



Dŵr Cymru
Welsh Water

Enhanced Investment
Case:
WSH53-CW01 -
Improving Raw Water
Quality in Catchments
through Green Solutions



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Executive Summary

This enhancement case focuses on the expansion of our established programme of drinking water catchment activities that supports our *Welsh Water 2050 Strategic Response 1: Safeguarding clean drinking water through catchment management* (SR1). It describes the new activities that will be undertaken, in line with the associated SR1 Journey Plan inter-AMP outcomes, to safeguard our drinking water supplies now and for future generations. Through undertaking effective catchment management work, we can ensure that the water entering our water treatment works is reliable, consistent and manageable.

We have structured this document using the enhancement assessment criteria set out in section A1 of Appendix 9 (Setting Expenditure Allowances) in the PR24 final methodology. The enhancement assessment criteria are divided into four criteria groupings:

- need for enhancement investment (seven criteria);
- best option for customers (eight criteria);
- cost efficiency (three criteria); and
- customer protection (three criteria).

Need: The Water Framework Directive (England and Wales) includes the requirement of all waterbodies intended for human consumption to be identified as Drinking Water Protected Areas (DrWPA). Specific requirements of Article 7 of the WFD relevant to this enhancement case are as follows:

- Article 7.1 – designate DrWPAs for surface and groundwaters intended for human consumption (i.e., >10m³ a day or serving more than 50 persons).
- Article 7.3 – avoid deterioration (from the 2007/8 baseline) of water quality (due to anthropogenic activities) in a DrWPAs to prevent an abstraction having to be abandoned/ an alternative used, or the need for additional purification treatment.

There are also clear expectation around catchment management from Natural Resources Wales (NRW) and the Environment Agency (EA). This enhancement case is an expansion of the previous AMP (5-7) enhancement programmes, it covers new activities to be undertaken across all 3 of our established management approaches: *recover, prevent and adapt*. This case has been aligned to the PR24 NEP, where all catchments in Wales have been included under the 3 DrWPA drivers, which has been accepted in principle by NRW. See Appendix D for further details on the Regulatory differences between Wales and England.

The DWI also support our approach following submission of detailed plans for their review. They have issued a Commended for Support letter - Ref DWR9.

Options: We have assessed 8 options within our investment to consider how best to scale and target our response. Our chosen option is a combination of three of our main options. This combination solution will deliver the expectation of our regulators.

The optioneering process undertaken has been supported by a cost benefit analysis (CBA) tool. The proposed solutions include quantification of risk and benefit over the long term via service measure framework (SMF) values, including valuation of: natural capital; social capital; human and intellectual properties.

What We Will Deliver: This enhancement case will deliver; 1) Actions plans to progress the removal of 5 safeguard zones in AMP8 via the implementation of catchment management actions, 2) a new suite of partnership projects within the Bannau Brycheiniog Mega Catchment, 3) expand the delivery of preventative catchment management actions to avoid the designation of new safeguard zones.

Efficient Costing: We will invest £26.6m (post efficiency, 2022/23 price base, overlap removed) to deliver activities across our 5 workstreams: *Risk Evaluation, Smart Catchments, Research Translation & Advanced Techniques, Partnerships & Engagement and Mitigations & New Ways of Working*.

Catchment Management are non-traditional, non-engineering-based approaches. In developing schemes, we have modelled the costs using the historic trend analysis and extrapolation approach, described in section 5 Costing Methodology of 'Overview: How we have developed our investment plan' to cost this investment case.

Customer Protection: This work will be ringfenced through a price control deliverable (PCD) linked specifically to the delivery of all measures as documented in the Safeguard Zone Action Plans, for the 5 focus catchments that have been identified. These Action Plan measure have been agreed by NRW/EA.

Benefits: Natural capitals and wider societal capitals have been considered through application of Welsh Waters Multi Capital Approach (MCA) valuation of service measure impacts. Our established *WaterSource* principles are also applied to each scheme undertaken.

Our approach has been independently assessed by Jacobs (Engineering and Costs) and Economic Insight (CBA).

1. Introduction

This enhancement case summarises our approach to achieving the ambitions of Welsh Water 2050 Strategic Response 1: *Safeguarding Clean Drinking Water through Effective Catchment Management* (SR1). It outlines the AMP8 activities, as well as the long term projects and schemes, that need to be delivered to achieve the SR1 outcomes which will build resilience in our water supply systems from source to tap.

In line with the SR1 Journey Plan (see section 2.5 for details), this document describes the progress demonstrated to date, and outlines the new activities and further development of existing schemes which will need to be undertaken to achieve the inter-AMP outcomes which will allow us to fully realise our 2050 ambitions.

For the protection of drinking water sources, under Water Framework Directive (WFD) (2000/60/EC) Article 7, there are requirements to:

- **Article 7.1** - designate Drinking Water Protected Areas (DrWPAs) for surface and groundwaters intended for human consumption (i.e., >10m³ a day or serving more than 50 persons).
- **Article 7.2** - comply with the Drinking Water Directive (DWD).
- **Article 7.3** - avoid the deterioration (from the 2007/8 baseline) of the quality of water (due to anthropogenic activities) in a DrWPAs to prevent an abstraction having to be abandoned/ an alternative used, or the need for additional purification treatment.
Where catchments are deemed 'At Risk', Safeguard Zones (SgZ) may be designated.

The EA and NRW, through the Water Industry National Environment Programmes (WINEP) and National Environment Programme (NEP), Ofwat's PR24 Final Methodology and the DWI via Drinking Water Safety Plans (DWSP) have all set expectations that water companies will work in collaboration with stakeholders and land managers to develop schemes and activities to protect drinking water sources. DWI have also indicated support for our PR24 plans via a Commended for Support letter - Ref DWR9, following our submission to them this year as part of their accompanying process to the price review.

Welsh Water recognises the importance of catchment management for supporting the resilience of our water supply system from source to tap. We want to ensure that raw water entering our treatment works is of an expected, consistent and manageable quality - catchment management is our 'first line of defence' in achieving this. Effective catchment management provides us with an opportunity to help control chemical and energy usage, and the associated carbon emissions associated with water treatment processes. It encourages investment in the best value solutions that also support the natural capitals approach and promotes collaborations and joint working, allowing us to deliver the best possible service for our customers.

In this investment case, 'green solutions' have been applied to all activities undertaken in our extensive drinking water catchment management programme i.e., from risk assessments through to stakeholder engagement and delivery of solutions at both local and catchment scales.

This programme will deliver a combined investment of £26.6M (post efficiency, 2022/23 price base).

1.1 Methodology for identifying catchment management measures

The EA *Operational Instructions 794_15 Drinking Water Protected Areas* set out the processes for identifying, confirming and agreeing the risk status of DrWPAs, identifying and delineating Safeguard Zones (SgZ), and identifying, implementing and recording measures, writing SgZ action plans and reporting and recording successful implementation of measures. This process has been adopted by NRW and is being followed by Welsh Water for the continued assessment of all DrWPA drivers:

- **Part 1** – Identifying surface water DrWPAs
- **Part 2** - Confirming and agreeing the risk status of DrWPAs
- **Part 3** – Identifying and delineating surface water SgZs for ‘At Risk’ DrWPAs
- **Part 4** – Identifying, implementing, recording measures and writing SgZ action plans
- **Part 5** – Reporting and recording

These five steps are illustrated in Figure 1 below.

There is no current specific guidance for confirming the process for the de-designation of SgZ status.

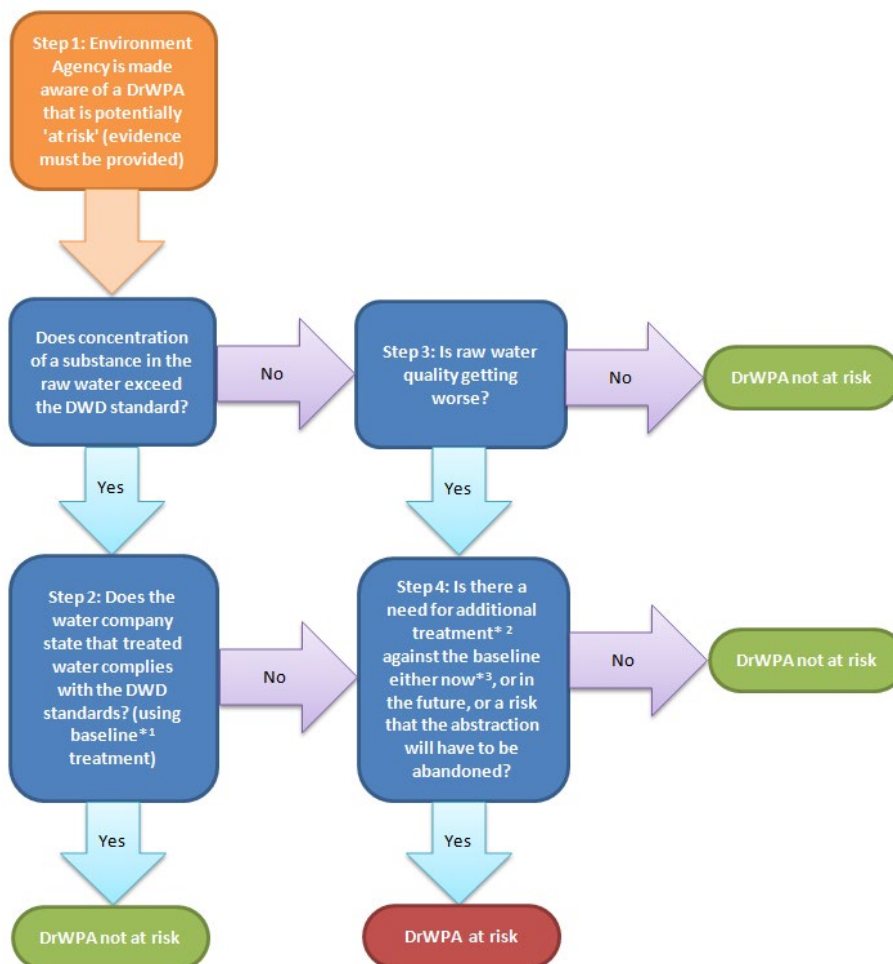


Figure 1 DrWPA risk review process (EA Operational Instruction 794_15 Drinking Water Protected Areas: Part 2 - Confirming and agreeing the risk status of DrWPAs).

1.2 Welsh Water Management Approaches

To comply with WFD Article 7.3, we have followed the assessment process set out above and, in AMP6, under the NEP driver DrW2, we completed comprehensive catchment characterisation exercises to determine the ‘At Risk’ status of each of our water treatment works (WTW) catchments. These assessments were submitted to NRW and the EA in 2020. The outcomes of these assessments enabled us to prioritise our intervention milestones for all our DrWPAs, subsequently we categorised our drinking water catchments into **three management approaches**, which will guide our intervention responses until at least 2050.

