6 DSR replacement programme.

The chart below indicates the costs curves used for the 'target price' (design and construction costs including costs for programme management, land, planning and feasibility.)



Illustration of STUCA cost curves (£/m<sup>3</sup>) for new DSRs



This has been cross checked with the Service Reservoir Benchmarking Tool prepared for Hafren Dyfrdwy by Turner and Townsend in preparation for PR19. This external benchmarking has taken account of costs for comparable projects including previous SVT projects, and from the wider water industry.

The resultant cost curve from this exercise is illustrated in the chart below (note that this excludes "expert client" costs, so is essentially comparable with the "target price" from STUCA).



Benchmarking of capital construction costs (£/m<sup>3</sup>) for new DSRs

The Turner and Townsend benchmarking provided a most likely outturn cost, and likely range of costs. The conclusion from this analysis is that STUCA estimates of Target Price compare favourably with wider industry benchmarking, particularly for larger DSR schemes such as Higher Berse.

There is more variability between STUCA estimates and wider industry benchmarking at the extreme bottom end of the operational capacity range, but this is expected as there are less samples available, and a higher proportion of the costs will be related to contractor on-costs and risk allowances, so will naturally be more variable between companies.

The costs anticipated for this replacement/abandonment programme are illustrated in the table below. These are total project costs including feasibility, design, construction, client costs, land and planning, and other third party costs.



#### Costs for replacing and abandoning DSRs

DSR site	Solution	Scope	Cost (£k)
[REDACTED]	Replace	Build new 1,100m3 DSR on adjacent land. Cut and cap pipes to existing DSR.	1,650
[REDACTED]	Replace	Build new (upsized) 29m3 DSR on adjacentland. Cut and cap pipes to existing DSR.	306
[REDACTED]	Abandon	Upgrade existing upstream pumping station and replace 250m of pipe.	132
[REDACTED]	Abandon	Relocate and replace upstream pumping station to provide variable speed and D/A/S capability. Cut and cap pipes to DSR.	258
[REDACTED]	Replace	Build new 9,091m3 DSR on adjacent land. Cut and cap pipes to existing DSR.	4,494
[REDACTED]	Replace	Build new 100m3 DSR on adjacentland. Cut and cap pipes to existing DSR.	516
		TOTAL	7,358

## Our solutions contribute to the long term resilience of system

We have reviewed the various ways we are trying to prevent failure and preparing an efficient response in the event of a failure. This analysis is based on the cabinet office four-box model for identifying resilience responses:

Reliability	Resistance
<ul> <li>All reservoirs are inspected at least once every 10 years with the aim of moving to a risk based frequency.</li> <li>We will look to replace membranes every 15 years unless a flood test demonstrates the life can be extended.</li> <li>Design, construction and process standards are in place to ensure we are following recognised best practice.</li> <li>For our new Statutory DSR, our monitoring cost build up includes an allowance for pre-inspection after eight years. This would provide early warning and allow sufficient time to optimise any remedial work ready for the S10 inspections.</li> </ul>	<ul> <li>We are planning to carry out a review of the risk of landslip to our DSRs. The area in Wales we serve is known to have a higher risk of landslip. The current design has not been modified to take account of this, but we are investigating if it is needed in the future.</li> <li>As part of our review of SEMD requirements, we have reviewed how resilient the DSRs (specifically the covers) are to vandalism and terrorism.</li> </ul>
Response and recovery	Redundancy
<ul> <li>The enabling works we are proposing as part of this plan will mean that surrounding pumping stations and pipes will be able to continue to operate should the DSRs need to be isolated.</li> <li>We have tanker connection points that would enable water to be directly fed into the network.</li> </ul>	<ul> <li>The replacement DSRs we are proposing will be built with multiple cells and full height dividing walls, such that they can continue to be operated whilst one cell is isolated for inspection, repair, or a potential asset failure</li> </ul>

### Cabinet office four box model



downstream of a DSR as a fall-back position at the We will consider implementing the STV • higher risk sites. Design Manual for DSRs, which includes As part of our winter resilience plans submitted to • back-up level detection and "out of Welsh Government and updated annually, we have calibration" alarms for all cells, in case the to set out how we would manage under extreme primary sensor fails winter conditions, for example if we were In several zones the network can be fed by prevented from accessing the site for an extended multiple DSRs. period. In some island zones (fed from either one • We have identified a need to update and fully source or storage provided by one DSR) we integrate the hydraulic models for the North Wales have agreements with neighbouring area to enable us to use live flow meter and companies for bulk supplies. pressure data to respond more effectively during an incident.

Due to the rurality and topography of our area, in many cases ensuring the reliability of these assets is the most effective way of ensuring resilience.

The enabling works we are proposing as part of this long term plan effectively reinforce the ability of the network to cope whilst the DSR is isolated. This increases the resilience of the network, as we are better able to respond to any DSR asset failures without putting our customers' supplies at increased risk.



# **E. Protecting Customers**

We have considered how best to protect customers from under delivery but also to incentivise us to take the necessary steps to manage risks.

## **Performance Commitments**

During AMP6, DVW had an activity based performance commitment that tracks completion of the construction activity. The Ofwat methodology signals that this is an undesirable form of performance commitment and therefore we have not pursued this.

There are two performance commitments that relate closely to this investment:

- CRI, which has a specific component relating to DSR compliance; and
- supply interruptions.

The table below shows our estimate of the likely impact of a water quality failure on our CRI score, for our four highest risk DSRs (the four we are proposing for replacement).

#### Estimated impact of a water quality failure on our CRI score

DSR site	Impact of failure on CRI score
[REDACTED]	0.150
[REDACTED]	0.004
[REDACTED]	1.520
[REDACTED]	0.015
TOTAL	1.689

Given our target is 0 with a deadband of 2 it is clear that if failure occurred at the above sites it would represent 85% of the deadband. The PC for CRI is therefore a clear incentive to progress the work to minimise the risk at these sites.

Our supply interruptions performance commitment is also very stretching and we are committing to a 27% improvement in AMP7. This will drive us to minimise unplanned isolation of DSRs due to water quality issues, and maximise the redundancy/ resilience in the network, so that the risk of supply interruptions is minimised whilst DSRs are isolated for inspection, or for longer term abandonment.

We believe these two measures sufficiently hold us to account for delivering this investment need, but also offer the incentive for us to do more if we are not on track to meet our commitments even if we have completed the activity.

## Affordability

Affordability has been a key consideration in forming our proposals. The solutions included in this business case strike the right balance between risk, action and affordability across all proposed investment.

We have reviewed willingness to pay research and tested proposals with customers, specifically to understand their views on intergenerational fairness and resilience.

Affordability for our customers has been tested as part of the overall acceptability of the plan. The results are set out in Chapter 3.

## Internal and external challenge

### CCG challenges

We explained this challenge to the CCG on several occasions. The CCG sought clarity on the customer benefits that would be seen from this investment. We responded to this challenge and the details set out in section D summarises our response.

A member of the independent third line assessment team attended the August CCG meeting so that they could seek assurance. They asked if we had applied the correct approach for meeting the requirements of a cost adjustment claim and whether the evidence was robust. They were satisfied with the response.

