UUWR_39

PR24 Draft Determination: UUW Representation

Area of representation: Cost and PCD – Resilience uplift

August 2024

This document outlines our response to the creation of the Resilience uplift provided to cost allowances as part of the draft determination.

Reference to draft determination documents: Expenditure allowances, page 115, section 3.7.2 Climate change resilience uplift

United Utilities

Water for the North West

1. Key points

- **Being resilient to climate change is a core business driver:** We fully understand the importance of being resilient to climate change that has already occurred and the changes that are likely to occur.
- **Adaptive pathways are critical to success**: Climate change risk assessment and adaptation intervention is central to our Long-Term Delivery Strategy (LTDS) and delivery of our strategic planning frameworks (e.g. our water resource and drainage and wastewater management plans)
- **Some climate change has already occurred and is impacting services and assets**: Some climate change has already occurred, and the effects are threatening customers, the services we provide to customers and the assets that we own and operate.
- **Impact on interdependent services**: We are not unique in being impacted by climate change. Significantly, other infrastructure providers that we reply upon are already being impacted (e.g. electricity distribution).
- **Timely investment is critical**: We welcome Ofwat's decision to include a climate resilience uplift within cost allowances, given the risks of not intervening in a timely manner.
- **Third party assurance**: We have satisfied Ofwat's requirement for Independent third-party assurance for our resilience uplift business case.

2. Overview and Introduction

We welcome Ofwat's decision to allow a sector wide enhancement uplift for companies to start to address their biggest climate change related risks, focused on flood and power resilience. We have reviewed our current investment needs and have proposed a programme with the following four elements;

(1) **Power resilience:** Targeted on addressing the largest climate driven risks to service provision from loss of power for both water and wastewater services.

(2) **Asset and community flood resilience:** Targeted on addressing key water service risks where climate risks have introduced new vulnerabilities to sole source supplies.

(3) **Raw water quality resilience:** Targeted on addressing key threats to raw water supplies at risk from climate related deterioration.

(4) **Hydraulic property flooding resilience:** Targeted on addressing six wastewater catchments most at risk of increased property flooding from predicted growth in rainfall in AMP8.

In sections 3 and 4 we summarise the proposals previously included within our business plan and Ofwat's responses in the draft determination.

Section 5 demonstrates that the North West is particularly vulnerable to the predicted and observed increasing frequency and severity of storms associated with climate change.

In section 6 we provide a summary of the proposed programme associated with the resilience uplift including an outline of our approach to scheme selection and assurance.

We are therefore requesting an allowance for resilience of £79.5m, representing an increase beyond the £36.7m, or 0.7% of base expenditure included for in the draft determination. We believe that this larger plan represents best value for customers opposite the significant challenges arising due to climate change.

Whilst this is intended to be a one-off adjustment for PR24, we would welcome further consultation on potential future funding requirements to address climate change adaptation, including accounting for regional variances of impacts and costs. We consider that this is essential given that knowledge of the impacts and implications of climate change – and the speed at which these occur – will develop over time.

3. UUW's PR24 proposal

In our October 2023 PR24 submission we set out our general principles to securing a multilayered approach to resilience, aligned to the 4 Rs of resilience published by the Cabinet Office (Resistance, Reliability, Redundancy, Response & Recovery).

We included a section on securing resilience to climate change, which included a summary of how we assess and evaluate the likely risks from climate change, how we factor in multiple future pathways and include well evidenced climate uplifts to our water resource management plan and within our drainage and wastewater management plan.

We included longer-term plans and detailed our approach to adaptive pathways (including climate change) within our LTDS.

To address immediate concerns regarding power resilience and climate change resilience, we made enhancement cases for enhancing power resilience and resilience to property flooding from increasing rainfall as a result of climate change.

Power resilience

In our power resilience enhancement case (document *UUW67 - Cross Price Control Enhancement Case*) we set out how we wanted to secure additional resilience to power supply failures from the supply network, addressing risks from the supply side Distribution Network Operators (DNO) separate from any issues with the asset health of our own asset base – these risks are outside of management control.

The scope of work was developed in-line with the methodology set out in the draft and final PR24 methodology Appendix 9 Setting Expenditure Allowances[1] section 3.4.3 Investment to improve resilience.

