UUWR_78

PR24 Draft Determination: Enhancement Case

Windermere – Enhancement case

August 2024

This document sets out the service enhancement expenditure and activity that we will undertake through AMP8 and supports our draft determination response documents, UUWR_75 and UUWR_77.

United Utilities

Water for the North West

Contents

Appendices

Enhancement submission

Title:	Ww Windermere WINEP Catchment Strategy
Price Control:	Ww Network Plus
Enhancement headline:	**Enhancement expenditure to protect and enhance Windermere, England's largest lake which is impacted by phosphorus inputs from a variety of sources, including those from UWW assets, whilst facing the increasing impacts of climate change.** On 5 July 2024 we received a new WINEP from the Environment Agency with changes to deliverables and there have been subsequent changes to the WINEP since this date. Requirements included in the WINEP are to further reduce phosphorus from nine final effluent discharges and reduce spills from three storm overflows that discharge into the Windermere catchment. This case is to enable us to meet the needs of the AMP8 WINEP for new or enhanced final effluent standards from wastewater treatment works and intermittent discharge permit requirements in the Windermere catchment. This document sets out where the Environment Agency require us to enhance service standards to deliver environmental benefits, which they will enforce by varying our Environmental Permits. This enhancement investment is driven by the following statutory drivers: • The Water Environment (Water Framework Directive) Regulations 2017; and • Environment Act 2021; and the non-statutory driver: • 25-years Environment Plan.
Enhancement expenditure (FY23 prices)	

Windermere Catchment overflows	AMP8 Capex inc TI (£m)	AMP8 Opex (£m)	AMP8 Totex (£m)
Pre RPE and Frontier Shift	153.0	N/A*	153.0
Post RPE and Frontier Shift	150.5	N/A	150.5

Windermere Catchment WwTWs	AMP8 Capex inc TI (£m)	AMP8 Opex (£m)	AMP8 Totex (£m)
Pre RPE and Frontier Shift	33.4	N/A	33.4
Post RPE and Frontier Shift	33.0	N/A	33.0

	The table above shows the total expenditure, inclusive of accelerated programme and transitional investment, on both a pre-efficiency (i.e. pre frontier shift and real price effects basis, consistent with the cost data tables), and a post efficiency and RPE basis (i.e. consistent with the value we propose to be recovered from price controls). All numbers referenced hereafter in this enhancement case are on a pre efficiency and RPE basis. *Opex costs have not been allocated in AMP8 due to the delivery dates of the projects being at the end of FY2029/30 or later.
This case aligns to :	Expenditure and cost driver information relating to this case can be found in • CWW3.185-188, 19, 20, ADD17 and ADD20 • Draft determination representation document *UUWR_77 New WINEP*
PCD	We are proposing that this group of schemes are incorporated into Ofwat's newly proposed Large Scheme Gated Process Further details outlining why we consider these schemes to be appropriate can be found in *UUWR_11_Gated Mechanism section 8.2.*

1. Enhancement case summary

Gate	Summary	Location reference
Need for enhancement investment	• Our base expenditure only covers the cost of meeting current Environmental Permit requirements. This enhancement investment is driven by the following statutory and non-statutory drivers to allow us to meet future final effluent permit requirements: – The Water Environment (Water Framework Directive) Regulations 2017 (statutory) – Environment Act 2021 (statutory) – 25-years Environment Plan (Non-statutory)	Section 3
Best option for customers	• We have undertaken an exercise to identify the most cost effective way of meeting the future permit requirements we are required to comply with.	Section 4
Cost efficiency	• To ensure robust and efficient costs in our programme we have used an estimating approach based on data collected over a number of AMPs (AMP3 to AMP7) updated to reflect present market conditions under which we and the UK Water Industry are operating. We have reviewed our costs against industry data.	Section 5
Customer protection	• Customers are protected from non-delivery through the Large Scheme Gated Process (as described in *UUWR_11 Gated Mechanism*) where schemes are uncertain in scope, cost or deliverability. Customers would also be protected the following performance commitment: – DPC_Discharge permit compliance1.where if we fail to deliver improvements to our discharges on time we would expect the Environment Agency to issue the revised permit which we would fail to achieve. • Additional consequences of non-delivery include: – Prosecution and fines due to non-compliance with permits – Reputational impact of reducing Environmental Performance – Loss of trust with customers and stakeholders – Loss of trust with the Environment Agency leading to less support for innovative approaches to delivering environmental improvement	Section 6
Price Control Deliverable	• The schemes are not included within the PCDs for AMP8, as we consider the Large Scheme Gated Process is more appropriate for this group of complex and currently uncertain projects. The justification for this is summarised in *UUWR_11 Gated Mechanisms* 6. Investments more suited to the Large Scheme Gated process.	Section 6 *and UUWR_82*

[1] UUW30_Performance Commitment Technical Document, Chapter 5 supplementary document. Section 4.16 and 4.17

2. Introduction

2.1.1 This document sets out the enhancement case of £186.4m totex to allow UUW to meet more onerous Environmental Permit requirements, storm overflow spill reduction and for tightening or new final effluent requirements as a result of drivers in the AMP8 WINEP.

2.1.2 This covers strategic investment to accelerate work at facilities that discharge into the nationally important lake Windermere. This case covers improvement to three storm overflows and nine wastewater treatment works.

2.1.3 We strive every day to deliver great performance and environmental protection to Windermere and customers have told us how important it is that we take action to maintain the health of the lake and prevent future deterioration. However, due to climate change, the unique nature of the waterbody and increasing stakeholder ambitions we now need to go further and faster to deliver enhancements that will deliver further improvements to water quality of the lake.

2.1.4 We propose inclusion of these schemes within the Large Scheme Gated Process due to uncertainty in scope, cost and deliverability from the late identification of these schemes within the WINEP. The uncertainty due to the developing maturity of this need means it is not suitable to include it in a PCD however we believe that its inclusion in the Large Scheme Gated Process will provide customers with adequate protection.

2.1.5 This Windermere specific enhancement case covers changes to WINEP since our initial business plan submission in October 2023. Any additional requirements or changes to requirements that fall outside of the Windermere catchment will be detailed within the relevant DD documents representation documents, including *UUWR_10 - Overflows*; *UUWR_33 - Phosphorus removal*; *UUWR_11 - Gated Mechanisms*; and summarised in *UUWR_77 - New WINEP*.

2.1.6 This enhancement case considers the unique nature of Windermere and why the enhancement investment is required. It also covers our approach to nutrient reduction within the catchment, including solution development and how we will ensure that costs are robust. A total of nine wastewater treatment works have been identified for enhancement to meet new or more onerous phosphorus limits and three storm overflows have been identified for improvement to reduce spill frequency to meet the long-term storm overflows requirements as set out in the Environment Agency's WINEP storm overflow guidance. The scheme covered by this case and the WINEP requirements are outlined in Appendix B of this document.

2.1.7 The development of the WINEP has been informed by the key regulatory guidance including the WINEP methodology, WINEP options development guidance, WINEP options assessment guidance, WINEP driver and supporting guidance. Our approach reflects the specific context within which we operate in the North West of England.

2.1.8 Where possible we are making use of phasing to ensure that we are delivering the best value solution to meet our long-term objective of reducing phosphorus and improving the discharge standards into Windermere. Our approach will also minimise disruption where possible by promoting additional, non-statutory improvements at sites where we have statutory requirements. This will ensure that we are developing solutions that are aligned to long-term objectives that can be delivered through one solution. Due to some uncertainty in scope, these schemes are recommended for inclusion in the Large Scheme Gated Process proposed by Ofwat as part of the Draft Determination.