#### **Board** assurance

We designed a bespoke assurance framework to support the development of our plan to the highest quality. This Board-led framework builds upon our robust annual assurance processes. Each building block within our plan was assessed for risk to include the individual components, for example data, methodology, judgements and assumptions, against our likelihood factors (level of change, complexity, roles and responsibilities and subjectivity) and our impact factors (financial value, customer impact, competition, statutory / regulatory requirement). The level of risk determined the type and level of assurance required with significant or high risk building blocks allocated to an independent third line assurance provider depending on the particular expertise required. This framework was applied to our cost adjustment claims and have been assured through all three lines of assurance.

For this adjustment, third line assurance was undertaken by Black and Veatch using a two staged approach; 1) an initial review of our methodology and 2) a final review of our processes and data. Black and Veatch found that;

"An effective process was used to identify potential challenges justifying Cost Adjustment Claims (CACs) which met Ofwat criteria and were material. These were challenged internally, by customers and by other stakeholders. The proposed CACs were justified, supported by customers and had been robustly costed" and;

"Costs had been assessed for each CAC at an appropriate level of detail, based on similar work carried out by the company or estimates provided by others, and were as robust as possible at the planning stage. A proper assessment of options had been carried out and steps taken to optimise work scope and cost" and;

The **Supply Resilience CAC** is justified on the grounds of the faster pace of implementation of mandatory reservoir safety legislation in Wales, the disproportionately large service reservoir stock in HD, and HDs limited ability to absorb spikes in investment, due to its small size. We concluded that costs had been estimated using appropriate methods, based on similar costs for STW's service reservoirs, were material, and that affordability had been taken into account."

For more information on how we developed and applied our framework to our cost adjustment claims and the findings of the assurance, please read our 'Securing Trust, Confidence and Assurance' Chapter 10.



# Annex 1: Risk assessment of DSRs

Condition Grade	Condition description	Condition description (detailed)	UKWIR Generic Condition Grades
1	Excellent / As New	As new	'As new' condition except for tolerable cosmetic defects, <b>highly unlikely</b> to impact on H&S, WQ, security of supply.
2	Good	No significant concerns Minor, self-sealing cracking As expected for age and use Passes flood test	Deterioration starting to show but <b>very</b> <b>unlikely</b> to impact on H&S, WQ, security of supply or structural integrity.
3	Fair/ Adequate	Showing localised obvious cracking or spalling Not indicative of widespread problem/deterioration Warrants investigation and/or remedial action	A defect or deterioration that is <b>unlikely</b> to impact on H&S, WQ, security of supply or structural integrity. Defect / deterioration should be monitored at next inspection.
4	Poor	Severe localised or widespread cracking and/or spalling Urgent remedial action required	A defect or notable deterioration that <b>could</b> impact on H&S, WQ, security of supply or structural integrity. May require planned investment at or before next inspection.
5	Very poor	Structurally failed and unsafe Reached limitstate Cannot guarantee structural behaviour	A defect or severe deterioration that will <b>almost certainly</b> impacton H&S, WQ, security of supply or structural integrity. The defect / deterioration should be rectified immediately.

## Scoring methodology

Isolation Grade	Comments
1	Each cell can be isolated separately with no adverse effect on the network, other than the obvious reduction in strategic storage during the isolation
2	As above, but with some minor works required to allow the isolation of each cell, such as the refurbishment of a PRV, or the reluctance to isolate each cell, due to increased throughput stirring up known deposits
3	Off-site modifications to the network such as rezoning needed to isolate the cells, which puts discrete areas at higher risk of low pressures or discoloration, but these changes have been successfully completed in the past and the risks are understood
4	Means of isolation exists (i.e. VSD pumps and PRVs) but hasn't been trialled or needs fine tuning, or one cell is significantly larger than the other, which presents a more significant (but potentially tolerable) supply risk when the larger cell is isolated. Or, if isolated on fixed speed pumps, blow off tool (venting) can be used, but network can cope with this running like this for 1 month+
5	Currently impossible to isolate due to the need to buffer diurnal supply/demand deficit, or low/high pressure risks, or isolated previously but only for one day, with fixed speed pumps run in hand, and overlanding/blow-off tools (venting) i.e. not suitable for a longer term isolation and repair works



The results below have been sorted on the following fields, in this specific order, to create a prioritised list (highest priority at the top):

- Combined score (Condition x Isolation)
- Condition
- Water Quality (regulatory failure since 2011)
- Age beyond notional life (i.e. a comparison of build date to a notional asset life of 25 years for steel/GRP, and 80 years for masonry/concrete)

Rows highlighted **<u>Green</u>** are those still to be addressed in AMP6.

Rows highlighted <u>Blue</u> are those proposed for abandonment or replacement in AMP7.

<u>Note</u>: Fron Bache, Penygraig and Llandynan are identified as potential abandon ment options from a previous study undertaken by DVW. Enabling works are proposed to allow these DSRs to be inspected thoroughly, this will then allow a decision as to the best TOTEX solution for these sites. This will take account of: how well the isolation has performed, the risks to supply with storage removed, the extent and costs of any repairs required, and affordability within the overall programme.

Reservoir	Material	Built	Inspect	F	Risk Score		wq	Maintenance	Enabling
Name			date	Condition	Isolation	Total	fail	Plan	Needed
Berwyn	Concrete	1868	2029	5	5	25		Replaced AMP6	N/A
Welshpool yr Allt	Steel	1976	2025	5	5	25		Replace AMP7	N/A
Church Hill	Steel	1986	2024	5	5	25		new liner AMP6	Y
Higher Berse	Concrete	1953	2024	5	5	25		Replace AMP7	N/A
Hope Mountain	Concrete	1965	2025	5	4	20	Y	Replace AMP7	N/A
Llanrhaeadr	GRP	1981	2023	5	4	20		Abandon with booster refurb	N/A
College- Aberhafesp	GRP	1982	2022	5	4	20		Replace - high seasonal demand,	N/A
Fron Bache*	Steel	1984	2023	5	4	20		inspect/repair /abandon AMP8	Y
Cymau	GRP	1989	2019	5	4	20		Abandon with booster refurb <u>AMP6</u>	N/A
Penygraig*	Concrete / brick	1964	2023	5	4	20		inspect/repair /abandon AMP8	Y
Llandynan*	Concrete / brick	1965	2026	5	4	20		inspect/repair /abandon AMP8	Y
Sugn-y-Pwll	Concrete / steel	1991	2027	5	4	20		Replace AMP6	N/A
Berriew - Bryn	GRP	1980	2019	4	5	20	Y	abandon in AMP7	Y