- At Risk
 - Recovery: where raw water quality is currently deteriorating in one, or a number of parameters from anthropogenic activities.
 - We worked with the EA and NRW to designate catchments deemed ‘At Risk’ of one or more failing parameters as SgZ. At the start of AMP7 there were 23; 1 in England and 22 in Wales.
- Not at Risk
 - Adaptive: where raw water quality is currently not deteriorating but may be impacted by future challenges.
 - Prevention: where co-design of new ways of working, at a landscape-scale, will prevent any deterioration in raw water quality.
- Our Bannau Brycheiniog Mega-Catchment (BBMC) programme which takes a landscape-scale approach (rather than assessing single risks in individual catchments)

Our catchment management approaches are mirrored by the EA & NRW PR24 DrWPA Drivers. NRW have confirmed that all catchments can be included in subsequent NEPs if programmes of work are being further developed, new geographical areas are being covered and new partnership networks are being established:

Table 1 WI/NEP DrWPA PR24 Drivers

WI/NEP DrWPA PR24 Driver code	WI/NEP DrWPA PR24 Driver description	Welsh Water Management Approach
W_DrWPA_INV1	Investigations for ‘at risk’ DrWPAs, groundwater safeguard zones (SgZ) or abstractions to identify cost effective actions to prevent deterioration, any need for catchment schemes, and / or cost beneficial actions to reduce treatment.	Adapt
W_DrWPA_IMP1	Implementation of actions through a scheme to improve water quality (ground and surface water) so the level of purification treatment can be reduced over time. Recommended by previous investigations and cost benefit analysis, and to meet DrWPA good chemical status objectives.	Recover
W_DrWPA_NDIMP1	Implementation of actions through a catchment scheme, or a wastewater treatment works, to prevent deterioration (or improve following a deterioration) in water quality to avoid an increase in the level of water purification treatment.	Prevent

The results of this analysis are mapped out in Figure 2 below, (with a WTW breakdown presented in Appendix A). Please note that there are overlaps between the 3 management approaches, as the individual ‘recover’ and ‘adapt’ catchments fall within the BBMC landscape-scale programme area.

Long-term Strategic Approaches to Catchment Management

- >100 Catchments
- Total area c. 11,000km²
- DCWW own <5% of land

-  **Recovery**
Safeguard Zones (SgZ)*
-  **Prevent**
Brecon Beacons Mega Catchment (BBMC)
-  **Adapt**
To change and emerging risks

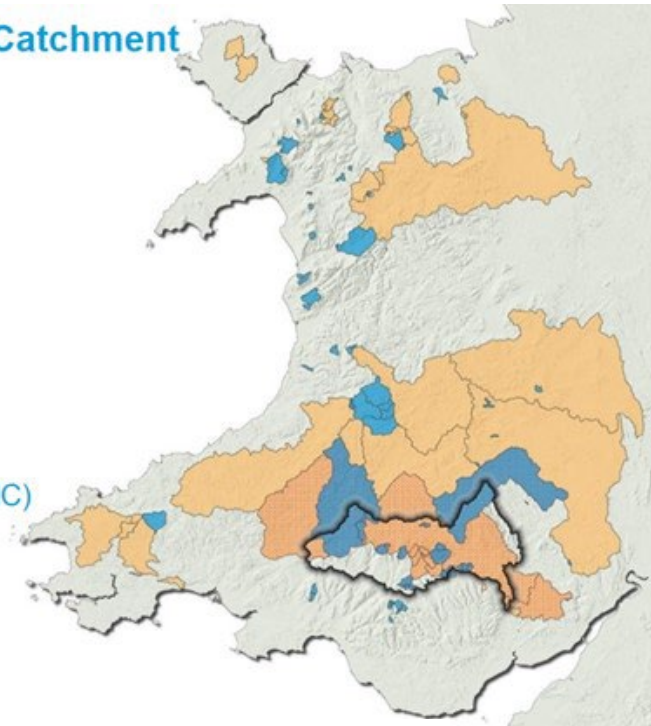


Figure 2 DrWPA risk status map

1.3 Measures Delivery Framework

The *Strategic Response 1 Journey Plan* has identified seven key 2050 outcomes which will deliver for our water treatment works and customers (see section 2.5 for full details):

Catchments are crypto risk free	We have complete understanding of how our catchments and reservoirs behave	Our customers no longer detect adverse taste and odours	Raw water quality is being maintained and/or improved through a robust land management strategy
Technologies to remove NOM are in place	Early warning systems are in place	Continuous identification and effect mitigation of emerging pollutants	

To realise these outcomes, Welsh Water acknowledge that our activities will need to respond and adapt to changing environmental, political and social pressures, and that commitments to catchment management will need to continue over multiple AMPs, as the payback period for benefits delivered may take years to realise.

In 2016, we launched our *WaterSource* guiding principles which underpin all of the schemes and activities we undertake. These continued in AMP7 and will form the basis of our AMP8 plans. They are:

- **Prevention not cure**
 - Ensure water quality is the best quality possible before it gets to the treatment works so fewer chemicals and less energy is needed during treatment
- **Evidence Based**
 - Routine water sampling, investigations and research helps us understand the root cause of issues and identify fit for purpose solutions
- **Right for our Customers**
 - Improving water quality while it is still in the environment helps keep bills low and protect the wider environment.
- **Inclusive and Collaborative**
 - Working with communities and business that live, work and visit our catchments to safeguard our water sources now and for future generations.
- **Delivering Multiple Benefits**
 - Catchment management has many additional benefits - we're helping with farm efficiency, biodiversity, forestry, tourism and safeguarding our natural resources for future generations

To support the effective delivery of our long term catchment management programme, in AMP7, we implemented a standard programme of targeted catchment solutions, across all our operational catchments, this will continue over multiple AMPs to drive the delivery of our solutions and interventions:

- **Risk Evaluation**
 - Understanding of challenges and risks to water quality through regulatory monitoring, catchment knowledge and Drinking Water Safety Plans
- **Smart Catchments**
 - Working towards a 'Digital Twin' that will allow us to better predict when water quality might be affected so that we can work smarter
- **Research Translation & Advanced Techniques**
 - Supporting cutting edge science to improve understanding of managing the causes of changes to water quality which impact Customer Acceptability
- **Partnership & Engagement**
 - Collaborating with partners and communities to raise awareness of the importance of safeguarding drinking water supplies now and for years to come
- **Mitigations and New Ways of Working**

- Co-designing solutions with our key stakeholders which will deliver multiple benefits for water, the environment and people.

Some of our AMP7 key achievements to date are shown in Figure 3.



Figure 3 AMP7 Key achievements

1.4 Collaborative Working

We cannot deliver this long term, multi-faceted programme of activities alone. We recognise that effective catchment management will only be achieved by working in collaboration with a variety of partners and stakeholders to drive the behaviour changes that are needed, across all organisations and sectors, to ensure long term resilience in our water environment. Some of our key partners are shown in Figure 4.



Figure 4 Welsh Water key partners

1.5 Structure of this Document

We have structured this document using the enhancement assessment criteria set out in Ofwat's PR24 Final Methodology, Appendix 9 (Setting Expenditure Allowances), Section A1:

ID from Appendix 9	Abbreviated Assessment Criterion	Addressed
A1.1.1 Need for enhancement investment	a Is there evidence that the proposed investment is required?	Section 2.1
	b Is the scale and timing of the investment fully justified?	Section 2.1
	c Does the proposed investment overlap with base activities?	Section 2.2
	d Does the need and/or proposed investment overlap/duplicate with previously funded activities or service levels?	Section 2.3
	e Does the need clearly align to a robust long term delivery strategy within a defined core adaptive pathway?	Section 2.4
	f Do customers support the need for investment?	Section 2.1
	g Have steps been taken to control costs, including potential cost savings?	Section 2.5
A1.1.2 Best option for customers	a Have a variety of options with a range of intervention types been explored?	Section 3.1
	b Has a robust cost-benefit appraisal been undertaken to select the proposed option?	Section 3.1
	c Has the carbon impact, natural capital and other benefits that the options can deliver been assessed?	Section 3.2
	d Has the impact of the proposed option on the identified need been quantified?	Section 3.2
	e Have the uncertainties relating to costs and benefit delivery been explored and mitigated?	Section 3.3
	f Where required, has any forecast third party funding been shown to be reliable and appropriate?	Section 3.4
	g Has Direct Procurement for Customers (DPC) delivery been considered?	Please refer to WSH50-IP00 Our Approach to Investment Planning (Section 3.4.1)
	h Have customer views informed the selection of the proposed solution?	Please refer to Stepping up the Challenge: Business Plan 2025-30 (Section 2.2)
A1.1.3 Cost efficiency	a Is it clear how the company has arrived at its option costs?	Section 4.1
	b Is there evidence that the cost estimates are efficient?	Section 4.2
	c Does the company provide third party assurance for the robustness of the cost estimates?	Section 4.1
A1.1.4 Customer protection	a Are customers protected if the investment is cancelled, delayed or reduced in scope?	Section 5.1
	b Does the protection cover all the benefits proposed to be delivered and funded?	Section 5.1
	c Does the company provide an explanation for how third-party funding or delivery arrangements will work for relevant investments?	Not applicable to this case

2. Need for Enhancement Investment

2.1 Evidence that Enhancement is Needed

***Is there evidence that the proposed enhancement investment is required?
Where appropriate, is there evidence that customers support the need for investment?***

Is the scale and timing of the investment justified?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.1a, A1.1.1b and A1.1.1f

The WFD provides the mandate to safeguard our drinking water supplies. The WI/NEP DrWPA drivers provide the mechanism to support the delivery of measure which will ensure that we are meeting obligations of WFD Article 7.3.

The AMP6 DrW2 NEP reports provided the evidence of raw water quality declines in many of our drinking water sources for a number of parameters, namely, pesticides, algae/nutrients/taste and odour, bacteria & cryptosporidium and sedimentation/Turbidity. These parameters can lead to significant challenges to downstream water treatment process, many also contribute to customer acceptability contacts. As a result of these assessments, we identified 23 ‘At Risk’ catchments which were subsequently designated as SgZs but EA and NRW.

There is also greater expectation from the DWI to assess the risk, understand the potential sources of new and emerging contaminants and collaborate with stakeholder to minimise these risks at source, e.g., Per- and polyfluoroalkyl substances (PFAS) – as outlined in Information Letters, 05/2021, 03/2022 and 02/2023. All current risks to raw water quality are documented through our catchment Drinking Water Safety Plans (DWSPs), where again there is an expectation that control measures are understood and influenced where possible.

We have very limited control over the way land is managed within our catchments. We abstract water for drinking from ~120 catchments, which cover an area of almost 11,000km² in Wales and parts of England. Land within our catchments is subject to a variety of land use types and management practices and we own limited land (<5%) within these areas. Land management, as well as natural characteristics such as climate, soils, geology and topography, all influence raw water quality. These characteristics are diverse and will change over time, in the last 5 years we have already experienced significant, unseasonal weather events (snow, floods, droughts etc.) which have driven deteriorations in raw water quality, either in the short-term or over a more prolonged period.