2.1.9 The delivery of solutions to achieve the benefits are within the timescale of the AMP8 programme, however the WINEP delivery dates for the interventions lead to the benefit of investment to be realised in AMP9. Our approach complements other significant programme of activities within the catchment to improve water quality. We are a committed member of the Love Windermere partnership. This active group supports activities to enhance data collection, promote additional funding through government

grants, and other sources, to improve assets outside of the water company's control, and deliver improvements within the catchment.

2.1.10 We will also investigate the potential to allocate investment for first time sewerage[2] that will contribute to improvement of the Windermere catchment by reducing the number of septic tanks discharges.

2.1.11 Details of the site specific requirements can be found in Appendix B. Of the individual drivers proposed within this enhancement case, nine relate to a new or tightening of phosphorus limits with four to meet the current technically achievable limit of 0.25mg/l on average, and five to meet 0.5mg/l on average. Near Sawrey is included on the WINEP with a holding line for 0.25mg/l annual average but this is in the process to be altered to reflect the proposed best value intervention to meet 0.5 mg/l annual average which is reflected in the solution cost. Five of the schemes also have drivers to meet additional final effluent permit requirements including BOD; suspended solids and ammonia (mg/l 95%ile) and two include treatment of additional flows to enable a reduction in storm overflow spills upstream of the WwTW. To deliver this tightening or new permit limits some solutions will require a step change in technology and may require a complete re-build of small treatment works that have not been designed to meet the discharge quality improvements.

2.1.12 In addition to interventions to meet final effluent requirements, three storm overflows have been identified for accelerated spill frequency reduction, two of which were previously profiled for completion in AMP9 but require investment in AMP8 to deliver the AMP9 benefits. These assets will provide some benefit towards our long-term ambition of nutrient reduction within the catchment and will also deliver the long-term spill frequency target (<10 spills/annum) for the Windermere catchment. A summary of the requirements by primary driver can be found in Table 1 below, and details of the individual requirements can be found in Appendix B.

Table 1: Overview of requirements, number of schemes and associated Totex included in this enhancement case

Driver	Number of sites	Capex	Opex	Totex
Sanitary Determinands and Phosphorus removal (WFD)	5 of 9	13.5		13.5
25 year Environment Plan - Phosphorus	9	20.2		20.2
Storm overflow	3	153.0		153.0
Total		**186.4**		**186.4**

Source: UUW Analysis

2.1.13 The enhancement costs and performance improvements can be found in relevant PR24 data tables, CWW3, CWW20, CWW19, ADD20. and ADD17 for sanitary determinands. Due to the delivery of these projects at the end of AMP8, Opex costs are not allocated until AMP9. Likewise, the full benefit realisation from all the activities to improve Windermere will be beyond AMP8 when the impact can be assessed and verified.

2.1.14 In addition to the work included in this enhancement case, we are separately addressing resilience to power outage across critical assets across the Cumbria region (including the Windermere catchment). Cumbria is the worst served area of the North West and most severely affected by weather related power outages. Power outages can lead to pollution, and this is a high priority for resolution where there is a sensitive water body including bathing water that could be impacted. A list of candidate resilience projects in the Windermere catchment is included in Table 10, Appendix A of our DD representation document *UUWR_39 Resilience uplift*.

2.1.15 Additional improvements to meet the bespoke performance commitment *Wonderful Windermere*, are included in representation *UUWR65_Wonderful Windermere*. This performance commitment is seeking to improve the water quality of Windermere through partnership working to reduce nutrients from third

[2]UUW65, case 21 First Time Sewerage

party assets and reduction of phosphorus beyond UUW's permit limits and what is viewed as technically achievable. It will measure the reduction in phosphorous equivalents into the lake.

3. Need for enhancement investment

3.1 Introduction

3.1.1 As the largest lake in England, Windermere is a nationally significant water body located at the heart of the Lake District National Park. At over 900 square miles, this UNESCO world heritage site supports an abundance of wildlife and ecosystems, as well as receiving around 7 million visitors per year and contributing over £750 million to the local economy. Windermere is an iconic site that customers, communities and stakeholders alike expect to be leading in water quality. As such we have identified further investment, beyond our statutory requirements, to support the driver to reduce nutrient loading within Windermere.

3.1.2 **This section details the environmental driver and legislation which supports the need for investment and our approach to addressing these requirements.**

3.1.3 We have seen a significant increase in media focus for Windermere, our analysis shows that Windermere was mentioned over 7,000 times in relation to sewage in news articles from June 2023 to June 2024. Windermere has been the subject of local, national, and international news coverage and the spotlight has been on UUW to go above and beyond the regulatory requirements to protect the lake. It's not just news outlets that are raising awareness, celebrities and TV personalities, politicians, and naturalists, have all visited this site. Raising awareness and supporting campaigns for increased regulatory scrutiny, tighter legislation, and increased drive to improve water quality in the Lake.

3.1.4 The repeated media focus at Windermere and continued drive from environmental stakeholders and campaign groups, demonstrates the high value that society place on this unique location.

3.1.5 The Environment Agency introduced a '25-year environment Plan' driver for locally significant issues. Where supported by customers, companies can go above and beyond their statutory requirements. At Windermere we recognise the need to deliver further nutrient removal from the catchment, we note that this catchment may be specifically vulnerable to nutrient loading and therefore want to work to deliver long-term sustainable reductions in nutrient input into the lake.

3.1.6 Under Environment Agency guidance, nine sites have been identified for enhancement in AMP8, as part of a long-term plan to reduce nutrient load into Windermere under the AMP8 WINEP driver 25YEP_IMP. A site may be given an 'EnvAct_25 year' driver when improvements are not covered by other statutory drivers. All the sites identified for final effluent improvements contribute to nutrient loading into the lake and through our enhancement investment will reduce this load by 515 kg of phosphorus per year. This will contribute towards improved water quality of the lake.

3.1.7 There are four bathing waters at Windermere Lake, which have all consistently achieved excellent bathing water status based on Environment Agency sample data from 2015 to date. The Environment Agency's Storm overflow driver guidance states that for any site discharging within 5km upstream of an inland bathing water should be improved to reduce spills to an average of 1 spill per bathing season and 10 spill per year. All other inland storm overflows should be improved to meet an average of 10 spills per year, the 'average' should be assessed over a minimum of 10 years. UUW has accelerated improvements at three storm overflows, two of which were previously identified in our storm overflow action plan for investment in AMP9, with Hawkshead PS (LAK0107SO) identified for WFD improvements in AMP9. This investment will contribute towards the long-term goal within this catchment to reduce spill frequency and therefore nutrient load entering the lake.

3.1.8 We have specifically factored the impact of climate change into the development of our WINEP, for example we account for climate change in our hydraulic models when identifying the need for storm overflow improvement schemes and developing options to address the drivers.

3.1.9 In addition to the enhancement investment proposed we have increased maintenance frequency and tasks in AMP7, assessed power loss resilience with a view to efficiently utilising base investment within

this catchment. We will also continue to be a committed member of the Love Windermere Partnership, supporting ongoing activities to deliver improvements. Our PR24 business plan submission also includes a proposal for a bespoke performance commitment, targeting a reduction in total phosphorus entering the lake from both public and private sewage assets (including septic tanks), catchment interventions and through other targeted campaigns. Our bespoke performance commitment proposal will focus on removing more P from our WwTW than currently viewed as technically achievable, as well as partnerships and co-delivery of improvements within the catchment to deliver the best outcome.

3.1.10 We have aligned the AMP8 WINEP requirements with a view to deliver nutrient removal from our assets within the short term, whilst we continue to promote partnership solutions at private sewage facilities and interventions within the catchment to deliver long-term improvements. Investing in this way, ensures that we are delivering improvements across the catchment as soon as possible whilst also providing opportunities to collect more water quality data that will help target specific areas of nutrient loading in the future.