Reservoir	Material	Built	Inspect	F	lisk Score		wq	Maintenance	Enabling
Name			date	Condition	Isolation	Total	fail	Plan	Needed
Llantysilio (Rhewl)	Concrete	1960	2019	4	5	20		Repair AMP6	N/A
Garth Upper	Concrete	1926	2027	4	4	16		inspect/repair /abandon AMP8	Y
Mont- gomery Castle	Concrete	1938	2025	4	4	16		Inspect/ repair	Y
Pontricket	GRP	1996	2025	4	4	16		Inspect/ repair	Y
Pengwern	Concrete	1948	2025	4	4	16		inspect/repair /abandon	Y
Sun Bank	Concrete / brick	1950	2025	4	4	16		inspect/repair /abandon	Y
Aberhosan	Concrete	1969	2021	3	5	15	Y	Inspect/ repair	Y
Chuch Stoke	Concrete	1970	2026	3	5	15	Y	Inspect/ repair	Y
Hyssington	Concrete	1973	2027	3	5	15	Y	Some repairs in AMP6 - inspect / repair in AMP8	Y
Cinders	Concrete	1979	2024	3	5	15	Y	Inspect/repair in <u>AMP6</u>	Y
Llandiloes	Concrete	1957	2025	3	5	15		Inspect/repair	Y
Pendinas	coloidal grout	1970	2024	3	5	15		Inspect/ repair	Y
Glascoed Newtown	Concrete	1971	2023	3	5	15		Inspect/repair	Y
Cefn Coch- Llanfairc	Concrete	1971	2021	3	5	15		Inspect/ repair	Y
Glyn- gynwydd	Concrete	1973	2025	3	5	15		Inspect/ repair	Y
Newhall	Concrete	1978	2020	3	5	15		Inspectin AMP8	Y
Heniarth	Concrete	1985	2023	3	5	15		Inspect/ repair	Y
Moel y Garth- Trefenant	GRP	1983	2021	4	3	12		inspect/repair /abandon	Ν
Corndon	Concrete	1962	2027	3	4	12	Y	Some repairs in AMP6 - inspect / repair in AMP8	Y
Guefron	Concrete	1936	2023	3	4	12		inspect/repair /abandon	Y
Newtwon Hollies	Concrete	1938	2024	3	4	12		Inspect/ repair	Ν



Reservoir	Material	Built	Inspect	F	lisk Score		wq	Maintenance	Enabling
Name			date	Condition	Isolation	Total	fail	Plan	Needed
Pen-y-bony Fawr	Concrete	1938	2025	3	4	12		Inspect/repair	Y
Pentredwr	brick/ Concrete	1950	2023	3	4	12		inspect/repair /abandon	Y
Commins Coch	Concrete	1965	2021	3	4	12		Inspect/ repair	Y
Penycae	coloidal grout	1968	2025	3	4	12		Inspect/ repair	Y
Darowen	Concrete	1969	2023	3	4	12		Inspect/repair	Y
Penymynydd	Steel	1996	2023	5	2	10	Y	inspect/repair /abandon	
Higher Wilford	GRP	1987	2021	5	2	10		Abandon with booster refurb <u>AMP6</u>	
Llan- wyddelan	Concrete	1972	2021	2	5	10		Inspect/repair	Y
Llangurig	Concrete	1973	2025	2	5	10		Inspect/repair	Y
Upper Blackhill	GRP	1983	2022	4	2	8	Y	inspect/repair	Ν
Briw	Steel	1999	2027	4	2	8	Y	Repaired in AMP6 - replace in AMP8	Ν
Gronwen	Concrete and brick	1885	2028	4	2	8		Inspect in AMP8	Ν
Newtown Park Lane	Concrete	1972	2022	2	4	8	Y	Inspect/repair	Ν
Staylittle	GRP	1973	2025	2	4	8		inspect/repair	Y
Llanfair Caereinion	Concrete	1945	2022	3	2	6		Inspect/ repair	Ν
Clewedog	Concrete	1968	2019	3	2	6		Inspected and repaired AMP6	Ν
Penrhos	Concrete	1973	2027	3	2	6		Inspectin AMP8	Ν
Cefn Twlch- ty Mawr	Concrete	1976	2021	3	2	6		Inspect/ repair	Ν
Bryn Mawr	Concrete	1965	2025	2	3	6		Inspect/ repair	Ν
Bausley	Concrete	1966	2022	2	3	6		Inspect/ repair	Ν
Abermorddu	Concrete	1976	2027	2	3	6		Inspect in AMP8	Ν
Hirnant	Steel and GRP	1984	2028	4	1	4	Y	Some repairs in AMP6 - replace AMP8	Ν



Reservoir	Material	Built	Inspect	F	lisk Score		wq	Maintenance	Enabling
Name			date	Condition	Isolation	Total	fail	Plan	Needed
Pentre- Beirdd	Concrete and brick	1975	2025	4	1	4	Y	Inspect/repair	Ν
Abertridwr 2	Steel	1982	2024	4	1	4		inspect/repair	Ν
Abertridwr 1	Steel	1987	2024	4	1	4		inspect/repair	Ν
Welshpool	Concrete	1969	2021	4	1	4		Inspect/ repair	Ν
Wern	Concrete	1972	2021	4	1	4		Inspect/ repair	Ν
Foel	Concrete	1938	2022	2	2	4	Y	Inspect/ repair	Ν
Winllan	Concrete	1938	2024	2	2	4	Y	Inspect/ repair	Ν
Sarn	Steel	1995	2025	2	2	4		inspect/repair	Ν
Tanyfron	Concrete	1981	2026	2	2	4		Inspectin AMP8	Ν
Pen-y- palmant	Concrete	2010	2020	1	4	4		Repair AMP9	Y
Pennant	Concrete and brick	1969	2028	3	1	3	Y	replace AMP8	Ν
Upper Keel	Concrete	1971	2023	3	1	3	Y	replace AMP8	Ν
Brithdir	Steel	1995	2019	3	1	3		Inspected and repaired AMP6	Ν
Cemmeas Road	Steel	1995	2019	3	1	3		Inspected and repaired AMP6	Ν
Kerry	Steel	1995	2020	3	1	3		Inspected and repaired AMP6	Ν
Penrhallt	Concrete	1953	2023	3	1	3		Inspect/ repair	Ν
Beacon Ring 2	Concrete	1971	2022	3	1	3		Inspect/repair	Ν
Highlands	Concrete	1981	2028	3	1	3		Some repairs in AMP6 - Inspect / repair AMP8	Ν
Llanfair Caereinion- ty-Banc	Concrete / GRP	1985	2022	3	1	3		Inspect/repair	Ν
Cefn Gwestydd	Concrete	1995	2022	3	1	3		Inspect/ repair	Ν
Cefn Mawr	Steel	1975	2026	2	1	2	Y	Inspect/repair in AMP8	Ν
Llanfyllin	Concrete	1944	2022	2	1	2	Y	Inspect/ repair	Ν
Talerddig	Concrete	1998	2021	2	1	2	Y	Inspect/ repair	Ν
Dolfor	Concrete	2000	2022	2	1	2	Y	Inspect/ repair	N
Heldre Hill	Steel	1996	2024	2	1	2		Abandon with booster refurb AMP8	Ν



Reservoir	Material	Built	Inspect	F	Risk Score		wq	Maintenance	Enabling
Name			date	Condition	Isolation	Total	fail	Plan	Needed
Beacon Ring	Concrete	1959	2022	2	1	2		Inspect/repair	Ν
Llandinam	Concrete	1969	2018	2	1	2		Inspected and repaired AMP6	Ν
Pant	Concrete	1982	2022	2	1	2		Inspect/repair	Ν
Garth Glynceiriog	Concrete	2010	2026	1	2	2		Inspectin AMP8	Ν
Bronwylfa reservoir	Concrete	2018	2026	1	2	2		Inspectin AMP8	Ν
Bryngwyn	Concrete	2015	2025	1	1	1		Inspect/ repair	N



# 4.3.4 Biodiversity and wellbeing cost assessment claim

## A. Overview

We are committed to environmental leadership and embrace the new approach to the sustainable management of natural resources in Wales. The investment proposed in this business case will help our region's environment to thrive and ensure we make our contribution to achieving the Welsh Government's vision for the future management of natural resources and the well-being of future generations in Wales. Our customers share our ambition.