Our solution was to install power resilience assets at 51 sites that currently do not have protection, enabling them to continue to run without grid power and speed up system recovery time post power restoration. This need was in response to a change in HM Government risk assessment, indicating an elevated level of likely consequence and a change to worst case planning scenario issued to Local Resilience Forums (LRFs).

We have identified a likely future transitional risk from climate change mitigation as the UK decarbonises its power supply systems and moves towards more intermittent power sources, exacerbated by greater demand on the grid from increased electrification of transport.

We assessed our plans against the investment plan of the DNO in our region to ensure that customers were protected from paying for power resilience enhancement twice.

Rainwater flood resilience

In our rainwater management enhancement case (document UUW65, case 15) we set out our ambitious plans to deliver rainwater management solutions (for example SUDS) to provide resilience against the increased risk of property flooding driven by the impacts of climate change on the wastewater system (volumes of additional rainwater runoff requiring collection and treatment) a particular risk factor for UUW due to our higher than industry average proportion of combined sewers (54% for UUW vs. 33% for the industry average). This was an AMP8 deliverable with both immediate and long-lasting future benefits; the scope of work having been determined from our Drainage and Wastewater Management Plan (DWMP), which accounted for climate change in line with industry standard tools and utilised a 2D hydraulic modelling approach rather than standard 1D.

[1] PR24_final_methodology_Appendix_9_Setting_Expenditure_Allowances.pdf (ofwat.gov.uk)

4. Draft determination position

This section has been written in two parts to address the two specific outcomes of the draft determination.

Power resilience
In its draft determination of the sectors plans Ofwat has stated that no company of the eight that made enhancement claims for either power or climate change resilience activity had been able to satisfactorily demonstrate the need for investment, or that it was appropriate for additional enhancement funding citing that base expenditure allowances include a provision for climate change and that it is the company's duty to deliver resilient services day-to-day taking into consideration pressures from climate change.

Ofwat's decision to deny enhancement claims in this area was ascribed to poor evidencing of the need for enhancement investment, or poor evidencing that risks were outside of management control.

Enough companies (eight) made representations in business plans for power or climate change related claims that Ofwat has determined that it is appropriate to fund the sector more generally, recognising this as a one-off uplift, to address the highest priority climate related resilience risks. This is despite Ofwat's view that companies individually made unconvincing arguments.

'We intervene to make these allowances so that all companies have additional funding to deal with the impacts of climate change on their assets and performance for customers. This should, as a minimum, address additional flood and power resilience requirements from climate change.'

Ofwat PR24 Draft Determinations Expenditure Allowances - page 115

Specifically for the power resilience case (*UUW67 - Cross Price Control Enhancement Case*) Ofwat made no specific funding allowance, in recognition of the establishment of a sector wide climate resilience uplift allocation.

Rainwater management
In their draft determination of UUW's Rainwater management enhancement case (document *UUW65 – Wastewater Quality Additional Requirements Enhancement Claims, case 15*) Ofwat made no specific expenditure allocation for this case.

Ofwat rejected the assessment on the basis that it considered there was inadequate demonstration that;

(a) There is a quantified problem requiring a step change;

(b) The scale or timing of the investment is justified; or

(c) Proposed investment did not overlap with base expenditure plans or other enhancement funding.

In its judgment Ofwat re-stated that it is companies' duty to deliver resilient services day-to-day taking into consideration pressures from climate change.

Resilience uplift
In response to the requests from the sector, and in recognition that climate change has and will continue to have significant impact on companies' risk positions and performance Ofwat has established a resilience uplift allocation.

This one-time adjustment to all companies allowances of 0.7% of base costs (water & wastewater only) has been derived from the median power and climate change related claim from companies (post efficiencies) for enhancement funding. For UUW this equates to £17.2m on water and £19.5m on wastewater.

The funding has been included within the enhancement allowances, with a requirement from companies to detail the schemes that we intend to invest in and why these have been prioritised. All companies must justify how climate change is driving the change in risk leading to the new investment need.

To satisfy this core requirement we have detailed our approach to determining our candidate schemes below.

- in section 6 we summaries how we have screened options for priority, causal factors, and deliverability
- In section 6.1.1 we provide evidence of the causal link between climate change and flooding risk

- In section 6.1.2 we provide evidence of the causal link between climate change and power resilience risk
- In section 6.1.3 we provide evidence of the causal link between climate change and water quality risk
- in section 6.1.4 we provide evidence of the causal link between climate change and the need to remove additional volumes of rainwater from the sewerage system.
- In section 6.1.5 we provide evidence of third party assurance undertaken on our resilience uplift business case, as requested by Ofwat in its PR24 draft determination – Price control deliverables appendix.