3.2 Phosphorus management

3.2.1 Phosphorus is a nutrient which is essential to life and as such, is found in high concentrations in wastewater and agricultural waste. However, if too much phosphorous is released into the environment within the final effluent from a wastewater treatment works. Its nutritional properties can cause excessive plant or algae growth and lead to an alteration of the ecosystem from the natural state. It can also cause blue-green algal blooms in some waterbodies, which can prevent people and animals from using the waterbody and can damage the wider ecology of the habitat.

3.2.2 Reducing the concentrations of phosphorus in the final effluent reduces the risk of adverse environmental impacts. The AMP8 WINEP requires us to meet new low phosphorous limits at many wastewater treatment works in order to meet the targets of various Regulations and Acts, with the cost being driven by the Water Environment (Water Framework Directive) Regulations 2017, Urban Wastewater Treatment (England and Wales) Regulations 1994 and Habitats Regulations [2017] as well as the Environment Act 2021 and anticipated Levelling up and Regeneration legislation.

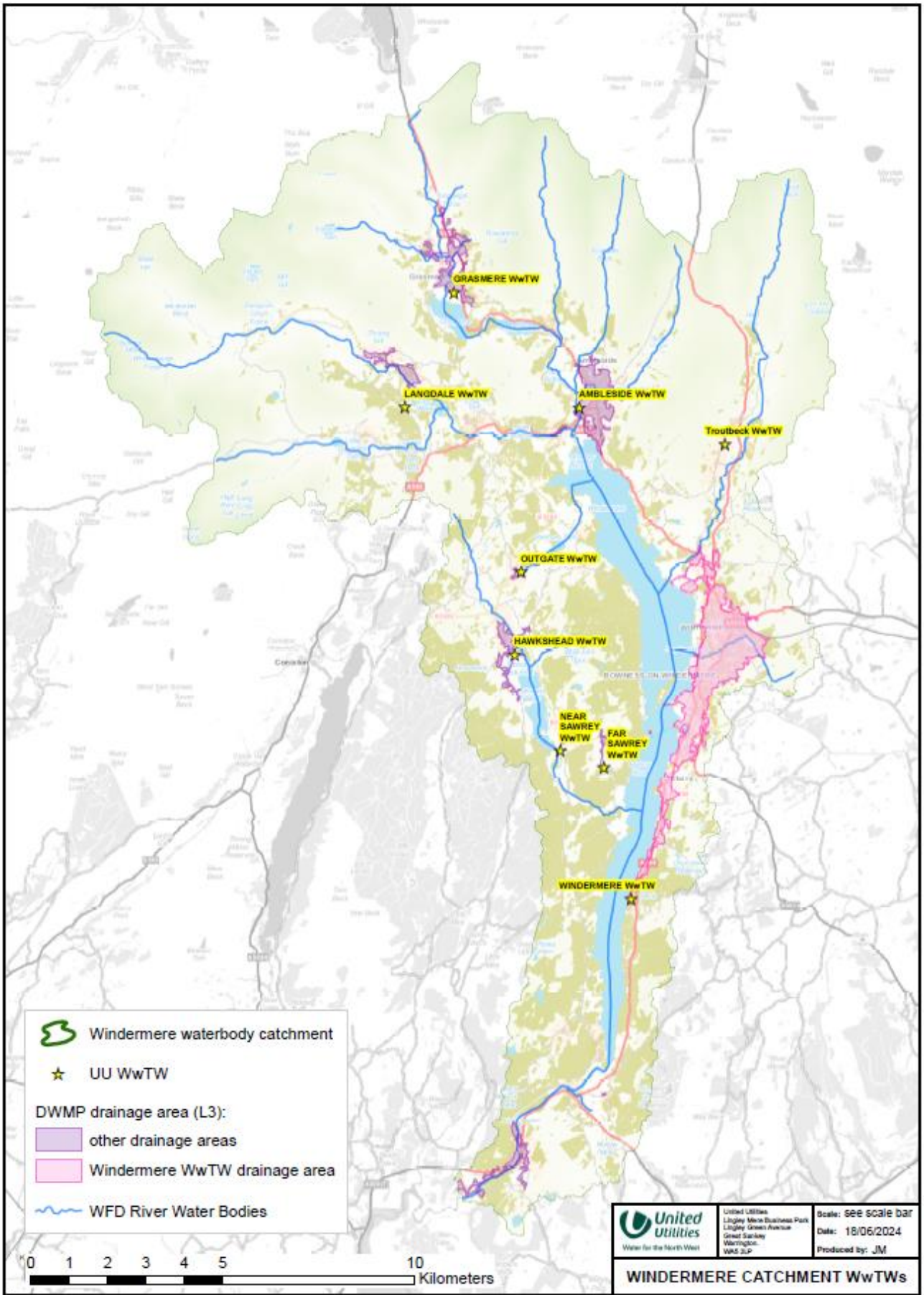
3.2.3 A letter from the Environment Agency received on 3 June 2024 and a follow up email on 11th June 2024, identified five wastewater treatment works within the Windermere catchment for improvements under the Water Environment (Water Framework Directive) Regulations 2017. The EA included indicative permit limits which would require new or tightened phosphorus and sanitary limits for all five WwTWs to prevent deterioration in water quality as a result of WwTW final effluent discharges.

3.2.4 Subsequently these five and four further WwTWs were identified for improvements under the 25 year environment plan, meaning nine locations in total are included in the WINEP for a further reduction in phosphorus.

3.2.5 UUW has reviewed the options to deliver new or tighter phosphorus limits at our WwTW and have developed several options to understand best value, see section 5.

3.2.6 Within our business plan submission, UUW identified 72 WwTW which require either a first-time phosphorus limit or a tightening of an existing phosphorus limit. The enhancement case UUW63 Wastewater (Quality – Treatment) Case 11: Final effluent limits, provides details of these schemes and solution identification, any changes to these requirements are included within the representation document *UUWR_77_New WINEP*. The nine sites within the Windermere catchment that have been identified after our initial business plan submission for new or tighter final effluent permit limits are shown in. Figure 1 below including the location of Windermere WwTW, which has an existing permit to achieve the technically achievable limit of 0.25mg/l and is therefore not selected for further phosphorous reductions.

Figure 1: Location of WwTW in Windermere catchment requiring P removal in AMP8 and Windermere WwTW



Source: UUW representation of WwTW

3.2.7 Identified in UUW63 Wastewater (Quality – Treatment) Case 11: Final effluent limits, historically our approach to phosphorus removal has been based on chemical treatment to meet specific permit requirements. In AMP6 and AMP7, we changed our strategy to embrace biological phosphorus removal; leading the way with delivering innovative Nereda plants for four wastewater treatment works. We also successfully used catchment offsetting to achieve phosphorus targets in catchments. We have also worked with the Environment Agency on the implementation of a catchment permit for phosphorus in order to prevention deterioration in phosphorus concentrations in the Manchester Ship Canal by optimising phosphorus removal across the upstream catchment.

3.2.8 Finding sustainable solutions for phosphorus removal at smaller wastewater treatment works has been challenging. We continue to explore innovative ways to achieving lower phosphorus limits at small WwTW which serve fewer than 2,000 people however, as we have seen within our AMP8 plan, chemical removal may still be identified as the most cost-effective solution. For some very rural sites, such as those in Windermere, chemical removal would not be practical due to challenges in accessing sites and therefore alternative options must be developed.

3.2.9 We will continue to look for alternative, sustainable options to achieve lower permit limits through our winning bid in the Ofwat innovation fund[3], we will explore alternative approaches to phosphorus removal at rural WwTW and implement our learning from this project in AMP8. More information on this is in UUW63 Wastewater (Quality – Treatment) Case 11: Final effluent limits.