For this submission, we've responded to Ofwat's feedback on our May submission by focussing the scope on our contribution to the duties in the Environment (Wales) Act and well-being goals. This document sets out our longer term comprehensive strategy that matches our customers' ambition.

## Our case in summary

We set out below the need for investment, our customers' views on our proposals, how we have balanced investment across AMP7 and AMP8 in order to make bills affordable, and the steps we have taken to control costs.

### Customer support to do more

Our proposals are supported by extensive customer engagement. Our customer insights work reveals a deep connection between customers, their community, the local environment and their wish that we should protect and improve it wherever we can. Our customers are not concerned about differentiating between meeting legal requirements and taking further action. They are concerned, however, that the affordability consequences should be managed.

### Affordability

Affordability has been a key consideration in forming our proposals. While there is little choice over investment to meet statutory obligations, we are seeking to strike the right balance between extent of biodiversity improvements and affordability. We have therefore tested proposals with customers where possible and have considered the pace and phasing of investment to ensure that our proposals are agreed as being affordable.

We have agreed contributions from other water companies where they will benefit from our action, for example improvements to the Vyrnwy catchment will help United Utilities to manage treatment costs.

We have also worked in partnership with charities also to allow us to access other funding streams, for example the Heritage Lottery Fund.

### Underpinned by legislation

Whilst there is strong customer support for improvements, the proposals in this business case also support the Welsh Government's vision for Wales' water environment and are underpinned by statutory requirements.

- Environment (Wales) Act 2016. A duty on public authorities to seek to maintain and enhance biodiversity and in so doing promote the resilience of ecosystems. This replaces the biodiversity duty in the Natural Environment and Rural Communities Act 2006 (known as the NERC Act) in Wales.
- Wildlife and Countryside act (1981) + EU Regulation (1141/2014) on invasive alien (non-native) species. The Wildlife and Countryside Act is the primary piece of legislation that sets out duties to control and eradicate invasive non-native species (INNS). This is supplemented by an EU regulation on INNS.

In addition to these statutory requirements, we are committed to contributing to delivery of the Welsh Government's well-being goals as set out in the **Well-being of Future Generations (Wales) Act 2015**. This legislation is focussed on improving the social, economic, environmental and cultural well-being of Wales. It is



intended to make public bodies working in Wales think more about the long-term, work better with people, communities and each other, look to prevent problems and take a more joined-up approach. Whilst water companies are not included in the definition of public bodies within the Act, the Water Strategy for Wales, which is strongly underpinned by the well-being goals, sets out clear expectations for water companies to embed the principles of the well-being goals into our business planning process es.

#### We've worked collaboratively to drive down cost

To achieve savings for our customers, we've worked collaboratively with NRW, local wildlife trusts, the Royal Society for the Protection of Birds and neighbouring water companies to identify the best value opportunities. We intend to deliver our commitment entirely through partnership working that will involve volunteering from our employees and local communities. By delivering in this way we will also maximise well-being benefits by helping the customers and volunteers become active and engaged.

#### Achieving multiple benefits for our customers and communities

Our proposed investment will deliver the following benefits for customers and the environment:

- improved biodiversity on a minimum of 450 Hectares of land; including a major project on our Lake Vyrnwy moorland SSSI catchment in partnership with NRW, RSPB and the Welsh Government (who alongside the Heritage Lottery Fund will make a financial contribution); and
- improved amenities for customers, local communities and visitors at Lake Vyrnwy to enjoy the biodiversity and heritage which will contribute to well-being goals for:
  - o A resilient Wales.
  - o A prosperous Wales.
  - o A healthier Wales.
  - o A Wales of Cohesive Communities.
  - o A Wales of vibrant culture and language.

## B. The need for adjustment

This is an enhancement pursuant to the Environment (Wales) Act 2016, which requires companies in Wales to enhance biodiversity. The relative size of our landholding (100km<sup>2</sup>) and number of customers (circa 100,000) to support investment in biodiversity compared to other companies (for example Severn Trent with 107km<sup>2</sup> and circa 3,500,000 customers) means that the econometric cost assessment models are highly unlikely to include sufficient allowances to deliver the improvements required by statute.

This case also supports the aims of the Well-being of Future Generations (Wales) Act 2015 which only applies to the two water companies operating in Wales. The legislation was introduced too late to influence the data used by Ofwat to create the econometric cost assessment models, which means there is negligible expenditure in the historical time series and we do not believe there are any variables that reflect well-being drivers.



# **C. Need for investment**

Our proposals are underpinned by both the need to meet our statutory obligations and our customers' support for improvements.

## Meeting our statutory obligations

Our proposed programme is underpinned by three pieces of legislation, two of which are statutory drivers;

- Environment (Wales) Act 2016
- Wildlife and Countryside act (1981) and EU Regulation (1141/2014) on INNS

While meeting the requirements of legislation is mandatory there is some discretion around timing of implementation.

#### Environment (Wales) Act 2016 – Section 6 biodiversity duty.

The Environment (Wales) Act 2016 puts in place legislation to plan and manage Wales' natural resources in a more proactive, sustainable and joined up way. In relation to Wales, this new duty replaces the biodiversity duty in the Natural Environment and Rural Communities Act 2006 (referred to as the NERC Act) which required that public authorities must have regard to conserving biodiversity.

Section 6 of the Act introduces a duty on public authorities operating in Wales to **"maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions".** Public authority in this instance includes water and wastewater companies and we are required to set out an action plan for how we will comply with this duty.

Specifically, the duty requires us to take account of the resilience of ecosystems, particularly the following aspects:

- the diversity between and within ecosystems;
- the connections between and within ecosystems;
- the scale of ecosystems;
- the condition of ecosystems (including their structure and functioning); and
- the adaptability of ecosystems.

Under Section 7 of the Act, Welsh Government, in consultation with NRW, will prepare and publish a list of the living organisms and types of habitat which in their opinion are of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales. We must have regard to this list when preparing our biodiversity plan, as well as the State of Natural Resources report (first published in 2016) and any subsequent area statements which NRW issue under Section 11 of the Act.