This enhancement case is the delivery route for achieving the inter-AMP outcomes of Welsh 2050’s SR1: *Safeguarding Clean Drinking Water through Catchment Management*:

- **Recover:** In AMP7 we targeted the reduction of 5 Safeguard zones and remain on target to achieve this. In AMP8 we will target a further 5 SgZs (4 in England and 1 in Wales), through delivery of our action plans against each zone.
- **Prevent:** In AMP7 we launched our BBMC landscape-scale initiative, which takes a more holistic approach to proactive risk management. The BBMC Vision and Goals have been established, a Steering Group has been set up to provide governance in our programme development and we are working in several joint partnerships. In AMP8 we will build and further develop our partnership network to work towards ‘One Wales’ for environmental management in the BBNPA boundary.
- **Adapt:** In AMP8 we will take the best practices and lessons learnt for all of our current schemes and activities to ensure proactive management of all other catchments. This will ensure that we will not need to designate new SgZs in the future.

Table 2 below details the key outcomes of our AMP7 activities and how they are linked to the next steps / forward progression through our AMP8 programme of work.

Table 2 AMP7 outcomes and AMP8 Planned Activities

SR1 2050 outcome	Catchment workstream	AMP7 Outcomes	AMP8 Planned Activities
Continuous identification and effect mitigation of emerging pollutants	Risk Evaluation	<ul style="list-style-type: none"> - DWSP Accreditation - Managed catchment assessments and baseline monitoring for understanding PFAS risks to drinking water quality (new DWI guidance) - Building pollution reporting networks through wider engagement with NRW & EA 	<ul style="list-style-type: none"> - Develop improved catchment characterisation techniques (using statistical analyses) - Align to new Drinking Water Standards Directive requirements for new parameters of concern - Run annual stakeholder workshops to demonstrate the impact of pollutions at WTW and importance of timely pollution reporting
Early warning systems are in place	Risk Evaluation & Smart Catchments	<ul style="list-style-type: none"> - Installation of in-reservoir profiling systems at strategic reservoirs and x1 upstream river intake. Used data to inform reservoir draw-off management options - Trialling Citizen Science for evidence gathering 	<ul style="list-style-type: none"> - Add to existing in-reservoir and upstream river profiler network - Trial joint monitoring opportunities with other stakeholders for 'One Wales' overview - Expand Citizen Science network
We have complete understanding of how our catchments and reservoirs behave	Smart Catchments	<ul style="list-style-type: none"> - Reservoir bathymetric surveys completed on operational reservoirs - Trialling techniques in earth observation to support remote monitoring of water quality changes (Pontsticill catchment) - Developed methodology for hydro-connectivity mapping 	<ul style="list-style-type: none"> - Apply robust time of travel calculations on river systems - Implement a catchment 'Digital Twin' at 2 trial catchments - Understand the impact of the water/sediment interface on raw water quality changes
Our customers no longer detect adverse taste and odours	Research Translation & Advanced Techniques	<ul style="list-style-type: none"> - Worked with academia to demonstrate that T&O production is highly variable and linked to algae productivity, not biomass. T&O production is driven by nutrient ratios not nutrient loading. - A predictive model for Glascoed developed to forecast T&O risk (over a 2 week period) - x2 peer-reviewed research papers published 	<ul style="list-style-type: none"> - Use existing monitoring data and predictive model methodology to develop raw water quality forecast models for x3 more catchments - Work with leading academics to transfer learning from new climate change impacts into T&O sensitive drinking water catchments - Publish further papers in respected journals.
Technologies to remove NOM are in place	Research Translation & Advanced Techniques	<ul style="list-style-type: none"> - Worked through CEH FREEDOM model to understand DOC releases are not likely to increase significantly if current peatland conditions remain in at least the same status - Central Beacons partnership established to support collaborative working in peatland restoration (BBNPA area) 	<ul style="list-style-type: none"> - Join up with Wales Nation Peatland Action Programme to deliver restoration activities in more areas (not supported by NRW in AMP7)
Catchments are crypto risk free	Partnerships, Engagement & Mitigations	<ul style="list-style-type: none"> - Attendance at shows and events to engage members of the public in the importance of raw water source protection. - Trial of forest management planning for total ecosystem design (TED), to provide multiple benefits for water & biodiversity. - Run the annual WaterSource conference held to inform stakeholders of catchment management progress. - Established the Beacons Water group as our flagship for engaging with land management groups (award-winning partnership). Case study of activities used to support potential initiatives in the new Wales Sustainable Farming Scheme (SFS). - PestSmart is multi award-winning for monitoring, messaging, trial solutions and partnerships. Social science research paper published. 	<ul style="list-style-type: none"> - Promote messages and offers via local shows and events (x6 per year) - Establish TED at Pontsticill forestry - Use Beacons Water Group as the structure for setting up x7 new Water Groups to engage and trial new technologies on land (x1 in each target SgZ and a further x2 in the BBMC) - Use PestSmart as the framework for setting up new campaigns in nutrients/soil health and animal health - Trial 'exemplar farming' management in collaboration with National Trust & BBNPA (farm in BBMC) - Publish further papers in respected journals. - Undertake joint working with United Utilities, Severn Trent Water and Hafren Dyfrdwy in the River Dee (part of WINEP scheme)
Raw water quality is being maintained and/or improved through a robust land management strategy	Partnerships, Engagement & Mitigations	<ul style="list-style-type: none"> - Established the Beacons Water group as our flagship for engaging with land management groups (award-winning partnership). Case study of activities used to support potential initiatives in the new Wales Sustainable Farming Scheme (SFS). - PestSmart is multi award-winning for monitoring, messaging, trial solutions and partnerships. Social science research paper published. 	<ul style="list-style-type: none"> - Promote messages and offers via local shows and events (x6 per year) - Establish TED at Pontsticill forestry - Use Beacons Water Group as the structure for setting up x7 new Water Groups to engage and trial new technologies on land (x1 in each target SgZ and a further x2 in the BBMC) - Use PestSmart as the framework for setting up new campaigns in nutrients/soil health and animal health - Trial 'exemplar farming' management in collaboration with National Trust & BBNPA (farm in BBMC) - Publish further papers in respected journals. - Undertake joint working with United Utilities, Severn Trent Water and Hafren Dyfrdwy in the River Dee (part of WINEP scheme)

Our approach to customer engagement is set out in Stepping up to the Challenge: Business Plan 2025-30 (Section 2.2).

In conversations with customers and stakeholders catchment management approaches receive broad support. Our Customer Challenge Group have also given strong support for the initiatives set out.

Whilst we have not engaged customers specifically for their support for our catchment management programme, we know from our PR24 Phase2 customer engagement research (October 2022) that there is appetite for environmental protection. We understand from this research that customers expect climate change and population growth will impact on water resources in the future and that participants of the research still thought investing in our long term plans for safe drinking water, reliable water supplies and protecting the environment should continue. 38% of customers ranked river water quality and 29% of customers ranked contamination from land, in their top 3 objectives that they think are most important to address in our long term plans.

The independent Chair of our BBMC Steering Group met with the Chair of our Customer Challenge group in August 2023, who also confirmed customer support for our WaterSource approach and programme of activities. We present any new schemes to our Independent Environment Advisory Panel (IEAP) for their challenge and support.

We also facilitate a BBMC Steering Group, which meets quarterly to provide governance of our programme of activities and explore joint working opportunities. Here are some testimonials from members about our *Beacons Water Group (BWG)* initiative:

- *AT (farmer): The exchange we've had with other groups makes you realise quite how much you've learnt which gives you more confidence in what you're doing.*
- *RR (farmer): The group is diverse from a range of different farming systems which means each member has complementary skills and experience to share.*
- *DT (farmer): The group has developed a lot of really good practical experience and knowledge and is now at a point where we can look to expand that knowledge further and how we share it more widely.*
- *CMJ (CEO, Bannau Brycheiniog National Park Association): Having farmers engaged and working on solutions is essential.*
- *CdW (Country Land & Business Association (CLA): The group are taking forward much needed practical changes to deal with water resource issues given climate change and all that entails.*
- *PW (senior lecturer in environmental management, Bangor University): They clearly are an informed and visionary group of farmers who understand the need for their business to be sustainable from an economic and environmental perspective.*

To engage NRW and EA colleagues in our Safeguard Zone programme of activities, we hold:

- quarterly update calls with their Water Policy leads to review progress towards achieving our AMP7 MoS
 - to date NRW & EA have accepted our progress as being on track to deliver the MoS outcomes by the end of AMP7
- workshops and joint working meetings with local colleagues to explore joint working opportunities.

Since 2017, we have also held 5 *WaterSource* conferences, which provide a platform to share and demonstrate the actions being taken by us and our partners, to address the unparalleled challenges our drinking water sources face from land use pressures and climate change. These conferences are attended by Regulators and Legislators, academia, NGOs and local stakeholders Information (including agendas, presentations, videos etc.) on our previous events is available on our [corporate website \(WaterSource Conferences\)](#):

- **WaterSource17** - launching our *WaterSource* approach to catchment management and exploring support for the *Bannau Brycheiniog Mega Catchment (BBMC)* concept.

- **WaterSource18** – bring international best practice learning to Wales with New York’s Department for Environmental Protection and the Watershed Agricultural Council (WAC), based in the Catskills Mountains, New York.
- **WaterSource19** – shaping our AMP7 catchment management programme with support of our key stakeholders.
- 20/21 Covid restrictions – no conferences held.
- **WaterSource22** – linked to the Welsh Government Minister for Climate Change (Julia James, MS) Biodiversity Deep Dive, understanding the challenges and opportunities to deliver more from catchment management through enabling effective collaboration.

Each year we attend several county shows and events where we have the opportunity to engage our customers on our programme of activities. *For example* in 2023 we attended shows at; Brecon, Anglesey, Lampeter and Pembrokeshire and the Royal Welsh Summer Show where we engaged with over 150 members of the public and local land managers.

Details about our WaterSource approach and some of the schemes we have run are detailed on our [corporate website \(WaterSource\)](#) – e.g., in 2022/23 these pages have received over 5,000 views.

Our Twitter account *#WaterSourceDCWW* has 108 followers and our posts have received more than 14,000 views.

We have worked with our partners to design and deliver many of the schemes we undertake, below are examples of how well they have been received:

Impact of Weed Wiper Trial

- Respondents were asked how likely they were to participate in potential future *WaterSource* schemes because of participating in the Weedwiper trial. Three quarters said are likely (13%) or definitely (62%) going to take part in future schemes.
- 80% of respondents reported having improved knowledge of best practice for managing weeds and using herbicides, and 85% now recognise other approaches to managing weeds.

Impact of Pesticide Disposal Scheme

- 100% of participants said they would recommend the scheme.
- 70% of respondents agreed that scheme helped them to increase their awareness of responsible use of pesticides and over 50% agreed that the scheme helped them change practice in buying and disposing of pesticide products.

Impact of Be PestSmart Campaign

- Be PestSmart campaign launched in 2021 and in first year generated 14million digital and social impressions generating over 64,000 views of the website, and media coverage on TV and radio.

2.1.1 Scale and Timing of Investment

This enhancement case is the next phase in our long term approach to achieving Welsh Water 2050 Strategic Response 1 outcomes. It will also build resilience in our water supply chain to ensure a consistent, reliable and manageable raw water quality in our catchments, post 2050.

As described above, in AMP7 we have built a robust approach to catchment management in Welsh Water. In order to ensure efficiencies and retain the momentum, funding for future activities and schemes must continue, uninterrupted, AMP on AMP otherwise we will lose the trust and support of our local and national stakeholders. It would take a significant amount of time and effort to re-establish the programme in subsequent AMPs and we would likely have to start over with delivering our programme of activities.