3.2.10 As the requirements included within this enhancement case were late additions to the WINEP we have only had a short period of time to assess the scope and develop solutions with costs and a schedule. We have not had sufficient time to refine scope and costs to a level we have complete confidence in. We also have experience of delivering interventions in the Windermere catchment and know that due to the vital tourism industry in the area in order to minimise the impact on customers, tourism and business we cannot actively deliver all year round. Rock is present at shallow depth across the catchment which increases the time and cost of construction excavations.

3.2.11 We therefore propose to introduce a new, chemical free phosphorus removal technology at five small wastewater treatment works within the Windermere catchment to achieve new or tightened phosphorus consents. More information on this is in section 5.2 Innovation. For Windermere we also propose an adaptive approach to phosphorus removal, exploring capabilities of new treatment options to achieve low phosphorus, up to TAL (0.25mg/l).

3.3 Sanitary determinands including septic tanks

Sanitary determinands

3.3.1 To protect and enhance the environment five WwTW have also been identified as requiring investment to achieve new permit limits for sanitary determinands BOD and/or ammonia[4]. These have various drivers including U_IMP1 for UWWTR population threshold drivers, WFD and HD_IMP for improvements to meet Water Framework (WFD) Regulations or Habitats Regulations 2017 targets, and no deterioration drivers, WFD and HD to protect the current river classification. Additionally, all these sites also have a new or tightened phosphorus permit requirement.

3.4 Septic tanks

3.4.1 The WINEP includes a requirement for the removal of discharges from septic tanks to surface waters under driver code U_IMP7. This requires septic tanks which discharge to surface waters to provide secondary treatment capable of achieving 40:60 BOD:suspended solids. This driver only applies to water company assets, UUW have proposed a septic tank programme in AMP8 for our assets, details can be

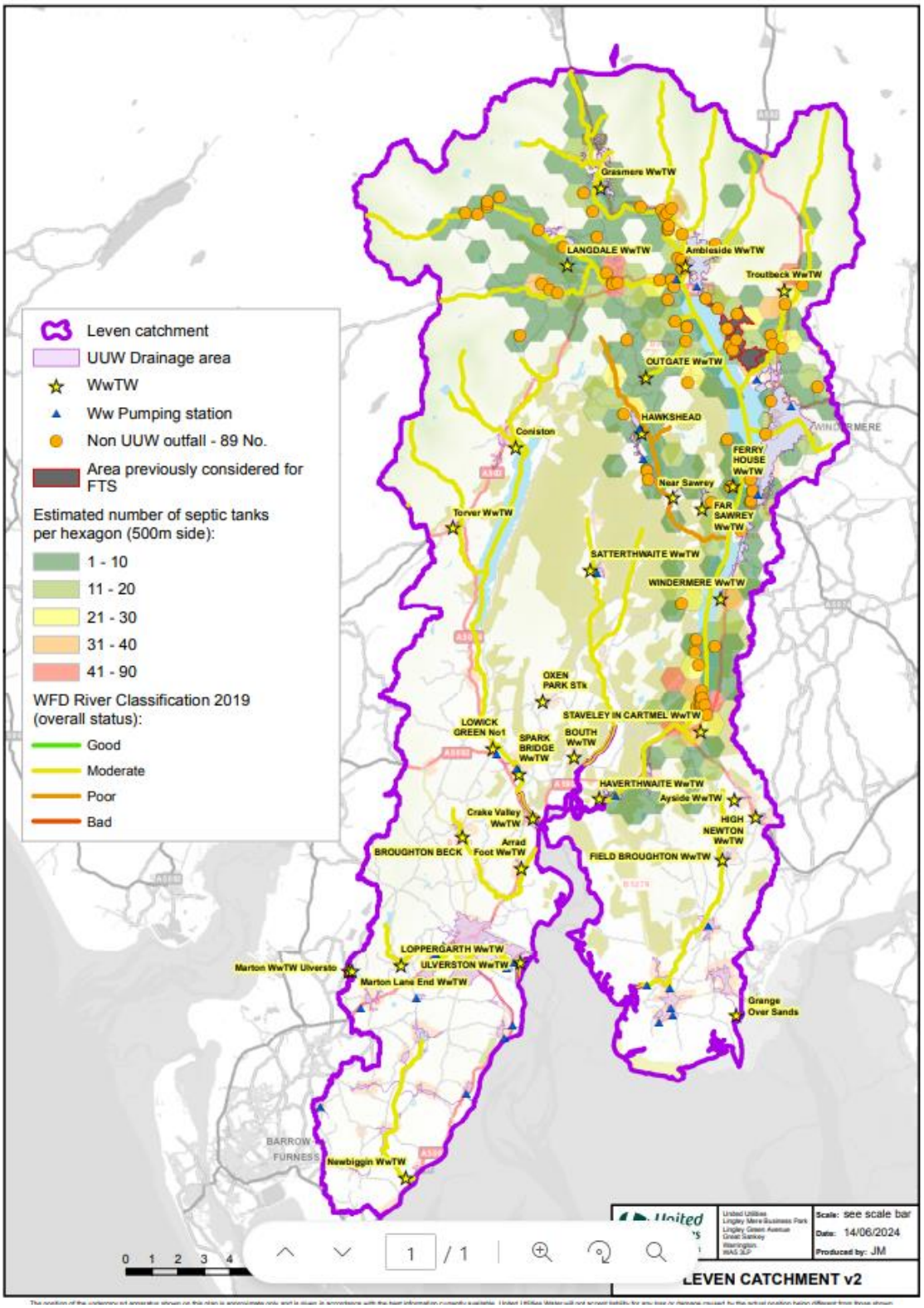
[3] Ofwat (2022) *Alternative approaches to phosphorus removal on rural wastewater treatment works.* Available here

[4] This excludes schemes with a U_IMP7 septic tank driver

found in UUW63 Wastewater (Quality – Treatment) Case 11: Final effluent limits. Section 4.4 Septic Tanks.

3.4.2 We will also explore the opportunities to work in partnership to enable nutrient removal from non UUW septic tanks across the Windermere catchment. There are estimated over 1,700 private septic tanks of these 89 have existing discharge permits shown in Figure 2.

Figure 2: Location of permitted non-UUW Septic Tank improvement sites in Leven catchment