As directed by the legislation we submitted a plan on how we intend to comply with the duty in December 2017. The key elements of our plan are to:

- enhance biodiversity and promote the resilience of ecosystems though responsible management of our land and via our investment plan;
- base improvements on environmental impact assessments and ecological surveys;
- seek opportunities for working with partners and local communities to maintain and enhance the biodiversity at our publicly accessible sites;



- have regard to the Welsh Government's National Natural Resources Policy; and
- develop a robust catchment management programme which will take account of findings set out in Natural Resources Wales' State of Natural Resources Report (SoNaRR) and the subsequent Area Statements.

We are required to report on progress against the plan by the end of 2019 and every three years thereafter.

We have agreed to evaluate our sites and implement an agreed action plan. A major element of this action plan will be a partnership scheme to improve the Lake Vyrnwy catchment.

#### Well-being of Future Generations (Wales) Act 2015.

The definition of public bodies within the Act does not expressly include water and wastewater companies. However, in 2015 Welsh Government also published their Water Strategy for Wales, the priorities of which were strongly underpinned by the well-being goals as set out in the Act. As we strive to meet the expectations for water companies set out in the Strategy, we will work to embed the principles of the well-being goals into our water resources planning and business planning processes, and from there into our day-to-day working practices. We also have the opportunity to shape delivery of biodiversity improvements to incorporate well-being goals. For example through partnership working, community volunteering and by attracting more visitors to our region.



As part of our biodiversity action plan we will also look for and invest in opportunities to help achieve wellbeing goals by improving access and amenity use.

### Our customers support - and are willing to pay for us to do more

Customers concern about biodiversity, access to green spaces and a desire to become involved is revealed in many aspects of customer research that we have undertaken and also that of other organisations.

Our customer needs research told us that customers place great value on the environment and have a significant connection with the natural environment. This can be through close proximity to rural Wales, through active involvement in rural life or simply by a desire to see the environment protected for future generations. Interest and concern about the environment is seen in different ways and through different associations:

- locally, through a concern with issues such as local biodiversity, green spaces and the availability of recreational facilities; and
- globally, through a concern with issues such as sustainable use of green energy, the reduction of carbon footprint and the desire to see companies and government adopt responsible approaches to the environment.

As well as the natural environment customers would like greater transparency about where water resources are used.

Our Willingness to Pay Research did not include biodiversity as a service attribute, however we did ask customers to select their top priorities from a list of potential additional improvement activities. 43% of customers selected *'improving biodiversity on our land'*. Also scoring in the top four options were *'making surplus land available for local communities to create green spaces'* (47%) and *'working with local schools'* (71%).



"I'd be willing to spend a bit more if it was going to promote biodiversity." – Customer needs research, Mid Wales

Our performance commitments, investment choices and outcome delivery incentive research indicated that 83% of household customers, and 90% of non-household customers found the proposed biodiversity performance commitment target acceptable.

We also conducted research with a representative sample of 435 household customers and 104 non household customers to get their views on the strategic investment areas. Customers were presented with three options, including a description and bill impact for each option. When faced these investment choices, and bill impacts, enhancing biodiversity was the area in which more customers selected the "do more" option; 53% of household customers supported the proposed option and 39% wanted us to do more. Only 5% of customers wanted us to do less than proposed. Similar results were obtained for non-household customers, with 51% selected the proposed option and 46% the do more option.



In triangulating our customer insight we have also referenced third party research that gives us a feel for the broader customer sentiment in Wales. The Wales Outdoor Recreation Survey (2014) tells us that the majority of people in Wales want to visit the outdoors more often, and 43% are concerned about biodiversity, with 30% feeling there had been a reduction in recent years. 12% of those surveyed actively volunteer to help the environment / wildlife.

The Wrexham Well-being Assessment research (2017), conducted by the Wrexham Public Services Board, revealed that many respondents made comments on the need for preservation and investment in green spaces.

Our conclusion from this combined insight is that the customers approve of our biodiversity plans and would do so more strongly if we were to deliver well-being related activities of schools and community involvement and increased access to better quality green spaces at the same time.

## Stakeholders have shaped our approach

We've consulted with our stakeholders about our proposals. In addition to our ongoing collaboration with NRW, in June 2017, we held workshops with stakeholders to discuss how we can best collaboratively address the future challenges that we all face.

A total of 23 stakeholders attended our Welsh Water Resources Management Plan workshops in Wrexham and Newtown in June 2017. We had representatives from the Welsh Government, RSPB, NRW, North Wales Wildlife Trust, Montgomeryshire Wildlife Trust, Environment Agency Canal and Rivers Trust, United Utilities, DWI, our CCG, CCWater, CLA, Farmers Union of Wales, and Dŵr Cymru. We received and reviewed 141 pieces of feedback relating to water resources, waste water improvements, catchment management and our wellbeing obligations. There was a clear message that they expected us to embrace the sustainable management of natural resources approach within our Welsh operations and enthusiasm for exploring partnership opportunities, particularly in relation to delivering against the biodiversity duty.

This feedback, summarised in the table below, was used to help shape our biodiversity and catchment management strategies.

#### Summary of feedback from June 2017 workshops

<ul> <li>Resilience</li> <li>Current catchment management schemes are focused on water quality, could they be expanded to indude flow attenuation and biodiversity</li> <li>Utilise existing groups for partnership working</li> </ul>	<ul> <li>Biodiversity</li> <li>The top 5 priorities in relation to the new biodiversity duty should be; partnership working, uplands (e.g. peatland restoration), working with farmers/land owners, review of our land management practices to identify ecosystems enhancement opportunities, and INNS.</li> </ul>
<ul> <li>Water Quality</li> <li>Use partnership working to help overcome water quality issues</li> <li>Septic tanks are a big problem and will be impacting water quality</li> <li>Land use changes will have a big impact on water quality and could be further impacted by climate change, for example increased chicken farms in the Mid Wales area</li> </ul>	<ul> <li>Customer Engagement</li> <li>A lot of work is being done with domestic customers, need to do more with land owners</li> <li>Get involved in local projects, be active in local partnerships</li> <li>Do customer tours of waste water sites</li> <li>Messaging should put more emphasis on the fact that a clean water environment reduces risks to water quality, which will ultimately lead to lower bills</li> </ul>
<ul> <li>Assets</li> <li>Take stock of our environmental assets and bio- diversity</li> <li>There are good opportunities around Vyrnwy e.g. peatland restoration. Look into opportunities to expand reservoir storage through surrounding wetlands for flood storage</li> <li>Develop assets to have multi-benefit, soft a pproaches</li> </ul>	<ul> <li>Partnership</li> <li>The Dee Catchment Protection Group should be seen as a great way of feeding into area statements</li> <li>Increase the amount of direct relationships with landowners, not through other organisations</li> <li>Do more 'soft' catchment approaches rather than improving treatment works</li> <li>Include behavioural changes activities and landowner collaboration as well as treatment focused options</li> </ul>

A further consultation workshop was held in Welshpool on 10 April 2018 to explore our draft plans and to consider further opportunities around catchment management and biodiversity. We were keen to hear a broad range of views at the workshop so a number of different stakeholder organisations were invited to attend. The organisations who accepted the workshop invitation included Welsh Government, Natural Resources Wales, Wales Dee Trust, Woodland Trust, RSPB, Wildlife Trusts and Severn Rivers Trust. In addition to this, members from the Wales Customer Challenge Group attended and were able to contribute to the discussions.