Our catchments cover a total of 11,000km² in our operating area in Wales and parts of England:

Recover.

- In total our SgZs cover ~81% of our operating area (i.e., 8,948km²).
- We are building on the momentum gained from our AMP7 programme of activities, which are driving the achievement of our **Measure of Success (MoS) Wt7: Water Catchments Improved**, where the removal of SgZ status from 5 of our 23 WTW catchments is expected to be realised (1% of total SgZ area).
- In AMP8, there is a significant step change in the geographical area to be targeted by SgZ activities. We will be delivering all measures identified in our Actions Plans for the next 5 SgZs to be targeted, these cover 2,716km² (~30% of the total SgZ area).
From our work described above we are confident that all our solutions will scale up to the area needed. i.e. our multi award-winning PestSmart programme has provided us with a robust methodology for undertaking future large-scale awareness and engagement campaigns (Soil and Animal Health campaigns will be developed in the future), the award-winning Beacons Water Group is providing a best practice framework for collaborations with land managers at a local level, and our work with academia is translating leading scientific outcomes to ensure we fully understand the root causes and triggers of raw water quality changes.
- Four of the five SgZs are included in PR24 NEP under the W_DrWPA_IMP1 driver. The fifth catchment is in England and is not in the WINEP (see comment in Appendix D)

The scale and the timing of target catchments are based on the number of parameters of concern, geographical area of each catchment, number of potential stakeholders to engage with and the associated complexity of delivery measures, with less complex catchment being focus areas in earlier AMPs.

Our current MoS will continue to be reviewed at the end of each AMP to ensure its continued appropriateness, as it is recognised that the impact of catchment management solutions at the point of abstraction, may take several AMPs to be realised. We will continue to deliver the measures identified on our SgZ Action Plans, which have been accepted by NRW/EA, to meet the trajectory of recovering the raw water quality in all SgZs by the end of AMP11:

Prevent.

- In total the BBMC covers ~12% of our operating area (i.e. 1,350km²).
- The BBMC Mission, goals and programme were firmly established in AMP7.
- In AMP8 we will further develop our programme of activities to build new networks and engage with new stakeholders and undertake a suite of new partnership projects that are protecting the water environment as well as delivering multiple benefits.
- The geographical coverage of the BBMC area remains constant.
- These catchments are included in PR24 NEP under the W_DrWPA_NDIMP1 driver.

Adapt.

- In total our adaptive management catchments cover the remaining ~7% of our operating area (i.e.~700km²)
- In AMP8 we will continue to develop our Pan-Wales campaigns, i.e. PestSmart and work to ensure that we are applying lessons learnt and new approaches, in order to prevent the need for future designation of additional SgZs.
- These catchments are included in PR24 NEP under the W_DrWPA_INV1 driver.

The effective delivery of our AMP8 programme will be dependent on engagement and buy-in from external stakeholders. Collaboration with our partners and communities is key to raising awareness of the importance of safeguarding drinking water supplies both now and for years to come.

2.2 Overlap with Activities to be Delivered through Base

Does the proposed enhancement investment overlap with activities to be delivered through base?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.1c

In AMP7 we were funded to deliver activities in 5 SgZ catchments, which cover just 87 km² of our total catchment area. It also funded, the development of our BBMC initiative. Our work in AMP8 and beyond will continue to build on our successes in both these programmes and initiatives and deliver more activities against SgZ Action Plan measures and the BBMC aims and objectives.

In AMP8 we will be utilising base allowance for the servicing and maintenance of the installed in situ monitoring equipment installed in AMP7 e.g., reservoir profilers and upstream river monitors. We will also need to keep our data licences up to date, this will also be taken from base.

2.3 Overlap with Funding from Previous Price Reviews

Does the need and/or proposed enhancement investment overlap with activities or service levels already funded at previous price reviews?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.1d

Previous AMPs (5-7) have seen successive Enhancement investment across multifaceted catchment management approaches. There is no duplication as this enhancement case and proposed work builds on lessons learnt from previous AMPs. It supports and expands our successful approach into new geographic areas. The proposed work will deliver activities in areas which had not previously received investment towards delivery of the SR1 outcomes.

Catchment Management History



Figure 5 Catchment Management History

This enhancement case will build on the AMP7 enhancement programme which was supported by EA, NRW, Ofwat and DWI working new catchments to deliver against the SgZ (Recover management approach) whilst continuing to deliver against BBMC (prevent) and our Pan-Wales measures (adapt).

The AMP8 NEP includes all catchments in Wales, under the 3 DrWPA drivers, these schemes have been approved in principle by NRW (awaiting final sign-off of PR24 NEP).

2.4 Alignment with the Long Term Delivery Strategy

Is the need clearly identified in the context of a robust long term delivery strategy within a defined core adaptive pathway?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.1e

Welsh Water 2050 has clearly defined long term ambitions as set out in each of the strategic responses. Their associated Journey Plans provide a clearly defined pathway to delivery of the expected outcomes.

This enhancement case is required to deliver the next phase of Strategic Response 1: *Safeguarding clean drinking water through catchment management* (Figure 6) which is achieving our long term ambitions. Alternative pathways have been assessed looking at a range of expectations on landowners to directly manage their own impacts on raw water, as well as pathways considering third party funding in the delivery of joint projects. Further details can be seen in WSH01 Long Term Delivery Strategy.

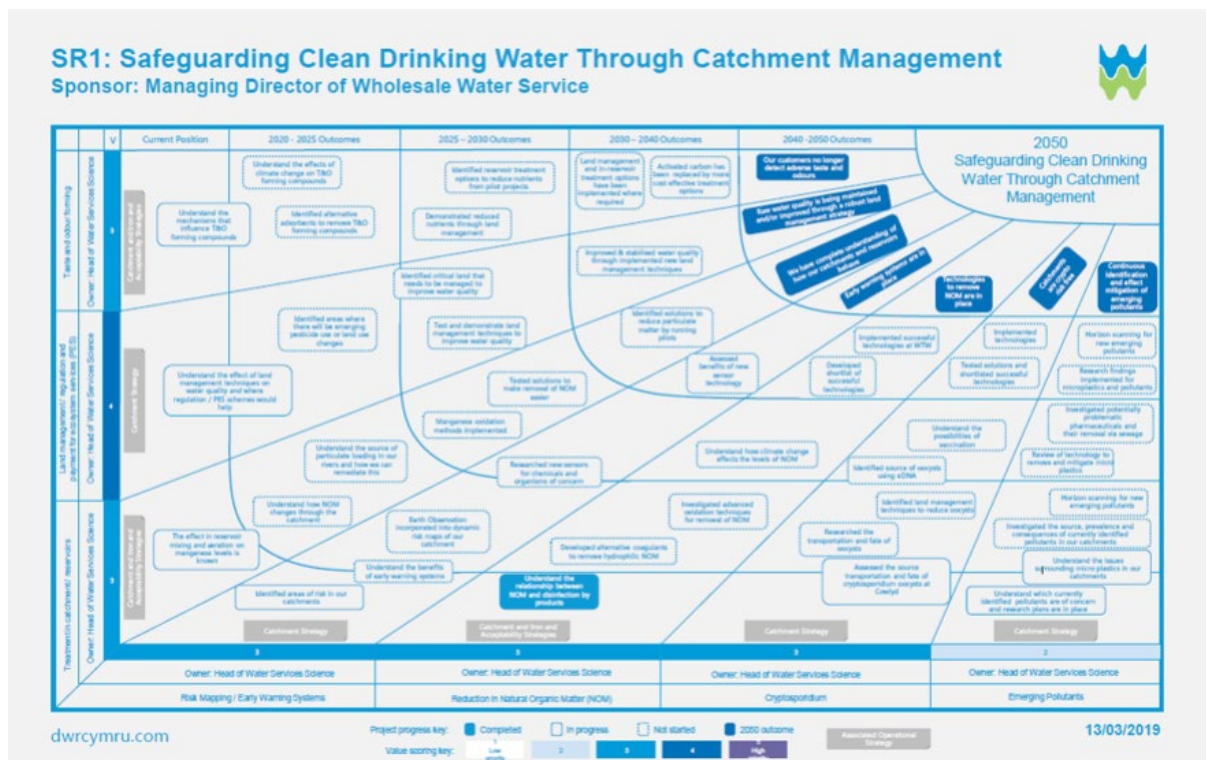


Figure 6 Safeguarding clean drinking water through catchment management

2.5 Management Control of Costs

Is the investment driven by factors outside of management control? Is it clear that steps been taken to control costs and have potential cost savings been accounted for?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.1g

The investment is driven by factors outside of our control because: 1) Welsh Water abstract from ~120 catchments covering an area of almost 11,000km² in Wales and parts of England, however, we own

less than 5% of the land within these catchments so have limited direct influence on land management activities and 2) climatic changes have a significant impact on raw water quality.

The actions of external stakeholder across these areas, as well as climate and land use policy changes, all have the potential to impact on water quality. Without catchment management investment (do nothing option) the impacts of raw water quality declines would need to be fully mitigated at the downstream water treatment works,

As outlined above, in our summary of key achievements, all of the catchment management work we undertake is being further built on so that we become more effective and are able to achieve greater cost savings.

The impact of our catchment management work is best outlined by our award-winning *Be PestSmart* Campaign. This campaign was developed to raise awareness of the importance of safeguarding people, water and wildlife from pesticide losses, whilst promoting integrated pest management and the use of more natural alternatives as best practice. The campaign has been running since 2021 and to date has cost ~£250,400.

So far we have achieved:,

- Over **20 pieces of media coverage** including features on TV (ITV Wales Coast & Country), BBC Radio Wales items and articles in Kitchen Gardener and Amateur Gardening publications
- **78 million impressions** from our digital and social media adverts
- Attendance at shows and events with more than **300,000 social media followers**
- Working with **15 influencers and ambassadors** including Terry Walton, Huw Richards and Naomi Saunders
- The development of a website to host evergreen content that can be used for many years to come. The site has received over **231,000 views** to date.

This shows the reach we can achieve with a relatively small investment. The success of this approach has already allowed us to defer capital expenditure on our WTW estate.

In Table 3 below, we have identified several factors which are outside of Welsh Water’s direct management control.