5. Issues and implications

Key issues

- 0.7% of base expenditure is significantly below what is likely to be required to address the increased risks associated with climate change in AMP8 or for future AMPs.
- The North West is impacted by some of the wettest weather in England, with 40%[2] more urban rainfall than the industry average.
- Climate change does not impact all areas of the country equally. The National Infrastructure Commission report, Sayers et al., (2022)[3] highlights the North West as experiencing greater shifts in rainfall increases than central and southern regions during a 1 in 30-year return period storm event.
- A long-term view is required when considering climate change and early investment is critical to support the delivery of ambitious long-term targets.
- Power resilience is impacted by a wide range of factors including, but not limited to, climate change. We would welcome cross industry collaboration to better understand the impact of climate change and other factors on DNO performance and system resilience as part of the ongoing operational resilience working group.

We welcome the recognition of the impact of climate change and support the establishment of a resilience specific uplift. However, the valuation of the 0.7% of base expenditure is significantly below what is likely to be required to address the risks from climate change alone. By comparison the Climate Change Committee (CCC) in 2023 estimated that annual investment flows are in the order of £1bn – £2bn for the next decade to secure climate adaptation to flooding (£0.5bn- £1.bn) and public water systems (£0.5bn- £1.bn)[4]. Our submission responds to what we consider is an undervaluation of the immediate investment needs for the highest priority climate change schemes.

Climate change does not impact all water and sewerage companies equally. In defining the climate change uplift Ofwat states that the impacts of climate change are a sector wide issue but setting a flat 0.7% of base allowances for all companies suggests that the impacts and investment needs are equal. This is not the case, across the UK and even across our operational region climate change varies.

As can be seen in ***Figure 1*** below, there is significant variance across England and Wales with respect to the forecasted climate change uplifts associated with a 30-year storm across a range of event durations, with UUWs area of operation being the most severely impacted region across all English and Welsh Water and Sewerage Companies. The design rainfall uplifts show in ***Figure 1*** are taken from work completed under the climate Resilience Programme funded FUTURE-DRAINAGE project[5].

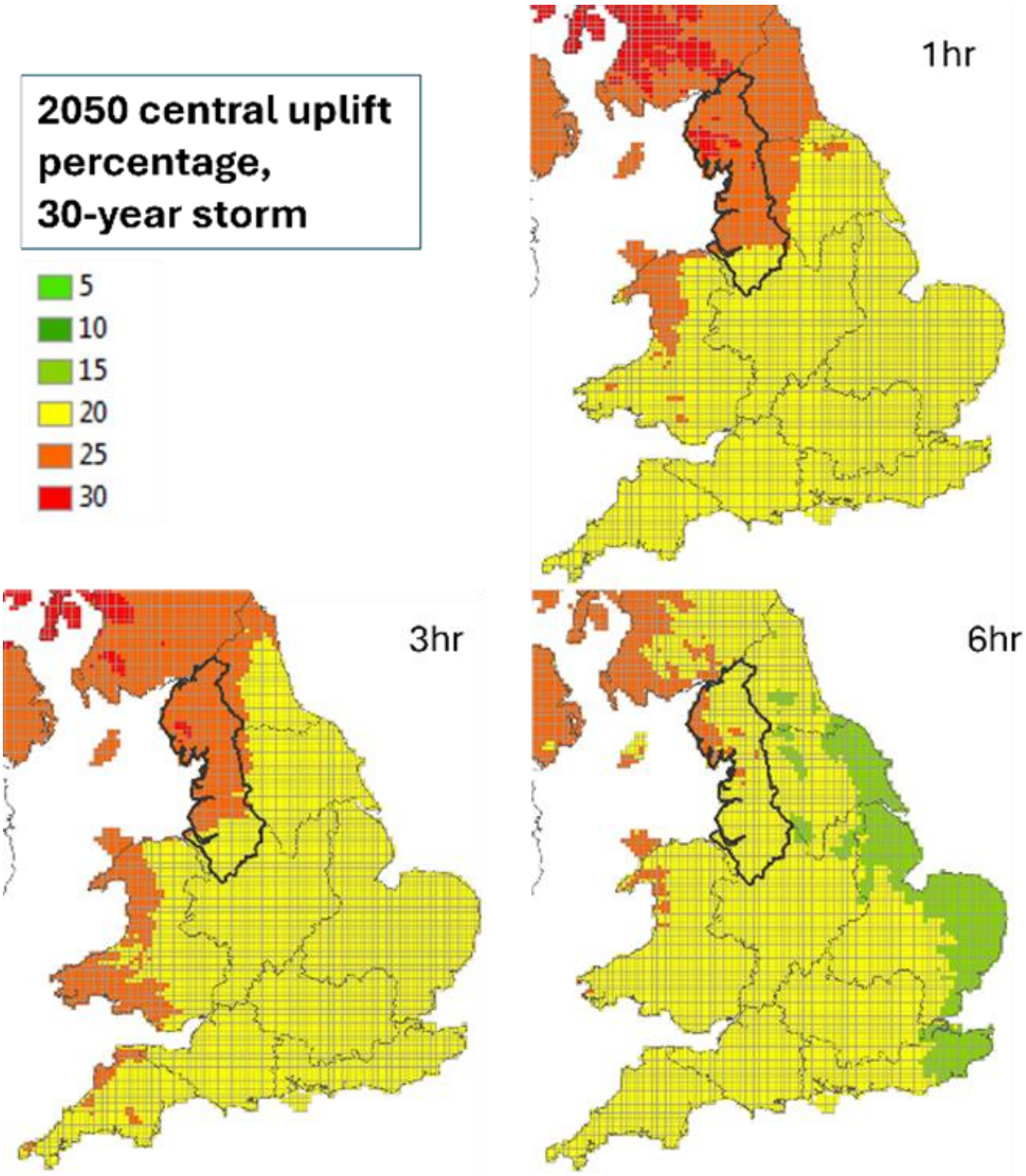
[2] https://www.ofwat.gov.uk/publication/urban-rainfall-calculations/