The first part of the workshop was used to provide the background on how we are developing our future plans on catchment management and biodiversity. This included how it links to the Welsh Government's Water Strategy for Wales and the legislative context of the Well-being of Future Generations (Wales) Act 2015. We also shared details on a range of opportunities that we could include in our future plans and asked workshop participants for their ideas and views on how these proposals could be implemented.



A wide ranging discussion took place amongst workshop attendees that included debates on:

- The size and scope of biodiversity initiatives such as tree planting and the introduction of beavers into the environment.
- How to maximise the value of any investment to benefit as many organisations as possible and where in the catchment it would be most effective.
- How to work with landowners to improve river quality through catchment schemes and payment by result.
- How to feed into CAP payments after Brexit?
- Ensuring that our future plans deliver what our customers want.

There was much support from workshop attendees to build on existing partnership working to have better understanding across the region so that we could all work together to the benefit of Wales. The workshop also discussed options on how to measure improvements and how to report progress with ideas shared that will now be considered.

Since this workshop we have met with the Montgomeryshire Wildlife Trust, North Wales Wildlife Trust, the RSPB and Natural Resources Wales to refine our plans and discuss how we can continue and extend our partnership working to deliver biodiversity and well-being improvement schemes.

We have also considered the views of non-governmental organisations (NGOs) when developing our plan. For example Wales Environment Link, a network of environmental, countryside and heritage organisations that is the official intermediary body between Welsh Government and the environmental NGO sector in Wales, produced 'Blueprint for the 2019 Price Review in Wales (Delivering for Future Generations through the Price Review)' Our plan aligns well to the high level outcomes the commitments that they want to deliver a step change in biodiversity.

## **Our Customer Challenge Group**

Our customer challenge group (CCG) is a multi-stakeholder body created to challenge whether our plans meet the needs of our customers, are supported by them and are delivered in a way that is congruent to their preferences.

Our approach to customer research, and emerging conclusions drawn from it, have been challenged by the CCG. We began our discussions with them in July 2016 and have held successive meetings as our research and proposals have developed;

- 13 September 2017; an introduction to the process and our initial view on potential claims.
- 29 November 2017; a progress update and review of our approach to seeking customers views .
- 13 March 2018; further update and refinement of our customer research approach.
- 12 April 2018; update and incorporate feedback from the Welshpool stakeholder session on the 10 April 2018.

We have responded to the challenges raised and expect the process to bring about further improvement to the robustness of our plans. The most significant challenges were raised at the April session. A summary of challenge and response is given below in the table below.



## CCG challenges and Response from April 2018 session

Challenge	Response		
Why should Hectares of land managed for biodiversity be a cost adjustment.	We believe that Wales specific new obligations in the 2016 Environment Act 2016 and Welsh Government expectations around the Well-being of Future Generations Act will be outside of Ofwat's cost modelling approach. If this is the case then we will have insufficient funding to deliver on these obligations		
Explain how the performance commitment will be measured.	<ul> <li>Hectares under an agreed biodiversity action plan;</li> <li>Sites will be surveyed to identify opportunities and develop an action plan</li> <li>Action plan agreed with a suitable independent body</li> <li>Actions implemented in partnership</li> <li>Site visit to confirm achievement of agreed actions</li> </ul>		
What amount of SSSI land is being managed and will this bein the special cost factor	This special cost factor case and performance commitment relates to all our land holdings (100km2) not just the 58% of which forms part of Berwyn SSSI		
There could be a small reduction in customer's bills if HD did nothing. Why ask customers to forego a decrease for a "good idea" for which measurable outputs are not being presented.	We believe we presented customers with sufficient information in Performance Commitment and Outcome Delivery Incentive Research on which to make an informed decision. The information used was based on the Vyrnwy Heritage Lottery Fund project which has detailed outputs specified.		
The water from Vyrnwy goes to UU customers in England so shouldn't they contribute as well?	United Utilities customers will benefit from improved water quality and more storage in the natural environment. We have discussed the issue with them and they are willing to contribute £50k.		



## D. Best option for customers

#### As we've developed our case, we've worked to exploit the potential for scope and/or cost reductions.

To do this, our approach has used the following levers:

- **Need** to ensure that schemes have only been included where we can demonstrate that there is a compliance issue to resolve and that it would be reasonable to expect. Hafren Dyfrdwy to contribute.
- **Phasing/timing** to ensure that we make the right intervention at the right time avoiding the potential for duplication between AMPs and smoothing bill impacts.
- **Synergies** taking a 'catchment view' across drivers and schemes to find synergies, strip out duplication and exploit multiple benefits. Identifying opportunities for partnership working wherever possible.
- **Optioneering** to ensure our solutions represent value for money.
- Innovation to drive down costs, or exploit additional benefits.

### Working collaboratively to maximise benefits

Through qualitatively assessing the additional benefits we will be better able to communicate to customers the contribution they make to the environment in their region. We will also be able to prioritise investments with multiple benefits over those which perform similarly on our cost benefit test but don't have multiple benefits.

We have worked collaboratively with the Montgomeryshire Wildlife Trust and the North Wales Wildlife Trust to scope out plans for our sites. This has involved meetings, joint site visits and sessions to identify and integrate wider opportunities for example integrating forestry planning and other licenced operations on our land and well-being initiatives.

Our intention is to deliver the vast majority of this activity in partnership with local wildlife trusts and, for Vyrnwy, the RSPB. There are numerous benefits to this;

- it will be a more cost efficient means of delivery than our consultant led supply chain as these groups have much lower overheads and can access existing community and volunteer networks;
- organisations will bring in local knowledge of the biodiversity issues and existing initiatives and;
- it enhances our ability to access and apply experience of what works locally and bring more energy, passion and innovative ideas.

We have looked for and found links to other investment areas and providing dual benefits, for example managing levels in our mothballed impounding reservoirs at Esgaireria and Pant Glas for biodiversity and reservoir safety benefits. This action will increase biodiversity benefits, reduce overall costs and maintain reservoir safety.

## Optioneering approach and prioritisation

We have over 70 sites where we could invest to improve biodiversity and well-being. However due to affordability we decided to prioritise 'significant sites' in AMP7.

The Lake Vrynwy Estate at 100km<sup>2</sup> represents over 95% of our landholding and is our highest priority and biggest opportunity. It forms an important part of the Berwyn SSSI and SAC and as such represents an exceptional opportunity to enhance biodiversity and the surrounding remote rural economy.





We identified a further 17 sites with more than one Hectare of addressable land or surface water area. For these sites we worked in partnership with local wildlife trusts to make an initial assessment of the key opportunities in terms of habitat potential and operational constraints. This exercise reduced the 17 down to six priority sites; reservoirs at Clywedog, Esgaireria, Pant Glas, Pendinas and Pen-y-Cae, and Newtown sewage works.

## Working in partnership to deliver efficiencies and contribute to well-being goals

We intend to deliver implementation of biodiversity measures entirely in partnership with local organisations and volunteer groups in order to bring efficiencies and allow us to contribute to relevant well-being goals.