Table 3 Identified risk to Welsh Water’s catchment management programme

Description of Risk	Present Mitigation	Mitigation RAG Status	Further Mitigation Actions	Timescale	Post Mitigation RAG Status
Climate Change/ extreme events e.g. 2022 drought	AMP7 schemes will improve landscape resilience. Local operational monitoring reviewed through regular review meetings /WTW optimisation response	RED	Review of 2022 data and impact ongoing, plans to be revised as required. Continued risk assessment through DWSPs and WTW operating plans revised.	March 2023	AMBER

Description of Risk	Present Mitigation	Mitigation RAG Status	Further Mitigation Actions	Timescale	Post Mitigation RAG Status
Uncertainty of security of long term funding - this is a long term approach/ long delivery timescales	AMP7 Investment programme provides security of approach to 2025. Working with partners on externally funded programmes which go to 2027 for some catchments.	AMBER	Requires multi-AMP investment, AMP8 plan developed. Explore alignment of catchment management with Welsh Government (WG) land management funding (Sustainable Farming Scheme (SFS) replacing CAP)	Funding in place to March 2025	AMBER
Unwillingness of key stakeholders to change their land use practices	Develop good working relationships with key sector land regulator leads. Projects supported by NRW/ WG.	AMBER	Continue with approach. Work closely with environmental regulators (and apply legal action if required)	Funding in place to March 2025	AMBER
Land use change	Catchment intelligence and assessment of new and emerging risks	AMBER	Continue to developing stakeholder relationships to improve intelligence/ understanding of water quality	March 2025	AMBER
Difficulties of joined up working across the business	Increased effort to share expertise and join workstreams, SMNR teams	AMBER	Joint working with Waste on NRW 4 Rivers for LIFE project. Pilot of 'multi-Capitals' approach in AMP8.	March 2027	GREEN
Reputational damage from management of Welsh Water land	Support and advise estate management where appropriate. Pollution prevention plans e.g. for Alwen wind farm, Garwnant Forest Holidays developed.	AMBER	Ensure estate management is included in future PR planning.	September 2023	GREEN
Recruitment of skilled staff	Our Programme team expanded in 2020. Supporting new sustainability degree at Black Mountains college.	AMBER	Continued investment in skilled staff. Working with WG on sector resource needs e.g. Biodiversity Deep Dive exploring green jobs, apprenticeships	Funding in place to March 2025	GREEN
Covid-19 impact on AMP7 Programme delivery	AMP7 Yrs 1 & 2 primarily focused on programme development so limited long term impact.	AMBER	Virtual alternatives have limited value. Return to limited in-person engagement in progress.	Programme completes March 2025	GREEN

Description of Risk	Present Mitigation	Mitigation RAG Status	Further Mitigation Actions	Timescale	Post Mitigation RAG Status
Changing/ new regulations: <ul style="list-style-type: none"> • Land use • Water Quality 	Supporting WG to develop post-EU publicly funded land management schemes Research into PFAS, DBPs, T&O	GREEN	Ongoing sharing of best practice/ programme outcomes and evidence to inform WG and DWI as appropriate	March 2025	GREEN
Scientific limitations and understanding	Funding research and innovation into key challenges e.g. T&O, PFAS investigations	GREEN	Continue to fund research and innovation on key challenges	March 2025	GREEN

4. Best Option for Customer

In this section we will describe how we have developed options for addressing the need identified above.

The four sub sections below correspond to the eight criteria set out in Ofwat's PR24 Final Methodology, Appendix 9 (Setting Expenditure Allowances), Section A.1.1.2.

4.1 Identification of Solution Options

Has the company considered an appropriate number of options over a range of intervention types to meet the identified need?

Is there evidence that the proposed solution represents best value for customers, communities, and the environment over the long term?

– Ofwat's final methodology for PR24, Appendix 9, A1.1.2a, A1.1.2b

In AMP7, Welsh Water adopted a standardised approach to the delivery of catchment management measures and the key workstreams which is the framework we will follow across subsequent AMP8:

Management Approach	Workstreams
Recover (SgZs)	Risk Evaluation
Prevent (BBMC)	Smart Catchments
Adapt (Other Catchments)	Research Translation and Advanced Techniques
	Partnerships and Engagement
	Mitigations and New Ways of Working

Table 44 below illustrates the range of activities within each workstream:

Table 4 Workstream activities.

Risk Evaluation	Smart Catchments	Research Translation & Advanced Techniques	Partnerships & Engagement	Mitigations and New Ways of Working
Understanding of challenges to raw water quality through regulatory monitoring, catchment knowledge and DWSPs	Develop a 'Digital Twin' for prediction of raw water deteriorations, for abstractions management and WTW optimisation	Supporting cutting edge science to achieve better understanding of how we can better manage the causes of changes to water quality which impact Customer Acceptability	Collaboration with partners and communities to raise awareness of the importance of safeguarding drinking water supplies	Co-designing solutions with our key stakeholders which will deliver multiple benefits for water, the environment, and people.
Examples of Activities in each Workstream....				
Drinking Water Safety Plans	Real-time monitoring networks	Sponsorships & Apprenticeships	Predictive Modelling of T&O events	Integrated Capitals in estate management
Emerging contaminants sampling	Integrated Catchment Modelling (digital twin)	Events & Shows	Research Hub	On-Farm best practices / precision farming
Catchment Operating Manuals	Smart data and analytics for early warning	Messaging and Digital Promotion	Earth Observation satellite data for risk prediction	Community & Wellbeing

Within these broad themes we have undertaken a longlisting and shortlisting process of traditional and non-traditional options to meet the requirements as outlined in the needs statement. Longlisting Options are detailed in Table 5.

Table 5 Long List Options

Option	Type of Option	Brief Description of Option and Comments	Potentially Viable, i.e., progress to shortlisting?
1	Eliminate, reduce or delay the need for change. Manage demand	Not Viable: Even if demand for raw water volumes were decreased, the sources would still be subject to the same land management and climatic influences that influence raw water quality.	
2	Maintain the effective risk controls already in place. Manage operation or use of the existing asset or service	Partially Viable: The long term approach to catchment management is to ensure water entering the WTW is of consistent, manageable and reliable water quality. This can be achieved through changing the operation/use in the catchments by changing stakeholders use of pesticides and their impact on the catchment. In isolation this approach would not be efficient and effective.	
3	Maintain the effective risk controls already in place. Maintain the existing asset or service	Partially Viable: The long term approach to catchment management is to ensure water entering the WTW is of consistent, manageable and reliable water quality. This can be achieved by influencing factors that impact upon surface water run off which in turn impacts on river water quality. In isolation this approach would not be efficient and effective.	
4	Maintain the effective risk controls already in place. Replace the existing asset like-for-like	Not viable: Replacing a water source with another would still result in the same underlying catchment issues	
5	Enhance existing resources or add new resources. Enhance/upgrade the existing asset or service	Partially Viable: Long term approach to catchment management is to ensure water entering the WTW is of consistent, manageable and reliable water quality. This can be achieved by enhancing elements of the catchment such as through estates management practices. In isolation this approach would not be efficient and effective.	
6	Maintain the effective risk controls already in place. Mothball/dispose of the existing asset or service	Not viable: no other new sources available without significant investment. Could not replace all existing sources for new.	
7	Enhance existing resources or add new resources. Create/acquire a new asset or service	Not viable: no other new sources available without significant investment. Could not replace all existing sources for new.	
8	A blend of the above interventions	Viable: No single intervention is viable and a blend of different approaches is required based on the specific requirements for different elements within a catchment.	

Shortlisted Options:

- Option 2 - Manage operation or use of the existing asset or service
- Option 3 - Maintain the existing asset or service
- Option 5 - Enhance/upgrade the existing asset or service
- Option 8 - A combination of options 2, 3 and 5

A combination Solution (Option 8) would be capable of addressing the business needs effectively, for each of our management approaches i.e. recover, prevent, adapt.

The longlisting and shortlisting process undertaken has been supported by a cost benefit analysis (CBA) using our standard approach, set out in WSH50-IP00 Our Approach to Investment Planning (Section 4.3). The proposed solutions include quantification of risk and benefit over the long term via service measure framework (SMF) values, including valuation of the following criteria: natural capital; social capital; human and intellectual properties.

The table below is an extract from the Bannau Brycheiniog Mega Catchment CBA. It shows a combined solution (Option 8) vs a do-nothing approach. All monetary values are expressed in 2022/23 prices and are prior to portfolio adjustments for corporate overheads and efficiency challenge. Welsh Water ref: SMF version 5.

In each case the optimal solution has been chosen that provides the highest net benefit. For example, in the BBMC example below the enhancement expenditure produces a very significant set of benefits relative to the “do nothing” option.

Table 6 BBMC example against ‘do nothing’ option

Solution Option	Option Name	CAPEX	Present Value Whole Life Costs (WLC)	Present Value Whole Life Benefits (WLB)	Benefit/Cost Ratio	Net Present Value (=WLB - WLC)
Conventional Solution	Do Nothing	£0	£0	0	N/A	-
Option S1	BBMC Enhancement	£9.246M	£8.299M	£39.912M	4.81	£31.613M

4.2 Quantification of Benefits

Has the company fully considered the carbon impact, natural capital and other benefits that the options can deliver?

Has the impact (incremental improvement) of the proposed option on the identified need been quantified, including the impact on performance commitments where applicable?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.2c, A1.1.2d

Our Catchment Management programme follows the guiding principle of delivering multiple benefits, where it is appropriate to do so. Natural capitals and wider societal capitals have been considered through application of our SMF.

We have included an excerpt of benefits from our CBA for the preferred option on this enhancement case below. The largest contributor to the overall benefits being the Drinking Water Quality Sampling Programme (i.e., water quality failures) which accounts for 83% of the total.

Table 7 below shows the benefits across the whole programme, the table in section 3.2 above represents the single largest project, BBMC, within the programme.

Table 7 Programme benefits

Scenario	Benefits from AMP8 Spend relative to baseline			
	Drinking Water Quality Sampling Programme	Drinking Water Quality - Complaints	Interruption to Supply	Total
Preferred	83.3%	11.2%	5.4%	100%

The benefits have been calculated on an assumed reduction in the frequency of water quality failures (pesticides, cryptosporidium, bacteria and taste/odour) from once every 10 years, to once every 25 years for the individual projects within the programme. These are low likelihood but high consequence events.

Our approach to catchment management will support delivery against our performance commitment for water quality contacts. Our overarching approach to this area is set out in WSH54-CW02 - Improving Acceptability of Tap Water – Networks. We have assumed a benefit of 0.05 contacts per thousand population from the work in this enhancement case.

4.2.1 Quantifying the Impact on Need and Performance Commitments

UKWIR research 19/EQ/01/17: *Catchment Management for water quality and quantity* evaluated whether catchment management makes a difference to water quality and quantity. The project included a structured evidence review and interviews of water company catchment leads. Over half of the evidence (122 catchments) demonstrated an improvement in water quality from catchment management.

We continuously aim to assess the impact of our larger catchment management schemes. For example, in partnership with the University of Leeds, our PestSmart approach, the Weed Wiper Trial was used as a case study in [behaviour change research summary](#). The study showed that working collaboratively with the land managers in the areas around our rivers and reservoirs through behaviour change campaigns can deliver quantifiable improvements on water quality. Research paper was published in the [Journal of Environmental Management](#).