[3] NIC-Reducing-the-Risk-of-Surface-Water-Flooding-Final-28-Nov-2022.pdf

[4] Investment for a well-adapted UK January 2023 (theccc.org.uk)

[5] FUTURE-DRAINAGE: Ensemble climate change rainfall estimates for sustainable drainage - (ukclimateresilience.org)

Figure 1: Forecast climate change uplifts for a 30-year storm event for England and Wales



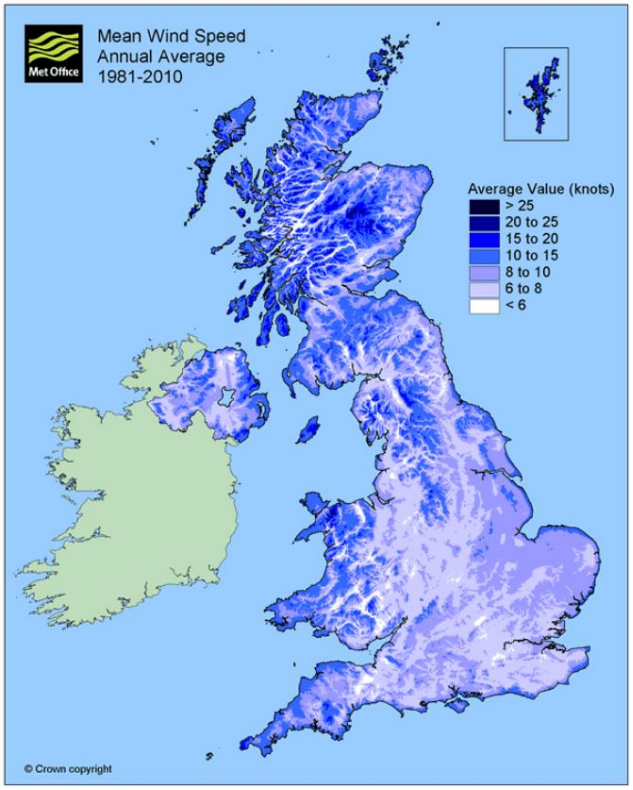
Source: MetOffice - Future Drainage[5]

The modelling we undertook for our DWMP demonstrated that by 2030, 90% of all modelled manholes across UUW's region, (covering 99.8% of the population equivalent) have a critical event duration of 3 hours or less. This statistic combined with the regional uplifts demonstrated in ***Figure 1*** (orange and red squares) suggests climate change will disproportionately affect UUW assets and customers. Therefore, we have included schemes above the 0.7% of base allowance to address specific risks from higher rainfall volumes.