Our first priority, as agreed with NRW, is to help move the part of Berwyn SSSI and SAC that falls within our Lake Vyrnwy estate from unfavourable to favourable status.

As a second priority we will also increase the area of our land that we actively manage for biodiversity in partnership with Local Wildlife Trusts.

Our third priority is to help change land management practices on land that we don't own by including biodiversity improvement opportunities in our 50% capital grant scheme (STEPS). We will deliver this through partnership working with the agricultural community and Middle Dee Trust. Full details of our catchment scheme can be found in section 4.2.2 of our business plan.

### Improvements to the Lake Vyrnwy Estate (biodiversity)

The Lake Vyrnwy catchment owned by Hafren Dyfrdwy is part of a major Special Area of Conservation and Site of Scientific Interest. Sections of the blanket bog within the catchment are unfavourable status.





We have worked collaboratively with NRW, Royal Society for Protection of Birds (RSPB) and Welsh Government on a joint Heritage Lottery Fund (HLF) bid which integrates biodiversity and well-being improvement activities. We will improve the environment (restoring the peatland catchment that is part of a SSSI) and the visitor experience at the Lake Vyrnwy estate. We submitted the HLF bid on the 15<sup>th</sup> March 2018.

HLF provides up to 60% match funding for projects that 'make a lasting difference for heritage, people and communities'. Only charities can apply, therefore the RSPB are leading the bid for Vyrnwy. There are two parts to the project: catchment enhancement (bio-diversity driver) and visitor experience improvement (well-being driver).

Within the catchment, the primary purpose is to restore approximately 450 hectares of upland peat bog. This involves making changes to 3km of existing drainage arrangements and removal of non-native species. This should improve the (Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) conditions with the intention that their status will be moved from 'Unfavourable' to 'Favourable'. The facilities on the RSPB's farm (leased from Hafren Dyfrdwy under a Farm Business Tenancy) will also be improved to accommodate volunteers.

On the visitor experience side of the project there are three main areas of focus; infrastructure, experience and engagement. In summary, it will deliver a change to the visitor flow, restore the chapel to a flexible use space, provide tell the stories of Vyrnwy (in English and Welsh) and involve local schools and the community.

The terms of the HLF project mean that we will spend a minimum of £100k in the development phase in the AMP6 period.

Bio-diversity benefits;

- Invasive species will be removed, peat hags re-profiled, ditches blocked and heather cut. This will result in 360 hectares of ridge top bogs being covered in short, natural bog vegetation (such as sphagnum moss), rather than the deep heather which currently envelops it. This will encourage Section 7 priority species for example Golden Plover to return as a breeding species and also benefit Black and Red Grouse, Hen Harrier, Curlew and Merlin.
- Healthy woodlands will be restored through removal of invasive conifers and rhododendron and being replanted with native broadleaf species, providing a future breeding and feeding habitat for priority species such as Pied Flycatcher, Willow Tit, Wood Warbler (all Section 7 and UK red list) and Redstart (Amber conservation status).



- By raising water tables on a minimum of 90 hectares of blanket bog habitat conditions for tipulid larvae (Daddy Long Legs) will be improved, thus providing increased food availability for a range of insectivorous upland bird species including golden plover, meadow pipit, whinchat and red and black grous e chicks.
- Invasive species will be cleared from cliffs surrounding the lake restoring a suitable nesting site for at least 3 pairs of peregrine and improving this SSSI feature.

## Improvements to the Lake Vyrnwy Estate (well-being opportunities)

Research shows that our Welsh customers cherish their natural assets and want to see us investing in, protecting and enhancing them; and they also know and value the visitor sites and want to see these developed. From a master planning community workshop held in December 2017 and our existing visitor feedback we have identified the following key constraints that need to be addressed to enable more people and the local community to benefit by accessing natural environment the heritage and:

- Lack of intuitive visitor flow, signage and interpretation space.
- Lack of activities for younger people and nothing for under 5s.
- Lack of local community engagement and interest.
- Limited car parking capacity.

Improving the site and catchment biodiversity will make the site more attractive to visitors. This in turn will make the local community and environment more resilient by increasing economic activity, community cohesion and cultural well-being.

Vyrnwy currently hosts over 200,000 visitors per year with potential for three times this number. The HLF bid forecasts an annual 4% increase in visitor numbers, equating to a total 25% increase from current baseline by the end of the project. From visitor surveys we know that 'day' visitors tend to come from the towns in Wales (73%) whilst 'staying visitors' tend to come from England (83%). There is a population of only 200,000 within 1hr drive but over 9 million within a 2hr drive (majority from the West Midlands).

The HLF project will only address the first three of the constraints outlined above. We have therefore included additional investment to improve the site infrastructure and capacity allow more visitor to stay longer.

This combined investment will make the local community more resilient by contributing to well-being goals;

- A resilient Wales
  - o By raising water tables and improving the quality of upland blanket bog, CO2 emissions from drying peat will be lowered. These habitats will begin to store carbon and contribute to lowering greenhouse gases in the atmosphere.
- A prosperous Wales;
  - The project will boost the economy by recruiting locally and improving skills of local people across different sectors;
    - o agricultural; between 2 and 4 full time agricultural interns per year;
    - woodland and carpentry; provide accredited woodland skills and carpentry training courses with Tir Coed;
    - $\circ \quad \mbox{retail and customer service; more opportunities as visitor numbers increase; and }$
    - Project; five or six new jobs to deliver the scheme.
  - o Local businesses and those in the wider Mid Wales area will benefit financially from more visitors in to the area.

### • A healthier Wales;

o Education and volunteering opportunities will encourage people to participate in energetic outdoor activities and improve the local communities connection to the natural environment.

#### • A Wales of Cohesive Communities;

- o Over 20 landowners will be engaged with changes in farm management that will benefit biodiversity particularly the Curlew.
- o A dedicated Community and Volunteer intern will be recruited through this project who will be responsible for ensuring all work streams are developed with the principle of maximising the use of volunteers, interns or trainees drawn from within local community.

#### • A Wales of vibrant culture and language

• We will deliver bilingual education activities in schools, providing opportunities to engage families up to 36 miles from Lake Vyrnwy.

The final benefit of the project relates to the volume and quality of water generated by the catchment. As bogs degrade they increase the speed of water runoff, thus reducing water storage potential and becoming less effective at purifying water. Improvement to this aspect of the catchment will benefit United Utilities who treat and supply the water to their customers in England. Recognising this fact United Utilities have agreed to contribute financially to the project by £50,000.

We are in also discussions with NRW on how we can integrate their Forestry leasehold land into our biodiversity and well-being plans.

### Investment at other sites

We have many other smaller sites that we do not actively manage to improve biodiversity. Given our duty under the Environment Act we assessed what we can achieve in AMP7 and beyond.