Since AMP6 our catchment management schemes have also been recognised as industry leading through several awards:

- Water Industry Achievement Awards 2016
 - Partnership of the Year (Weedwiper Partnership)
- Institute of Water Innovation Awards 2016
 - National Runner Up (Weedwiper Trial - brush the rush)
 - Regional winner (Weedwiper Trial - brush the rush)
 - Category winner – Collaborative Working – (Weedwiper Trial - brush the rush)
 - Category winner – Technology (Chemcatcher® – tracing pesticide in raw water)
- Institute of Water Innovation Awards 2017
 - Regional winner 2017 (EcoStable Slopes)
 - Category Winner – Environment (EcoStable slopes)
 - President’s Award – In-step with catchments
- Institute of Water Innovation Awards Regional 2020
 - Category Winner – Collaborative Working (PestSmart Initiative)
- Chartered Institute of Public Relations Awards 2022

- Category runner up - Best Integrated Campaign (Be PestSmart campaign)
- Institute of Water Innovation Awards Regional 2023
 - Category runner up – Market Adaptation (Be PestSmart)
 - Chairman’s Award – Beacons Water Group

The work in our catchments underpins the drive to ensure raw water quality is manageable, reliable and consistent. This in turn reduces the risk of water quality failures at our water treatment works. [The activities set out in this case are designed to manage risk and counteract the detrimental impacts of climate change. As such we have not set a step change output in the common performance measures CRI, customer contacts about water quality or water supply interruptions. This is because the measures are to mitigate future deterioration and the benefits of work in catchments tend to be seen over the longer term, not within the 5 year investment period they are delivered. We have estimated that the impacts of this work will reduce the risk of failure from once every 10 years to once every 25 years.

4.3 Uncertainties relating to cost and benefit delivery

Have the uncertainties relating to costs and benefit delivery been explored and mitigated? Have flexible, lower risk and modular solutions been assessed – including where forecast option utilisation will be low?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.2e

Our methodology is set out in WSH50-IP00 Our Approach to Investment Planning (Section 4.3). This includes commentary on our approach to optioneering, costing and cost benefit analysis.

Due to the nature of catchment management work and the external influencing factors (Climate Change, stakeholder receptiveness and engagement, land use change and policy), there will always be a level of uncertainty. Learning from previous and ongoing successes such as the Weedwiper trial and Beacons Water Group, we will be building on experiences and lessons learnt to continue working towards our future goals and safeguard our raw water sources to ensure raw water quality is manageable, reliable and consistent for future generations.

For this enhancement case we have evaluated a wide range of options in line with our TotEX hierarchy approach, as shown by our aforementioned longlisting and shortlisting process which highlights associated risks and constraints.

While the benefits of an individual project within this work package is uncertain, at the aggregate level, as we complete many small value projects in the aim of a wider goal, there is a much more certain level of benefit in total. The long term and spill over benefits of a catchment management approach to the environment and society are well evidenced.

4.4 Third Party Funding

Has the scale of forecast third party funding to be secured (where appropriate) been shown to be reliable and appropriate to the activity and outcomes being proposed?

– Ofwat’s final methodology for PR24, Appendix 9, A1.1.2f

This enhancement case does not include or rely on third party funding. However, we will consider future joint funding of collaborative working / co-financing where appropriate.

As examples, in AMP7 we leveraged around £17M of third-party funding, from ~£420,000 of Welsh Water direct contributions (see Table 5 for details). These projects further supported Welsh Water’s catchment management programme, where we recognised that by working in partnership, we could deliver multiple benefits beyond safeguarding the water environment i.e., community involvement, biodiversity/habitat restoration, carbon, citizen science.

This funding has not been required to deliver the benefits of our investment programme, but co-action has allowed wider benefits to be achieved. We do not expect third parties to fund elements of this programme in AMP8 but will seek funding to help our investment go further – to deliver benefits beyond those set out in this enhancement case.

Table 8 Project Funding

Project (funding body)	Welsh Water Cash Funding	Total Grant Value (funding to deliver benefits beyond Welsh Water's water quality driver)
PestSmart (Welsh Gov)	£34,800	£1,000,000
Taf Fechan Community project (RACT)	£28,367	£40,000
Crypto Innovation Partnership (EIP)	£2,447	£40,000
CaSTCo (Ofwat)	£150,000	£7,100,000
SW Rivers4 LIFE (NRW)	£200,000	£9,000,000
Glascoed (NRW)	£25,000	£25,000
TOTAL	£417,600	£17,205,000

5. Costing Efficiency

In this section we give specific details on our approach to costing and benchmarking. Our overarching approach to developing efficient costs is set out in WSH50-IP00 Our Approach to Investment Planning (Section 4.10).

The two sub sections below correspond to the three criteria set out in Ofwat's PR24 Final Methodology, Appendix 9 (Setting Expenditure Allowances), Section A.1.1.3.

5.1 Developing a cost for Green Solution.

Is it clear how the company has arrived at its option costs? Is there supporting evidence on the calculations and key assumptions used and why these are appropriate? Does the company provide third party assurance for the robustness of the cost estimates?

– Ofwat's final methodology for PR24, Appendix 9, A1.1.3a and A1.13c

We have used the historic trend analysis and extrapolation approach, described in section 5 Costing Methodology of the 'Overview: How we have developed our investment plan' to cost this investment case.

Due to the complex and diverse nature of our catchment management schemes and activities there are limited standard unit costs associated with the work we undertake. Our AMP8 programme has been developed from costs incurred through our AMP6 and AMP7 expenditure. These have been adjusted to account for i.e., inflation, increasing geographical coverage and upscaling.

All projects are undertaken in line with achieving best value through the appropriate procurement practices.

Along with our overall costing strategy being reviewed and assured by Jacobs, we have also employed third party consultants to review single enhancement cases to provide confidence that the estimates within them are robust and deliverable. Please refer to WSH50-IP00 Our Approach to Investment Planning (Section 6) for more information regarding the review and assurance undertaken.

5.2 Benchmarking our approach

Is there evidence that the cost estimates are efficient (for example using similar scheme outturn data, industry and/or external cost benchmarking)?

– Ofwat's final methodology for PR24, Appendix 9, A1.1.3

We have not undertaken specific benchmarking of our catchment approach. The activity consists of high volumes of low-cost interventions and being specific and bespoke to our operating area, are difficult to benchmark against other workstreams. We seek to work in collaboration or join existing third-party schemes to ensure we are not duplicating effort or funding and work with a diverse range of partners (see examples in section 1).

We are also part of the Water UK Catchment Management Network and discuss with other water companies to facilitate relevant knowledge share and ensure appropriate lessons learnt.

6. Providing Customer Protection

The work in this enhancement case is made up of a diverse set of activities which move us towards the goal of reliable, consistent, and manageable raw water. This is not a programme focused on building new assets but one based on creating changes in behaviour.

The work is included within the NEP/WINEP, regulated by NRW/EA, and underpins our target to reduce the number of designated SgZ. The investment will also increase resilience and reduce the risk of deteriorating performance against the Compliance Risk Index (CRI) performances measure.

In this section we set out the template for a proposed price control deliverable (PCD) to provide additional protection for a portion of our investment plan. The PCD is designed to provide strong controls in terms of work delivered against a key element of the funding allowed – if the proposed activity is not delivered, funding will be returned to customers on a proportional basis.

The below corresponds to the three criteria set out in Ofwat's PR24 Final Methodology, Appendix 9 (Setting Expenditure Allowances), Section A.1.1.4. There is no third-party funding for this enhancement case.

6.1 Proposed Price Control Deliverable (PCD)

Are customers protected (via a price control deliverable or performance commitment) if the investment is cancelled, delayed or reduced in scope?

Does the protection cover all the benefits proposed to be delivered and funded (e.g. primary and wider benefits)?

– Ofwat's final methodology for PR24, Appendix 9, A1.1.4a and A1.1.4b

This investment case has oversight from NRW through the NEP. Specifically, the SgZ programme, in Wales, is included in the NEP under the W_DrWPA_IMP1 driver.

In addition to the customer protection afforded by oversight of NEP deliverables, we propose a PCD for the number of SgZ moved towards de-designation. This builds on the reputational performance commitment used in AMP7.

The de-designation of a SgZ is outside the control of Welsh Water. We are therefore proposing that delivery of the work programme agreed with NRW is used to measure our performance in AMP8. We will be measured on delivery of the work which we have agreed to deliver (the input) rather than on whether the SgZ designation has been removed (the output).

Customer Facing Description of Enhancement Case	Improving Raw Water Quality in Catchments through Green Solutions										
Short Description of Enhancement Case / PCD Area	Drinking Water Catchment Management										
PCD Number	PCD4										
Summary of deliverable	Number of Action Plans delivered against the target Safeguard Zones (SgZ)										
Description	<p>At the start of AMP8 there will be 18 catchments subject to Drinking water Safeguard Zones (SgZ) measures within the company's operating area.</p> <p>SgZ are designated areas where raw water quality has been deemed to be "at risk" of deterioration, under Article 7.3 of the Water Framework Directive (WFD).</p> <p>These risks may arise due to activities within drinking water catchments due to changes in land management, as well as natural characteristics such as climate, soils, geology and topography, which all influence raw water quality. The way in which stakeholders manage land and weather patterns will change over time, changing risk profiles.</p> <p>In response, each SgZ has a defined Action Plan, which is owned by Welsh Water and has been agreed with Natural Resources Wales (NRW) or the Environment Agency (EA) to facilitate an overall improvement in raw water quality.</p> <p>As Welsh Water own less than 5% of the land within our catchments, a significant part of the company's 'source to tap' approach to managing water quality, is focussing on engaging with third parties who contribute to the water quality within catchments. The aim of this is to work in collaboration, to design and deliver best practice land use techniques, to deliver improvements to the water environment whilst maintaining multiple benefits for the land manager and the wider environment.</p> <p>The company's investment in drinking water catchment management is across its entire operating area, not only within our SgZ. We are, however, specifically targeting four SgZ in Wales and one in England for focused activities in AMP8 to move them towards future de-designation.</p> <table border="1"> <thead> <tr> <th>Catchments within PCD</th> <th>Cost</th> </tr> </thead> <tbody> <tr> <td>Bretton</td> <td rowspan="5">We have assigned a cost of £3.4275m for non-delivery of an action plan for any catchment.</td> </tr> <tr> <td>Builth</td> </tr> <tr> <td>Llyswen</td> </tr> <tr> <td>Felindre</td> </tr> <tr> <td>Whitbourne</td> </tr> <tr> <td></td> <td>This figure ties 75% of our investment against CW3b.013, which is companywide, to the agreed action plans within these five catchments.</td> </tr> </tbody> </table>	Catchments within PCD	Cost	Bretton	We have assigned a cost of £3.4275m for non-delivery of an action plan for any catchment.	Builth	Llyswen	Felindre	Whitbourne		This figure ties 75% of our investment against CW3b.013, which is companywide, to the agreed action plans within these five catchments.
Catchments within PCD	Cost										
Bretton	We have assigned a cost of £3.4275m for non-delivery of an action plan for any catchment.										
Builth											
Llyswen											
Felindre											
Whitbourne											
	This figure ties 75% of our investment against CW3b.013, which is companywide, to the agreed action plans within these five catchments.										