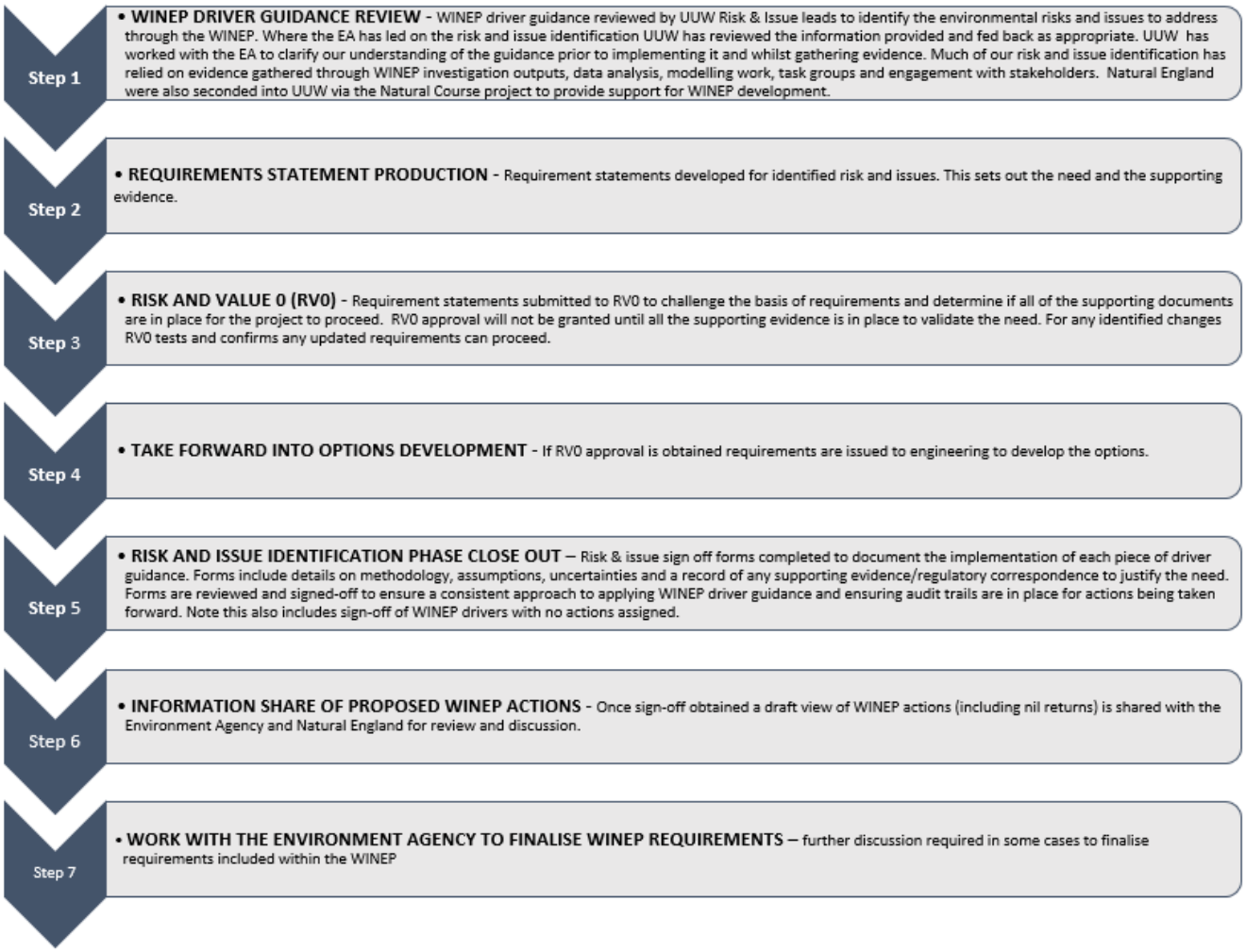


Source: UUW representation

3.5 Approach to risk and issue identification

3.5.1 The approach we have taken to identify WINEP actions is in line with Stage 2 of the Environment Agency's WINEP methodology. This involves collaboratively identifying environmental issues that need addressing and risks that require further monitoring/investigation through the WINEP. Our Risk and issue identification process follows a stage approached, shown in Figure 3, which has enabled us to identify where action is required to deliver compliance with our environmental obligations. Given the limited time since receiving these requirements a condensed version of this methodology has been applied in support of this case.

Figure 3: Risk and issue identification process stages



Source: UUW63 Wastewater (Quality – Treatment) Enhancement case, 4.8, Figure 8: Risk and issue identification process

3.5.2 This collaborative process has ensured that we are prioritising and investing in areas which have a well evidenced environmental need, and that we are meeting those needs in the most efficient way. Where evidence of environmental impact is uncertain, we have proposed an adaptive approach to delivery to ensure that any interventions are based on good evidence. We will continue to seek opportunities for partnership working through our bespoke performance commitment 'Wonderful Windermere', such that the best value for customers and the environment is secured.

3.6 Customer support

3.6.1 There is increasing stakeholder concerns over the impact of our operation on Windermere and we have seen increasing pressure to go above and beyond our current regulatory requirements. The repeated

media focus and continued drive from environmental stakeholders and campaign groups, demonstrates the high value that society place on this unique location. Our plan seeks to reduce the nutrient load into Windermere from nine sites through enhanced treatment process, this complements our ongoing work in the catchment through the Love Windermere partnership and our shared ambition to improve water quality and protect this North West landmark.

3.6.2 In addition, many customers either live near, or visit the area on a regular basis and in our bespoke PC proposal research (Bespoke Performance Commitments Research Report, 12th September 2023, Page 53), customers recognised that Windermere is an integral part of the North West and thought that it was important to take action to maintain the health of the lake and prevent future deterioration, they also felt it important to reduce the impact on plant and wildlife.

3.6.3 More generally, customer research indicates protecting the environment is a key priority in the North West. Research for DWMP identified that 76% of customers said, 'protecting lakes, rivers, reservoirs, fish and other aquatics plants and wildlife is really important to me'. This was also echoed by our PR24 research where customers identified that they wanted UUW to go further with our plans for addressing pollution.

3.6.4 United Utilities Water (UUW) hold a library of customer insights for projects we have delivered within AMP 7 (currently in progress from 2020 – 25). Each insight and research project has used an appropriate method to capture a variety of customer and stakeholder opinions, ensuring a representative view of the diverse customer base across the North West. This insight has been incorporated into the options development and selection process undertaken. Further information can be found in the UUW's WINEP approach to WINEP development and our insight and research library[5].

3.7 Management Control

3.7.1 Statutory enhancements to performance included in the WINEP are outside of management control. Base totex allowance maintains compliance with current permits. To enable compliance with new, more onerous permits, investment to enhance current assets or to deliver new assets is required. The sites identified within this enhancement case were identified by the Environment Agency in June 2024 and included within the WINEP, as such they did not form part of our October 2023 business plan submission, with exception to Hawkshead WwTW that was included under a Habitats Directive (2017) driver.

3.7.2 In addition to the statutory requirements originally identified by the Environment Agency, a non-statutory driver, 25YEP_IMP has been applied to nine sites and included on the most recent WINEP (July 2024). This will support the long-term strategy for phosphorus reduction in Windermere, to help protect the lake from excessive nutrients and future algal blooms. Where sites already have a statutory driver for phosphorus removal, this driver will build on those requirements to ensure that the solutions are fit for purpose in the future and ensure that we are only intervening at a site once. Although drivers are non-statutory, as discussed above there is clear customer and stakeholder support to go beyond statutory requirements within this catchment.

[5] 2023 (UUW) Customer insight and research library. Available here: https://www.unitedutilities.com/insight-and-research-library

4. Best option for customers

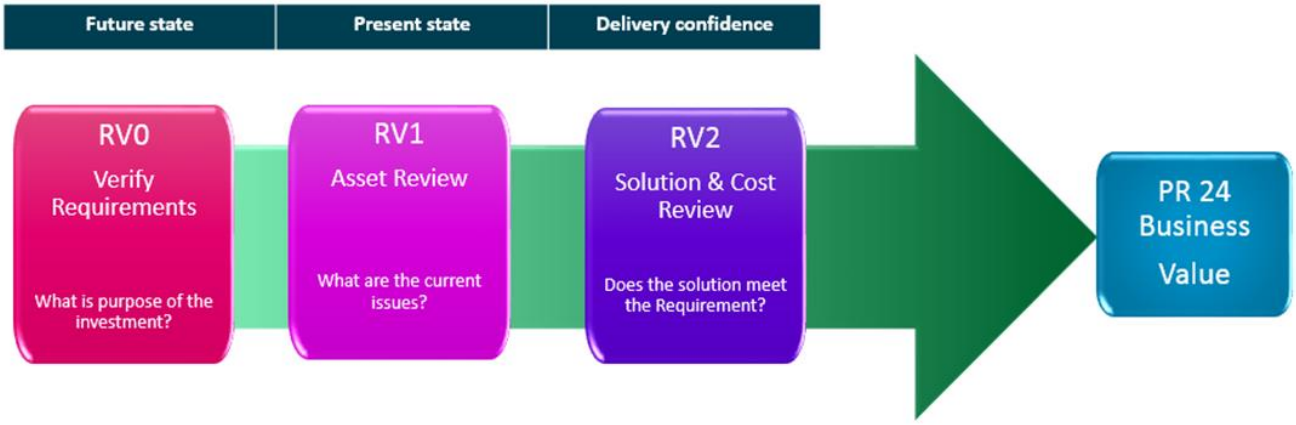
4.1 Options development

4.1.1 Due to the late addition of these schemes to the WINEP, we have not been able to assess the scope and develop interventions through the standard process in the timescale given, although the principles of this process have been followed, ensuring we have adopted the correct approach to option identification, development and selection to maximise the realisation of benefits.