In Mid Wales we visited these sites with the Montgomeryshire Wildlife Trust to assess the potential and prioritise these opportunities. Out of the ten sites visited the greatest opportunities were;

- Esgaireira and Nant-y-Geifr reservoirs (non-operational sites)
- Clywedog reservoir
- Newtown sewage treatment works

These sites had a variety of potential Section 7 habitats that could be enhanced; hedgerows, lowland meadows, mesotrophic lakes and Ponds. The potential Section 7 species benefiting from this action would be; Brown Hare, Otter, Willow Tit, Marsh Tit, Pied and Spotted Flycatcher, and Slow Worms. Numerous invertebrates and vascular plants that would benefit from habitat management works.

We intend to deliver these improvements entirely through partnership work and involve the local communities. This is the most efficient delivery route and maximises well-being opportunities primarily A Healthier Wales (Public Health Wales Outcomes Framework: Mental well-being 3a/3b and Health and Care Standards: Staying Healthy 1.1)

We intend to sustain this partnership over the long term and will spread this investment over multiple AMP periods. So our main focus in AMP7 will be;

• Clywedog, where we are already investing £75k in 2018/19 to improve visitor facilities



• Esgaireira (pictured below) close to Machynlleth where we have the opportunity to develop the existing broad leave woodland over the long term into a Celtic rainforest.



• Newtown sewage works, where we have an existing arrangement with the Wildlife Trust and disused assets that may be incorporated into our plan.



The 'Wild Well-being Partnership Project' with the Montgomeryshire Wildlife Trust will involve a Community Outreach Officer to provide supported volunteering sessions at our sites. These sessions will benefit the local community and the wildlife and will encourage residents and visitors of all ages and abilities to volunteer. We will specifically reach out to disadvantaged and "hard to reach groups" and individuals.

In North Wales we are starting similar discussions with the North Wales Wildlife Trust on impounding reservoirs in North Wales. Our key priorities are at two reservoir sites; Pendinas where we have existing partnership arrangement, and Pen-y-Cae where we believe we can manage reservoir levels to reduce investment needs and enhance biodiversity.

One third of these costs have been allocated to Waste Network plus and two thirds to Water Resources.

## Contribution from catchment management activity

The primary objective of our catchment management programme is to protect and improve water quality and to increase the amount of water stored in the catchment. On the river Dee we will deliver these objectives through our continued partnership with United Utilities and Severn Trent – the Middle Dee Trust. We will also extend the catchment management approach into Mid Wales to protect the water quality of our ground water sources. Both elements of our catchment management scheme will include a 50% capital grant scheme to help farmers and landowner investin structures to improve water quality and quantity.

Given our biodiversity duty we propose to allow increased grants where at marginal increased cost the investment to protect water quality and quantity. Investment in 'natural features' could include extended riparian margins, grass swales, enhanced ditch wetlands and sediment ponds.

Full details of our catchment scheme can be found in section 4.2.2.

## Cost

The cost of our biodiversity and well-being strategy is summarised below. The detail is set out in the table commentaries for WR8, WS2 and WWS2.

			AMP7		
Sites	Investment area	AMP6 Totex £k	Capex £k	Opex	totex £k
				PA £k	
Lake Vyrnwy	Biodiversity	50	400	-	400
	Well-being (resilience)	50	1,064	-	1,064
Other sites*	Biodiversity	-	122	26	254
	Invasive non-native species		-	10	50
	Well-being (resilience)	75	-	14	72
Catchment Mgt.	Biodiversity	-	-	10	50
Total		175	1,586	60	1,890

#### Estimated biodiversity and well-being investment

\* excludes investment relating to Waste sites of AMP7 totex of £130k that is reported in section 4.2.5.

We are investing in AMP6 so that we can generate well-being and biodiversity benefits early in AMP7. For example we are investing £100k in the development phase of the Vyrnwy Heritage Lottery Fund project and spending £75k on refurbishing the café at Clywedog. Both these investments will also increase and bring forward increased income from visitors to these sites. We have included increased income from visitors to Vyrnwy, estimated at £75k by per annum by 2023, in Table WR3, line 19.



# **E. Protecting customers**

The majority of the cost is in the Vyrnwy project (£1.46m totex) which has undergone external scrutiny and challenge during the heritage lottery fund bid process. The gated approval process has three stages; bid, development and delivery, with the project only proceeding through each gate if value for money is proven. The full process and governance is set out on the Heritage Lottery Fund website.

We received approval to move into the Development phase of the project in July 2018. We will not know whether the HLF will give approval to proceed to the to the Delivery phase until June 2019. There is therefore a risk that the project will not proceed. If this is the case we are committed to proceed with our investment as planned and will prioritise the investment to deliver the highest priority biodiversity benefit areas, the upland bog. We will then extend the period over which we deliver the remainder of the project objectives if we cannot secure additional funds from elsewhere.

The outcome delivery incentive will ensure customers are protected from form rising costs and scope creep in AMP.

We have benchmarked the cost of our biodiversity improvements against external benchmarks. This shows that our proposed biodiversity investment at approximately £2k per hectare compares favourably with studies on the benefits for ecosystem services; £2.3k (Benefits of Sites of Special Scientific Interest, Defra, 20/06/2011, Christie et al. and £2.4k (FEEM Report on ecosystem services, 2010).

## **Measurement of benefits**

The primary means to measure the is investment is covered by the biodiversity performance commitment which is for Hectares of land managed for biodiversity where our action has maintained or enhanced SSSI status, improved the habitat suitable priority species (Environment Act), or built a high wildlife value structure on third party land (that also improves raw water quality or resilience). The full description of the performance commitment is in Appendix 2.

We have not included a specific performance commitment for well-being improvements but will monitor and report on suitable measures such as; visitor numbers to Vyrnwy, Clywedog and Pendinas and the number of community volunteer days.

## Assurance of our case

We designed a bespoke assurance framework to support the development of our plan to the highest quality. This Board-led framework builds upon our robust annual assurance processes. Each building block within our plan was assessed for risk to include the individual components, for example data, methodology, judgements and assumptions, against our likelihood factors (level of change, complexity, roles and responsibilities and subjectivity) and our impact factors (financial value, customer impact, competition, statutory / regulatory requirement). The level of risk determined the type and level of assurance required with significant or high risk building blocks allocated to an independent third line assurance provider depending on the particular expertise required. This framework was applied to our cost adjustment claims and have been assured through all three lines of assurance.

For this adjustment, third line assurance was undertaken by Black and Veatch using a two staged approach; 1) an initial review of our methodology and 2) a final review of our processes and data. Black and Veatch found that;

"An effective process was used to identify potential challenges justifying Cost Adjustment Claims (CACs) which met Ofwat criteria and were material. These were challenged internally, by customers and by other stakeholders. The proposed CACs were justified, supported by customers and had been robustly costed" and;

"Costs had been assessed for each CAC at an appropriate level of detail, based on similar work carried out by the company or estimates provided by others, and were as robust as possible at the planning stage. A proper assessment of options had been carried out and steps taken to optimise work scope and cost" and;

There is a legislative requirement and customer support for Biodiversity Improvements. Detailed cost options have been developed in conjunction with conservation bodies. The work will be entirely carried out in conjunction with charitable organisations, who will monitor delivery. A substantial proportion of the cost is expected to be met by a Heritage Lottery Fund grant. This CAC is justified, costs are well developed and meet the materiality threshold."