<p>Measurement and Reporting</p>	<p>The company will measure the number of activities being delivered against their Action Plans associated with the 5 target SgZ catchments.</p> <p>Success will be measured as the delivery of all agreed actions listed in the associated SgZ Action Plans for the 5 target catchments, a process overseen by NRW in Wales and the EA in England.</p> <p>The company will report annually to NRW/EA on progress against the Action Plan and benefits gained for the water environment and other benefits. This will also be included in our Annual Performances Report to Ofwat.</p>
<p>Conditions on scheme</p>	
<p>Assurance</p>	<p>The company will agree appropriate assurances with Ofwat and NRW/EA as part of Final Determination.</p>
<p>Price control deliverable payment rate</p>	<p>We have set out Action Plans for the 5 target catchments to be delivered by the end of AMP8. The details of these are included in Appendix B.</p> <p>Whilst the activities we deliver will be companywide we have assigned 75% of the total value of the programme to be measured against the defined activities for the five priority catchments. Whilst we will not in fact invest all the proposed funding in these catchments, they are the catchments which will provide the greatest benefit towards risk reduction. We have assigned a value of £3.4275M to be returned to customers in each catchment where the activity plan is not delivered. This puts 75% of CW3b.013 allowance within the PCD.</p> <p>If an action plan for a catchment is not completed by the end of the AMP 8 period, an amount equal to £3.4275M will be returned to customers. This will apply per catchment, subject to a maximum total amount of £17.138M.</p> <p>The de designation of a SgZ is outside the control of Welsh Water. We are therefore proposing that delivery of the work programme agreed with NRW/EA is used to measure our performance in AMP8. We will be measured on delivery of the work which we have agreed to deliver (the input) rather than on whether the SgZ designation has been removed (the output).</p>
<p>Impact performance in relation to performance commitments</p>	<p>In AMP8 the company will target 5 SgZs and deliver the Action Plans, which have been previously agreed with NRW/EA.</p> <p>These actions will work towards ensuring that the quality of our raw water sources is more reliable, consistent and manageable therefore reducing the risk of future treatment failures due to worsening environmental conditions or changing land management practices on 3rd party land.</p> <p>The work will not directly impact on the average figures reported in our performance commitments (the compliance risk index) but will avoid a deterioration in CRI performance over coming AMPs related to raw water quality, due to climate and land use changes.</p> <p>Our approach to catchment management will support delivery against our performance commitment for water quality contacts. Our overarching approach to this area is set out in WSH54-CW02 - Improving Acceptability of Tap Water – Networks. We have assumed a benefit of 0.05 contacts per thousand population from the work in this enhancement case.</p>

6.1.1 Extent of Protection

Secondary benefits will accrue from this work but will not impact on measures for which Welsh Water is responsible.

7. Appendices

Appendix A – Catchment Management Approaches per WTW

Table 9 Welsh Water catchment management approaches per water treatment works per operating area.

Region	Not at risk		At Risk
	Adapt (W_DrWPA_INV1)	Prevent (W_DrWPA_NDIMP1)	Recover (W_DrWPA_IMP1)
North	Abergynolwyn Alwen Bala Capel Curig Cilfor Conwy Cwellyn Dinas Mawddwy Dolbenmaen Eithinfynydd Garreglwyd Gwastadgoed Llanymawddwy Llannerch Mynydd Llandegai Penybont Penycefn Rhiwgoch		Alaw Bretton Bryn Cowlyd Cefni Cwm Dulyn Glascoed Trecastell
South East	Elan Ffynnon Gaer Maerdy Pilleth Tynywaun	Cantref Court Farm Llwyn Onn Pontsticill Sluvad	
		Brecon Carno Hirwaun Nantybwich Talybont	Builth Cwmteillery Llyswen Mayhill
South West	Bontgoch Cefnllan Strata Florida	Capel Dewi Felindre	
		Bryngwyn Capel Dewi Cefn Dryscoed Crai Bolton Hill	Llechryd Preseli Pendine
England	Broomy Hill Dunfield Leintwardine Vowchurch		Whitbourne

Appendix B - Action Plans for the 5 target catchments

We have agreed an action list for each of the priority catchments with NRW/EA. These lists are incorporated within the NEP and are summarised here.

AREA WTW		NE Bretton				
SgZ BBMC		SGZ 23 [Bacteria, Organics, Pesticides] NO				
2019 Priority Substance Monitoring		YES				
Measures across years		Year 1	Year 2	Year 3	Year 4	Year 5
SMART CATCHMENTS	DWSPs	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required
	Abstraction Water Quality Monitoring	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events
	Mapping & Modelling	- Development of WaterSource Portal spatial data management system	- Establish risk/opportunity map	- Validation of risk/opportunity map	- Incorporation of monitoring data with risk/opportunity map	- Continuous review of risk/opportunity map
RESEARCH & INNOVATION	Customer Acceptability Crypto			- Review previous research to identify potential mitigation measures - Identify stakeholders - Continue Research	- Implement trial mitigations - Evaluate effectiveness of scheme	- Maintain trial mitigations - Evaluate effectiveness of scheme
PARTNERSHIP WORKING	PestSmart	- PestSmart Disposal Scheme	- Identify additional stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs - PestSmart Disposal Scheme	- Promote best practice guidance - Trial alternative land management method/s - Evaluate effectiveness of trials	- Establish alternative land management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme
	NutriSmart			- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Develop best practice guidance - Trial alternative management method/s - Evaluate effectiveness of trial	- Establish alternative management scheme - Promote key campaign messages - Evaluate effectiveness of scheme
	Animal Health			- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Develop best practice guidance - Trial alternative management method/s - Evaluate effectiveness of trial	- Establish alternative management scheme - Promote key campaign messages - Evaluate effectiveness of scheme
	Sector Engagement		- Establish NRW joint working group - Establish Farmer Discussion Group - Attendance at County / Local shows and events - Maintain support to existing cross-border groups - Support Dee LIFE project	- Maintain groups - Establish links with Farming Unions - Establish links with local YFC groups - Explore opportunities to support 3rd party schemes	- Maintain groups - Establish links with key Advisory networks - Develop WaterSource training materials and disseminate via established groups - Explore opportunities to support 3rd party schemes	- Maintain groups, networks, presence at shows and training materials - Explore opportunities to support 3rd party schemes
	Public Engagement					- Review feedback from land management schemes to identify best approaches - Develop links with key community groups - Establish Community network
MANAGEMENT PLANNING & EVALUATION	Catchment Management Plans	- Feasibility of Digital Twin system	- Development of Digital Twin system	- Implement and ground-truth Digital Twin system	- Review, maintain and update Digital Twin system	- Review, maintain and update Digital Twin system
	Safeguard Zone Measure Evaluation	- Evaluate trials and schemes, adjust actions as required - Development of reporting dashboards	- Agree evaluation criteria with NRW/EA - Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of AMP sign-off confirmed by NRW/EA - Recommend de-designation of SgZ status (as appropriate)

AREA WTW		SE Builth				
SgZ BBMC		SGZ 08 [Pesticides] NO				
2019 Priority Substance Monitoring		YES				
Measures across years		Year 1	Year 2	Year 3	Year 4	Year 5
SMART CATCHMENTS	DWSPs	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required
	Abstraction Water Quality Monitoring	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events
	Enhanced Sub-Catchment Monitoring		- Feasibility of upstream monitoring	- Installation of WQ monitoring equipment	- Review of data - Maintenance of equipment	- Review of data - Maintenance of equipment
	Mapping & Modelling	- Development of WaterSource Portal spatial data management system	- Establish risk/opportunity map	- Validation of risk/opportunity map	- Incorporation of monitoring data with risk/opportunity map	- Continuous review of risk/opportunity map
PARTNERSHIP WORKING	PestSmart	- Promote best practice guidance - Trial alternative land management method/s - PestSmart Disposal Scheme - Evaluate effectiveness of trials	- Establish alternative land management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme
	NutriSmart		- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Develop best practice guidance - Trial alternative management method/s - Evaluate effectiveness of trial	- Establish alternative management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative management scheme - Evaluate effectiveness of scheme
	Animal Health				- Promote best practice from other SgZ schemes	- Promote best practice from other SgZ schemes
	Sector Engagement	- Establish NRW joint working group - Establish Farmer Discussion Group	- Maintain groups, networks, presence at shows and training materials - Establish links with Farming Unions - Establish links with local YFC groups - Attendance at County / Local shows and events - Explore opportunities to support 3rd party schemes	- Maintain groups - Establish links with key Advisory networks - Develop WaterSource training materials and disseminate via established groups - Explore opportunities to support 3rd party schemes	- Maintain groups, networks, presence at shows and training materials - Explore opportunities to support 3rd party schemes	- Maintain groups, networks, presence at shows and training materials
	Public Engagement				- Review feedback from land management schemes to identify best approaches - Develop links with key community groups	- Establish Community network
MITIGATION MEASURES	Bulk Storage (Oil and Slurry)		- Identify extent of bulk supplies - Identify potential risk to water environment	- Research new/novel technologies for private waste treatment - Identify trial properties	- Implement new systems	- Evaluate efficacy of new system
MANAGEMENT PLANNING & EVALUATION	Catchment Management Plans	- Feasibility of Digital Twin system	- Development of Digital Twin system	- Implement and ground-truth Digital Twin system	- Review, maintain and update Digital Twin system	- Review, maintain and update Digital Twin system
	Safeguard Zone Measure Evaluation	- Evaluate trials and schemes, adjust actions as required - Development of reporting dashboards	- Agree evaluation criteria with NRW/EA - Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of AMP sign-off confirmed by NRW/EA - Recommend de-designation of SgZ status (as appropriate)

AREA WTW		SW Felindre				
SgZ BBMC		SGZ 07 [Pesticides]				
2019 Priority Substance Monitoring		YES				
Measures across years		Year 1	Year 2	Year 3	Year 4	Year 5
SMART CATCHMENTS	7	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required
	Abstraction Water Quality Monitoring	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events
	Enhanced Sub-Catchment Monitoring		- Feasibility of upstream monitoring	- Installation of WQ monitoring equipment	- Review of data - Maintenance of equipment	- Review of data - Maintenance of equipment
	Mapping & Modelling	- Development of WaterSource Portal spatial data management system	- Establish risk/opportunity map	- Validation of risk/opportunity map	- Incorporation of monitoring data with risk/opportunity map	- Continuous review of risk/opportunity map
PARTNERSHIP WORKING	PestSmart	- PestSmart Disposal Scheme	- Identify additional stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs - PestSmart Disposal Scheme	- Promote best practice guidance - Trial alternative land management method/s - Evaluate effectiveness of trials	- Establish alternative land management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme
	NutriSmart		- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Develop best practice guidance - Trial alternative management method/s - Evaluate effectiveness of trial	- Establish alternative management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	
	Animal Health		- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Develop best practice guidance - Trial on-farm method/s - Evaluate effectiveness of trial	- Establish on-farm scheme - Promote key campaign messages - Evaluate effectiveness of scheme	
	Sector Engagement		- Establish NRW joint working group - Establish Farmer Discussion Group - Attendance at County / Local shows and events - Support SW 4Rivers LIFE project	- Maintain groups - Establish links with Farming Unions - Establish links with local YFC groups - Explore opportunities to support 3rd party schemes	- Maintain groups - Establish links with key Advisory networks - Develop WaterSource training materials and disseminate via established groups - Explore opportunities to support 3rd party schemes	- Maintain groups, networks, presence at shows and training materials - Explore opportunities to support 3rd party schemes
	Public Engagement					- Review feedback from land management schemes to identify best approaches - Develop links with key community groups - Establish Community network
MITIGATION MEASURES	Bulk Storage (Oil and Slurry)		- Identify extent of bulk supplies - Identify potential risk to water environment	- Research new/novel technologies for private waste treatment - Identify trial properties	- Implement new systems	- Evaluate efficacy of new system
	Land / Forestry / Peat management			- Feasibility of LISS forestry management	- Implement LISS management	- Maintain LISS management - Evaluate LISS management
MANAGEMENT PLANNING & EVALUATION	Catchment Management Plans	- Feasibility of Digital Twin system	- Development of Digital Twin system	- Implement and ground-truth Digital Twin system	- Review, maintain and update Digital Twin system	- Review, maintain and update Digital Twin system
	Safeguard Zone Measure Evaluation	- Evaluate trials and schemes, adjust actions as required - Development of reporting dashboards	- Agree evaluation criteria with NRW/EA - Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of AMP sign-off confirmed by NRW/EA - Recommend de-designation of SgZ status (as appropriate)