4.1.2 In our options development, we considered the impact of our overflow options on the receiving wastewater treatment works and where relevant have included costs for necessary upgrades and increases in ongoing treatment costs if we need to increase the permitted flow to full treatment to accommodate additional storm water. This is applicable to the scope and solutions developed for Hawkshead and Langdale WwTW.

4.1.3 The considerations applied through the Risk and Value Process (Figure 4) were applied as a condensed process given the timescale for solutions to be developed.

Figure 4: PR24 Risk and value



Source: UUW63 Wastewater (Quality – Treatment) Enhancement case, 5.1. Figure 9: PR24 Risk and value

4.1.4 The requirements were clearly verified, and a review of the current asset condition and performance was undertaken to set the initial baseline and identify solutions.

4.1.5 High level screening was applied to refine the feasible solutions and determine solution development and estimating. In developing feasible options, the engineer will always have taken which solution could represent the best value to the customer into consideration.

4.1.6 A standardised methodology to solution identification was developed for the wastewater treatment works solutions to ensure a consistent approach. Elements from the 'Process Decision Support Tool' that cross references permit values, population and flow data with United Utilities' treatment processes and asset standards to identity and size interventions to meet the requirements were applied. Consideration of interventions included conventional (including chemical and biological phosphorus removal), innovative and nature-based solutions.

4.1.7 Use of these optioneering tools ensured the process was proportionate to the scale of the risk to be addressed and the timescale given to develop solutions. They provided a quick and effective way of ruling out unsuitable options and identifying feasible solutions from different option types.

4.2 Innovation

4.2.1 Throughout AMP7 United Utilities' has taken learning from AMP6 innovation roll out (such as that demonstrated with Nereda and Typhon) to deliver a new Technology Approval Process. This process

identifies opportunities for innovative technologies and nature based solutions and provides a methodical approach to due diligence, innovation risk identification and mitigation planning. The approved technologies/solutions include:

- those we have identified ourselves;
- those suggested by our construction partners;
- those identified by other WaSCs but not yet progressed by United Utilities in AMP7 i.e. I-PHYC Algal bioreactors; and,
- global innovation insights such as that secured through our engineering service provider Jacobs and other consultants such as Stantec.

4.2.2 Our Technology Approval Process has allowed us to progress technologies into approval without the need to trial, and we have incorporated the technologies that have now secured "Approved" status into our Process Decision Support Tool which was used to identify innovation opportunities by driver and site details. Where these innovation opportunities present the best value solutions they have been selected to be taken forward as the preferred solution. Alongside this we will continue to review those innovations / solutions not yet approved but relevant to AMP8 drivers and progress these through our Technology Approval Process and, where deemed truly necessary, deliver specific Innovation trials. We believe this sets United Utilities in good standing in terms of understanding the key opportunities that innovation can deliver within our PR24 submission but will also allow for further efficiency driven by our Innovation programme.

4.2.3 We continue to explore innovative ways to achieving lower phosphorus limits at small WwTW which serve fewer than 2,000 people however, as we have seen within our AMP8 plan, chemical removal may still be identified as the most cost effective solution. For five of the rural sites identified in the Windermere catchment, chemical removal would not be practical due to challenges in accessing sites and therefore alternative options were developed.

4.2.4 Following identification of an innovative technology on the conference circuit, United Utilities funded an innovation trial to investigate the potential of a highly novel, Japanese technology (and its applications on very small WwTWs as an alternative to septic tanks. The technology is a chemical free, package plant treatment system which is capable of removing phosphorus, suspended solids, BOD, ammonia and total nitrogen. Predominantly used in the domestic sector, our innovation trial has proven that the technology is also applicable in municipal settings. Through a pilot trial, hosted at Glazebury WwTW, results suggest that the technology could achieve an average phosphorus concentration of 0.5 mg/l, as well as excellent performance for suspended solids, BOD and ammonia. Trial data also suggests that the technology is capable of treating for Total Nitrogen, though the trial was not specifically designed to test this parameter. As well as the excellent performance, the technology also brings several other benefits:

- Standard product; modular installation;
- Low power consumption; potential to be powered renewably;
- Long desludge period; reduced OPEX and customer impact;
- Chemical free phosphorus removal; no requirement for deliveries, reduced H&S risk

4.2.5 We have moved at pace to adopt this technology, and has installed a unit at Calverhall Prees Road.

4.2.6 All data from the pilot trial is limited and does not provide evidence of performance under all scenarios, however it concluded that the technology has potential for widescale adoption and benefits across the AMP8 capital programme and the wider UU asset base, as well as upgrades to privately owned septic tanks in and around Windermere. This is not without risk.

4.2.7 In AMP7, two of these units will be installed at Whitegate WwTW to meet the regulatory Phosphorus driver (1 mg/l annual average) by December 2024 and we are proposing the installation of additional units in our region as treatment solutions for AMP7.

4.3 Options selection

4.3.1 The water sector is moving towards a 'best value' approach, promoted by the regulators, with a best value option being one which drives the best outcomes for the environment, society and UUW over the long term. We have therefore proposed the new, chemical free phosphorus removal technology at five of these small wastewater treatment works to achieve new or tightened permits, based on the potential identified through trials.

4.3.2 While we are confident that the scope we have developed could meet the requirements, we have not however been able to do detailed optioneering or optimisation of the programme of work and therefore complete a detailed value assessment of multiple options. Inclusion of the projects in the gated scheme process is valuable in refining the scope and therefore the cost and value for these projects.

4.3.3 The value associated with the selected options was assessed at a high level and will be assessed further using outputs from the value assessment tool developed by United Utilities specifically for this purpose. This tool lists intervention type and the associated benefits and value. It assesses value against a number of benefits including all the wider environmental outcomes as requested in the EA WINEP Options Development Guidance. The wider value element was also taken from the EA's WINEP guidance on Wider Environmental Outcomes.

4.3.4 The inputs to the value tool include costs (CAPEX, OPEX and whole life), carbon (embedded, operation and whole life), data on biodiversity plus risks and benefits as described above. The outputs from the tool include a cost benefit analysis. This will be undertaken as the solutions are reviewed and developed further. Due to the additional work required to review and develop best value solutions, and uncertainty in scope/need, cost and deliverability, these projects are ideally suited for inclusion in Ofwat's large scheme gated mechanism to accommodate changes in scope and cost. More information on this is given in *UUWR_11_Gated Mechanism*.

5. Cost efficiency

5.1 Introduction

5.1.1 This section sets out how we have calculated the value of this enhancement case, how we have challenged our assumptions to develop efficient costs and how these have been benchmarked and assured.

5.2 Approach to cost build

Costs for projects which have a final effluent improvement requirement have been assessed using site specific information. Our engineering team has developed solutions for each individual site based on the site specific requirements and the future permit requirements of the WINEP. We have utilised our estimating tools and experience of project delivery in the Windermere catchment to develop costs for all the schemes identified.

Approach to challenging our assumptions

5.2.2 There are several aspects of project costs, which are impacted by the scale of the programme and thus as the AMP8 programme matures, they may be subject to change. We have currently estimated 7% allowance for Corporate Overhead. This is estimated on anticipated high level organisational structures to support the programme. This has been calculated based on current delivery assumptions, which is a largely outsourced design and build basis.