AREA WTW		SE Llyswen				
SgZ BBMC		SGZ 09 [Pesticides]				
2019 Priority Substance Monitoring		NO				
Measures across years		YES				
		Year 1	Year 2	Year 3	Year 4	Year 5
SMART CATCHMENTS	7	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required
	Abstraction Water Quality Monitoring	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events
	Enhanced Sub-Catchment Monitoring		- Feasibility of upstream monitoring	- Installation of WQ monitoring equipment	- Review of data - Maintenance of equipment	- Review of data - Maintenance of equipment
	Mapping & Modelling	- Development of WaterSource Portal spatial data management system - Promote best practice guidance	- Establish risk/opportunity map	- Validation of risk/opportunity map	- Incorporation of monitoring data with risk/opportunity map	- Continuous review of risk/opportunity map
PARTNERSHIP WORKING	PestSmart	- Trial alternative land management method/s - PestSmart Disposal Scheme - Evaluate effectiveness of trials	- Establish alternative land management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme
	NutriSmart		- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Develop best practice guidance - Trial alternative management method/s - Evaluate effectiveness of trial	- Establish alternative management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative management scheme - Evaluate effectiveness of scheme
	Animal Health				- Promote best practice from other SgZ schemes	- Promote best practice from other SgZ schemes
	Sector Engagement	- Establish NRW joint working group - Establish Farmer Discussion Group	- Maintain groups, networks, presence at shows and training materials - Establish links with Farming Unions - Establish links with local YFC groups - Attendance at County / Local shows and events - Explore opportunities to support 3rd party schemes	- Maintain groups - Establish links with key Advisory networks - Develop WaterSource training materials and disseminate via established groups - Explore opportunities to support 3rd party schemes	- Maintain groups, networks, presence at shows and training materials - Explore opportunities to support 3rd party schemes	- Maintain groups, networks, presence at shows and training materials
	Public Engagement				- Review feedback from land management schemes to identify best approaches - Develop links with key community groups	- Establish Community network
	Bulk Storage (Oil and Slurry)		- Identify extent of bulk supplies - Identify potential risk to water environment	- Research new/novel technologies for private waste treatment - Identify trial properties	- Implement new systems	- Evaluate efficacy of new system
MANAGEMENT PLANNING & EVALUATION	Catchment Management Plans	- Feasibility of Digital Twin system	- Development of Digital Twin system	- Implement and ground-truth Digital Twin system	- Review, maintain and update Digital Twin system	- Review, maintain and update Digital Twin system
	Safeguard Zone Measure Evaluation	- Evaluate trials and schemes, adjust actions as required - Development of reporting dashboards	- Agree evaluation criteria with NRW/EA - Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of AMP sign-off confirmed by NRW/EA - Recommend de-designation of SgZ status (as appropriate)

AREA WTW		SE Whitbourne				
SgZ BBMC		SGZ 02 [Pesticides, Nutrients]				
2019 Priority Substance Monitoring		NO				
Measures across years		Year 1	Year 2	Year 3	Year 4	Year 5
SMART CATCHMENTS	7	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required	- Complete Annual Review & submit to DWI - Undertake Ad Hoc reviews as required
	Abstraction Water Quality Monitoring	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events	- Undertaken via the Regulatory Monitoring Programme - Encourage timely self-reporting, by land managers, of pollution events
	Enhanced Sub-Catchment Monitoring		- Feasibility of upstream monitoring	- Installation of WQ monitoring equipment	- Review of data - Maintenance of equipment	- Review of data - Maintenance of equipment
	Mapping & Modelling	- Development of WaterSource Portal spatial data management system	- Establish risk/opportunity map	- Validation of risk/opportunity map	- Incorporation of monitoring data with risk/opportunity map	- Continuous review of risk/opportunity map
PARTNERSHIP WORKING	PestSmart	- PestSmart Disposal Scheme - Promote best practice from other SgZ schemes	- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs - PestSmart Disposal Scheme	- Promote best practice guidance - Trial alternative land management method/s - Evaluate effectiveness of trials - Develop best practice guidance	- Establish alternative land management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative land management scheme - Evaluate effectiveness of scheme
	NutriSmart		- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Trial alternative management method/s - Evaluate effectiveness of trial - Develop best practice guidance	- Establish alternative management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative management scheme - Evaluate effectiveness of scheme
	Animal Health		- Identify stakeholders - Identify priority areas (link to risk mapping) - Identify investment needs	- Trial alternative management method/s - Evaluate effectiveness of trial - Develop best practice guidance	- Establish alternative management scheme - Promote key campaign messages - Evaluate effectiveness of scheme	- Maintain alternative management scheme - Evaluate effectiveness of scheme
	Sector Engagement	- Maintain support to existing cross-border groups	- Establish NRW joint working group - Establish Farmer Discussion Group - Attendance at County / Local shows and events - Maintain support to existing cross-border groups	- Maintain groups - Establish links with Farming Unions - Establish links with local YFC groups - Explore opportunities to support 3rd party schemes	- Maintain groups - Establish links with key Advisory networks - Develop WaterSource training materials and disseminate via established groups - Explore opportunities to support 3rd party schemes	- Maintain groups, networks, presence at shows and training materials - Explore opportunities to support 3rd party schemes
	Public Engagement				- Review feedback from land management schemes to identify best approaches - Develop links with key community groups	- Establish Community network
MANAGEMENT PLANNING & EVALUATION	Farm Management Plans		- Feasibility of Whole farm management plan - Align WaterSource Portal to new Agri Regs	- Identify trial farm/s & implement whole farm management plan	- Review & evaluate whole farm management plan	- Review & evaluate whole farm management plan
	Catchment Management Plans	- Feasibility of Digital Twin system	- Development of Digital Twin system	- Implement and ground-truth Digital Twin system	- Review, maintain and update Digital Twin system	- Review, maintain and update Digital Twin system
	Safeguard Zone Measure Evaluation	- Evaluate trials and schemes, adjust actions as required - Development of reporting dashboards	- Agree evaluation criteria with NRW/EA - Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of year sign-off confirmed by NRW/EA	- Evaluate trials and schemes, adjust actions as required - Report via Dashboards - End of AMP sign-off confirmed by NRW/EA - Recommend de-designation of SgZ status (as appropriate)

Appendix C - CapEx Costs By Year For AMP8

The table below shows the total CapEx enhancement costs in Amp 8 for this enhancement case. The Ofwat driver this enhancement case maps to are:

- Drinking Water Protected Areas; (WINEP/NEP) water CapEX - CW9.013
- Addressing raw water quality deterioration (green solutions), enhancement CapEX – CW3b.100

No other enhancement cases contribute to this driver.

Total CapEX in AMP8 Plan in 2022/23 prices

Driver Ref	Year in AMP8					Total
	1	2	2	4	5	
CW3b.100 CapEx	£0.746M	£0.735M	£0.735M	£0.739M	£0.748M	£3.703M
CW3b.013 CapEx	£4.601M	£4.535M	£4.534M	£4.563M	£4.617M	£22.850M
Total	£5.347M	£5.270M	£5.269M	£5.302M	£5.365M	£26.553M

What We Will Deliver: This enhancement case will deliver; 1) measures outlined in the SgZ Actions plans to progress the improvement of raw water quality of 5 safeguard zones in AMP8 via the implementation of catchment management actions, 2) a new suite of partnership projects within the Bannau Bryceiniog Mega Catchment, 3) expand the delivery of preventative catchment management actions to avoid the designation of new safeguard zones.

Appendix D - Regulatory differences

WI/NEP and water company Long Term Delivery Strategies for catchment management.

Delivering catchment management measures for Drinking Water Protected Areas (DrWPAs) can be supported by the Water Industry National Environment Programmes (WI/NEP). However, the EA and NRW currently have 2 differing approaches to using this mechanism for delivering long term strategies.

Current WINEP guidance from the Environment Agency directs that water companies cannot include the same catchment for the same 'at risk' parameters in subsequent WINEP programmes. That is as measures to address third party pesticide and ammonia losses in the river Teme (Whitbourne) were accepted in the AMP7 WINEP, we cannot include new schemes/work again in AMP8 for these parameters. We have raised this issue with our EA Water Policy lead who recognises that this does not support long term approaches for catchment management, where the benefits at point of abstraction may take years to realise.

We raised the EA approach with our NRW Water Policy lead who confirmed that NRW would be happy for the same catchments to be included in subsequent NEPs, for the same 'at risk' parameters, as long as the work was new measures / activities, included new stakeholders or was building on previous developments, i.e. enhancements to our PestSmart campaign. They will not support duplication of schemes/measures.

It is also worth noting that EA issued information letter EA/10/2023 in May 2023 to say that they will no longer support bacterial and cryptosporidium schemes as these parameters are listed in the Drinking Water Directive, so EA have no powers to regulate for them. Again, we asked NRW to confirm if their thinking was similar, but they have not yet taken the same approach.

Appendix E - International Best Practice Learning

International Best Practice Learning

In 2018/19 we undertook a series of international learning opportunities with New York's Department of Environmental Protection (DEP) Water Supply Bureau to gain insights into their internationally renowned catchment management programme in the Catskills Mountains.

In 1989, the U.S. Environmental Protection Agency set the Surface Water Treatment Rule; this required all public surface water supplies to be filtered. However, systems could be eligible for waiver known as a Filtration Avoidance Determination (FAD) if they:

1. Met certain criteria for quality:

- Faecal or total coliform
- Turbidity
- Inactivation of giardia (later updates to the rule also focused on Cryptosporidium)

2. Maintained a watershed control programme that demonstrates adequate control on activities liable to affect microbiological quality of source water

Filtration would have cost more than \$12 billion to construct and upwards of \$200 million annually for operations and would have been the largest USA infrastructure project on record. The NYC DEP opted to take a catchment management approach.

New York City remains the largest unfiltered water supply in the United States, and one of only four large cities with an active filtration waiver.

<https://www.nycwatershed.org/about-us/overview/croton-catskilldelaware-watersheds/>

We have taken the principles of the Watershed Agricultural Council to provide a best practice methodology for investing in our raw water sources, for example the Beacons Water Group (BWG) is modelled on Watershed Agricultural Council, and our proactive in-situ monitoring programme also developed from how NYC monitor and evaluate their raw water sources.