5.2.3 We commissioned Arup to run an independent scrutiny and challenge process on the development of the PR24 WINEP before the Windermere locations were identified for investment. Arup spent time working with specialists across UUW to understand how we had arrived at the scope, the approach to developing costs and whether the programme had been appropriately optimised.

5.2.4 Feedback from Arup '*Overall, we note the very significant amount of work that was done by UUW in the short time between our reviews… We found that UUW responded positively to the challenge and scrutiny applied to it from Arup and the Panel members, with a very significant amount of work undertaken after our initial review. We observed that progress had been made by UWW in many areas that we highlighted in our original review. As part of this, we also noted a strong push across the leadership and the operational teams on trying to ensure that the programme achieves a balance of solutions across traditional engineered approaches and alternative solutions where these are feasible and appropriate.*'

5.2.5 Following the initial review by Arup we incorporated their feedback into our plan and process for developing solutions. Particularly relevant to this case is the cost estimating methodology which following the second review they concluded that UUW costing methodologies largely comply with the requirements of WINEP guidance as well as standard industry practice. However, they did raise concern that "across a broad programme the level of risk allowance is at the lower end of the range we would expect' we have further developed our plan to ensure concerns raised are addressed within the final estimates.

5.2.6 We have run internal cost challenge processes since the 5 July 2024 WINEP, but a full cost challenge and assurance has not been possible in the time available, however,the storm overflow solutions identified have been compared with Ofwat's Draft Determination model assessment of the PR24 overflows programme for a view on efficiency.

5.3 Benchmarking UUW's capital costs

5.3.1 In July 2024 United Utilities commissioned Mott MacDonald to carry out a benchmarking exercise of United Utilities major capital construction costs.

5.3.2 The benchmarking of costs between companies is a challenging task, as such costs are often commercially sensitive, and are not readily shared. The sharing of out-turn costs could affect market competition between contractors and suppliers.

5.3.3 Mott MacDonald provide engineering and capital delivery services to three UK water and wastewater companies and were able to determine the costs incurred by those companies in the delivery of their major capital programme. United Utilities costs were compared to the other two water and wastewater companies (whose identity was not revealed to United Utilities, and who were referred to as "Benchmark 1" and Benchmark 2") and the outcome of this comparison was shared.

5.3.4 United Utilities provided cost breakdowns for high value construction projects, for use in the benchmarking exercise. The comparable project costs included elements such as materials, construction costs, and so on.

5.3.5 The benchmarking exercise found that all companies were most expensive for some line items, and least expensive for other line items.

5.3.6 When comparing all the most expensive line items from across the three companies, and all of the least expensive line items (the max of maxs, and min of mins), United Utilities costs were 18% below the max of max, and 19% above the min of mins.

5.3.7 Looking at overall average costs, United Utilities was 2% above Benchmark 1 costs, and 3% below Benchmark 2 costs, with an average variance of 1%.

5.3.8 This indicates that United Utilities costs are comparable to other companies in the sector, and that we are not high cost outliers. We will continue to work with contractors and partners to secure cost efficiencies as we move into the delivery phase of the programme.

5.4 Third party assurance of our cost estimates

5.4.1 UUW put in place a robust process to identify, scope and cost all solutions proposed within our business plan. This process is set out in detail in October's main business plan submission[6] along with supporting supplementary documents.

5.4.2 This process was subject to third party assurance during the development of our business plan. Full details of UUW's approach to assuring our business plan was set out in our October submission[7]. As set out within this submission, a number of third party organisations were involved in providing assurance including Deloitte, PWC and Faithful & Gould.

5.4.3 UUW's Board provided assurance that the solution development process underpinning our plan was appropriate, included extensive optioneering and that resulting expenditure forecasts were robust and efficient[8].

5.4.4 The scope and associated costs set out within this enhancement case have been developed using the same process described and assured in the above documents. This enhancement case has also set out specific evidence to support the unique aspects of this particular investment proposed. As such, we consider this to represent compelling evidence that the forecasted costs set out within this case are robust and efficient.

[6] UUW (2023) UUW08: Delivering at efficient cost. Available here:
https://www.unitedutilities.com/globalassets/z_corporate-site/pr24/main-documents/uuw08.pdf

[7] UUW (2023) UUW76: Confidence and assurance of the submission. Available here:
https://www.unitedutilities.com/globalassets/z_corporate-site/pr24/supplementary-documents/uuw76.pdf

[8] UUW (2023) UUW11: Board Assurance Statement. Available here:
https://www.unitedutilities.com/globalassets/z_corporate-site/pr24/main-documents/uuw11.pdf

5.5 Industry comparison

5.5.1 We have undertaken a review of our costs using available cost share data on similar schemes across the industry. Information on this is included in Wastewater (Quality – Treatment) Case 11: Final effluent limits, section 6.5. In our assessment of PR24 plan against this our PR24 phosphorus removal plan is less than the industry average, however the UUW costs do sit above other companies. Reasons for this could include:

- This is AMP7 data collected before the increase in input prices;
- The AMP8 programme includes more schemes where phosphorus permit limits are down to the technically achievable limit of 0.25mg/l increasing the amount of totex required to achieve the permit level;
- This analysis does not look at the current level of the permits at sites ahead of the new lower permit coming into force, an existing Urban wastewater limit may allow more optimisation of the process ahead of new lower limit therefore reducing cost; and
- Population equivalent of schemes is also a factor for the efficiency of £ per PE. It is more costly to remove a Kg of phosphorus from a small WwTW than one which serves a larger PE.
- This benchmark analysis is a simple analysis of unit rates and does not account for differences in treatment works size, phosphorus limits. Cost assessment should appropriately account for these factors when identifying efficient cost targets for phosphorus removal.

5.5.2 As part of our submission, table CWW19 includes the granular level data for the costs, design and current PE as well as Capex and Opex costs for the AMP8 programme.

5.5.3 As these requirements were late additions to the WINEP we have only had a short period of time to assess the scope and develop solutions with costs and a schedule. As a result, at this stage we are uncertain around the exact scope, cost and delivery schedule across all the drivers, as summarised in *UUWR_11_Gated Mechanism*, therefore we propose these schemes to be delivered through the Large Scheme Gated Process where schemes are uncertain in scope, cost or deliverability.

6. Customer protection

6.1 Introduction

6.1.1 It is important that customers have confidence that we will deliver the enhancement schemes that get reflected in our PR24 final determinations and they are suitably protected in the event of non-delivery, or if there are material changes to deliverables (including changes to dates), which leads to a change in cost (including changes in the timing of required expenditure). Ofwat proposes that, if companies fail to deliver or are late delivering improvements to customers, then price control deliverables (PCDs) should, where appropriate, be used to compensate customers.

6.1.2 Given the late addition of these requirements, the large scale of the schemes, plus the complexity of working in the Lake District we propose that the schemes are appropriate for the Large Scheme Gated Process as a grouped programme of work. Justification for this is included in *UUWR_11_Gated Mechanism*.

6.1.3 We have included the schemes identified in this enhancement case within updated data tables CWW19 (phosphorous) and ADD17 (sanitary determinands).

Appendix A Letters received from Environment Agency

A.1.1.1 This section includes copies of letter received from EA on 03/06/24 including table of new or tighter permit limits for five WwTWs in Windermere catchment.

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Environment Agency

Andrew Kendal
Louisa Simpson Brown
United Utilities Group PLC,
Haweswater House,
Lingley Mere Business Park,
Lingley Green Avenue,
Great Sankey,
Warrington WA5 3LP

Our ref: 17370030
Your ref: 17370030
Date: 29 May 2024

Dear Andrew and Louisa

Near Sawrey WwTW Permit Review (permit no. 17370030)

We have previously made you aware that we are undertaking a periodic review of 5 of your WwTW permits in the Windermere catchment. Our modelling and analysis for the Near Sawrey WwTW is now complete and the results and recommendations are provided below. The results of the modelling and limits for the other sites will be provided as soon as we have them.

Current Permit

Near Sawrey WwTW operates under permit number 17370030. The permit was issued on 15/10/2018 when it was updated into the modern permit format. The previous variation of permit was issued on 01/04/2015 to incorporate improvements delivered under AMP6. Current permitted DWF at Near Sawrey WwTW is 79 m3/day. The current permit limits for the WwTW are listed in Table 1.

Determinand	95 %-ile Permit Limit (mg/l)
BOD	30
Suspended Solids	45
Ammonia	30
Total Phosphorous	-

Table 1. Existing permit limits for Near Sawrey WwTW.

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Source Apportionment

The latest SAGIS modelling used a default concentration of 6mg/l to calculate the Total Phosphorus load as no measured data was available. This estimates the load as 302kg/yr, which is 21% of the annual load from all UU assets in the catchment.

Water Quality

The physico-chemical quality elements of Ammonia, Dissolved Oxygen, and Phosphate were at High classification standard in 2022 for the Cunsey Beck / Black Beck WFD waterbody (GB112073071400). However, concentrations of Total Phosphorus and Total Nitrogen are increasing upstream in Esthwaite Water, indicating a deteriorating trend in water quality as shown in Table 2.

Determinand	2014	2023
Total Phosphorus (mg/l)	0.0198	0.0255
Total Nitrogen (mg/l)	0.639	0.814

Table 2. Total Phosphorus and Total Nitrogen results (mg/l) for Sampling Point 88004551.

Recommendations

Table 3 lists the recommended permit limits derived from Monte Carlo modelling to prevent deterioration of Cunsey Beck downstream of the discharge.

Determinand	Recommended 95 %-ile Limit (mg/l)	Comments
BOD	30	10 % deterioration. Current measured discharge quality (95 %-ile 6.3 mg/l) resulting in approx. 1% deterioration.
Suspended Solids	45	1.5 x BOD
Ammonia	8	20% deterioration in river quality. Protects High status.
Total Phosphorus	2	Protects to High/Good WFD boundary, but results in approximately 200% deterioration of u/s river quality (SP 88004551).

Table 3. Recommended limits in mg/l given as 95 %-iles except for Total Phosphorus which is given as a mean.

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Discharge Point

The permitted discharge point is located at SD 3660 9511 (Outlet 1 on Map 1, the permit Site Plan). EA staff have observed in low flow conditions localised poor water quality adjacent to the outfall, which is located on the left-hand bank, not mid-channel as on the permit Site Plan. The water at the actual discharge point ponds as the main flow is in the far channel next to the opposite bank. Our sonde downstream of the discharge point is not picking up any deterioration which would suggest that by this point the effluent is well mixed and Outlet 1 would therefore be a suitable discharge point. We would recommend that the discharge point outfall is extended to be mid-channel to enable better mixing.

Map 1. Permit Site Plan

We would welcome the opportunity to discuss these recommendations with you at the earliest opportunity and will be in contact to arrange a meeting.

Yours sincerely

Nicki Rushton
Area Environment Manager

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Appendix B Schemes included within this enhancement case

Table is indicative view subject to review as projects develop

Table 2: Schemes included within this Windermere enhancement case

Project	EA Unique ref	Completion date	Project driver	Determinand	Statutory/Non Statutory	Capex (£m)	Opex (£m)	Totex (£m)
Glebe Road PS (LAK0045SO)	08UU102491	TBC*	EnvAct_IMP3, EnvAct_IMP4 and EnvAct_IMP5	10 spills pa and 1 spill per summer	Statutory	33.4		33.4
Grasmere WwTW inlet overflow (017370027SO)	08UU102492	TBC*	EnvAct_IMP4	10 spills pa	Statutory	42.1		42.1
Hawkshead PS (LAK0107SO)	08UU102490	TBC*	EnvAct_IMP4 and EnvAct_IMP5	10 spills pa (WFD already in AMP8)	Statutory	77.4		77.4
Ambleside WwTW	08UU102482	31/03/2030	25 year environment plan (25YEP_IMP)	0.25mg/l phosphorus (annual average)	Non-Statutory	0.8		0.8
Far Sawrey WwTW	08UU102485	13/05/2030	U_IMP1	30mg/l BOD, 45mg/l suspended solids, 20mg/l ammonia, 2mg/l phosphorus	Statutory	0.8		0.8
Far Sawrey WwTW	08UU102485	31/03/2030	25 year environment plan (25YEP_IMP)	0.5mg/l phosphorus (annual average)	Non-Statutory	0.8		0.8
Ferry House WwTW	08UU102489	31/03/2030	25 year environment plan (25YEP_IMP)	0.5mg/l phosphorus (annual average)	Non-Statutory	1.8		1.8

Project	EA Unique ref	Completion date	Project driver	Determinand	Statutory/Non Statutory	Capex (£m)	Opex (£m)	Totex (£m)
Grasmere WwTW	08UU102480	31/03/2030	25 year environment plan (25YEP_IMP)	0.25mg/l phosphorus (annual average)	Non-Statutory	0.3		0.3
Hawkshead WwTW	08UU102487	31/03/2030**	Water Framework Directive IMPg**	17mg/l BOD, 25mg/l suspended solids, 4mg/l ammonia (0.8mg/l P already in AMP8)	Statutory	4.2		4.2
Hawkshead WwTW	08UU102487	31/03/2030	25 year environment plan (25YEP_IMP)	0.25mg/l phosphorus (annual average) including increase to FTFT for 10 spill overflow solution	Non-Statutory	4.1		4.1
Langdale WwTW	08UU102483	31/03/2030	Water Framework – No Deterioration	20mg/l ammonia, 1mg/l phosphorus	Statutory	4.4		4.4
Langdale WwTW	08UU102483	31/03/2030	25 year environment plan (25YEP_IMP)	0.25mg/l phosphorus (annual average) including increase to FTFT for 10 spill overflow solution	Non-Statutory	5.6		5.6
Near Sawrey WwTW	08UU102486	31/03/2030	Water Framework – No Deterioration	8mg/l ammonia, 2mg/l phosphorus	Statutory	2.6		2.6
Near Sawry WwTW	08UU102486	31/03/2030	25 year environment plan (25YEP_IMP)	0.5mg/l phosphorus (annual average)***	Non-Statutory	2.6		2.6
Outgate WwTW	08UU102484	31/03/2030	25 year environment plan (25YEP_IMP)	0.5mg/l phosphorus (annual average)	Non-Statutory	3.0		3.0
Troutbeck WwTW	08UU102488	13/05/2030	U_IMP1	30mg/l BOD, 45mg/l suspended solids, 20mg/l ammonia, 2mg/l phosphorus	Statutory	1.1		1.1

Project	EA Unique ref	Completion date	Project driver	Determinand	Statutory/Non Statutory	Capex (£m)	Opex (£m)	Totex (£m)
Troutbeck WwTW	08UU102488	31/03/2030	25 year environment plan (25YEP_IMP)	0.5mg/l phosphorus (annual average)	Non-Statutory	1.1		1.1

Source: UUW analysis from WINEP Update 23/07/2024

*AMP9 Delivery dates to be confirmed through subsequent WINEP development (current indication is 2035 with plans aligned to this)
**Hawkshead Date changed to 31/03/2030 and driver changed to WFD_IMPg on 25/07/2024
***Holding line on WINEP for 0.25 mg/l annual average. But best value solution included in plan is 0.5 mg/l annual average and EA have been notified.

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United Utilities

Water for the North West