This is a similar picture regarding wind, which plays a significant role in power resilience risk as we demonstrate in 6.1.2 below.

Figure ***2*** below shows the distribution of average wind speeds across the UK for the period 1981-2010, clearly demonstrating the variance between upland and lowland areas. Windspeeds are, for example, on average lower in the Midlands and South East than the North and Western regions, suggesting that risk to overhead power lines from wind is not uniform across the UK.

Figure 2: Average wind speeds (annual) for the UK



Source - Where are the windiest parts of the UK? - Met Office

In future, most climate projections indicate that winter windstorms will increase slightly in number and intensity over the UK i.e. more winter storms, including disproportionately more severe storms, are projected to cross the UK - Met Office[6].

The 0.7% funding allocation was determined based on the efficient costs of company submissions, where companies made a relevant submission (8 out of 17). This approach was not referenced in the draft or final methodology and has not been consulted on and is unlikely to be the optimal method to arrive at an investment value.

While recognising that this is intended to be a one-off adjustment for PR24, we believe that further consideration is required of likely future funding requirements to address climate change adaptation including accounting for the regional variances in impacts and costs.

In Draft Determination document "PR24 Draft Determinations Expenditure Allowances" Ofwat cite the precautionary nature of the investment fund, given the risks of not intervening in a timely manner. However, its rejection of the rainwater management enhancement claim significantly overlooks this. Ofwat states in its draft determination of the plan that the investment is inefficient in the period 2025-2030[7]. This overlooks that the core ambition of the enhancement was to invest **ahead of the need** and to prevent future deterioration of flooding. This scheme aligned to Ofwat's recognition of the need to invest ahead of the requirement, particularly for climate change. We believe Ofwat should adopt a longer benefits assessment timeframe, greater than the period of 5 years, especially for climate change related investments.

[6] UK and Global extreme events – Wind storms - Met Office

[7] Draft determinations models - Ofwat – Wastewater – freeform inputs: enhancement expenditure model, Tab NWT_L4 cell C13

We recognise that this uplift is intended to be a one-off adjustment to a improve service resilient to a new level. However, given the likely challenges posted by climate change under both a benign and adverse climate change projections, we anticipate further uplifts being required in future asset management periods as the risks that are outside of management control materialise.

6. Approach for final determination

Summary

Being resilient to climate change is a core business driver. We fully understand the importance of being resilient to climate change that has already occurred and the changes that are likely to occur. We support Ofwat's recognition that climate change is happening and will continue, as well as its desire to ensure companies invest to mitigate identified risks.

We have worked extensively with our partners to identify the most appropriate solutions, ensuring that there is no overlap with interventions via base or other enhancement cases and so ensuring customers only pay once for resilience across our interconnected systems. We are using an adaptive pathways approach to drive our plan, as we believe that this approach delivers best value.

In our response we have considered the timeliness of the investments to ensure that while we are investing to offset future climate change the schemes, we have selected are such high priority that there is value delivered in the investment period.

We have selected the highest priority schemes and catchments where a current risk exists because of already occurred climate change, therefore any investment will deliver immediate in-period benefits to customers and the environments. In addition, this investment will deliver future service risk reduction due to the forecasted consequences of continued climate change.

With specific reference to the enhancement claims made in this area (Power resilience and Rainwater Management) we;

- Accept Ofwat's draft determination on the power resilience enhancement case and propose alternative power resilience investment as part of the resilience uplift.
- Accept Ofwat's draft determination on the rainwater management enhancement case and include the most beneficial climate change related scope from this case within our programme of schemes for the resilience uplift.

To address the additional flood and power resilience requirements from climate change in AMP8, our plan proposes:

- £19.9m investment in our water assets,
- £59.6m investment in our wastewater assets.

Whilst this is intended to be a one-off adjustment for PR24, we believe that there should be further future consideration of potential funding requirements to address climate change adaptation, including accounting for regional variances of impacts and costs.

In the following section we discuss and summarise additional climate change data to evidence the need for specific investment to secure resilience in power, flood and quality and our approach to defining which schemes we have prioritised and why.

This is underpinned by independent third party assurance provided by Deloitte LLP. Further details of this report is provided in section 6.1.5 and document UUWR_06_Assurance aggregations summary report.

Our approach

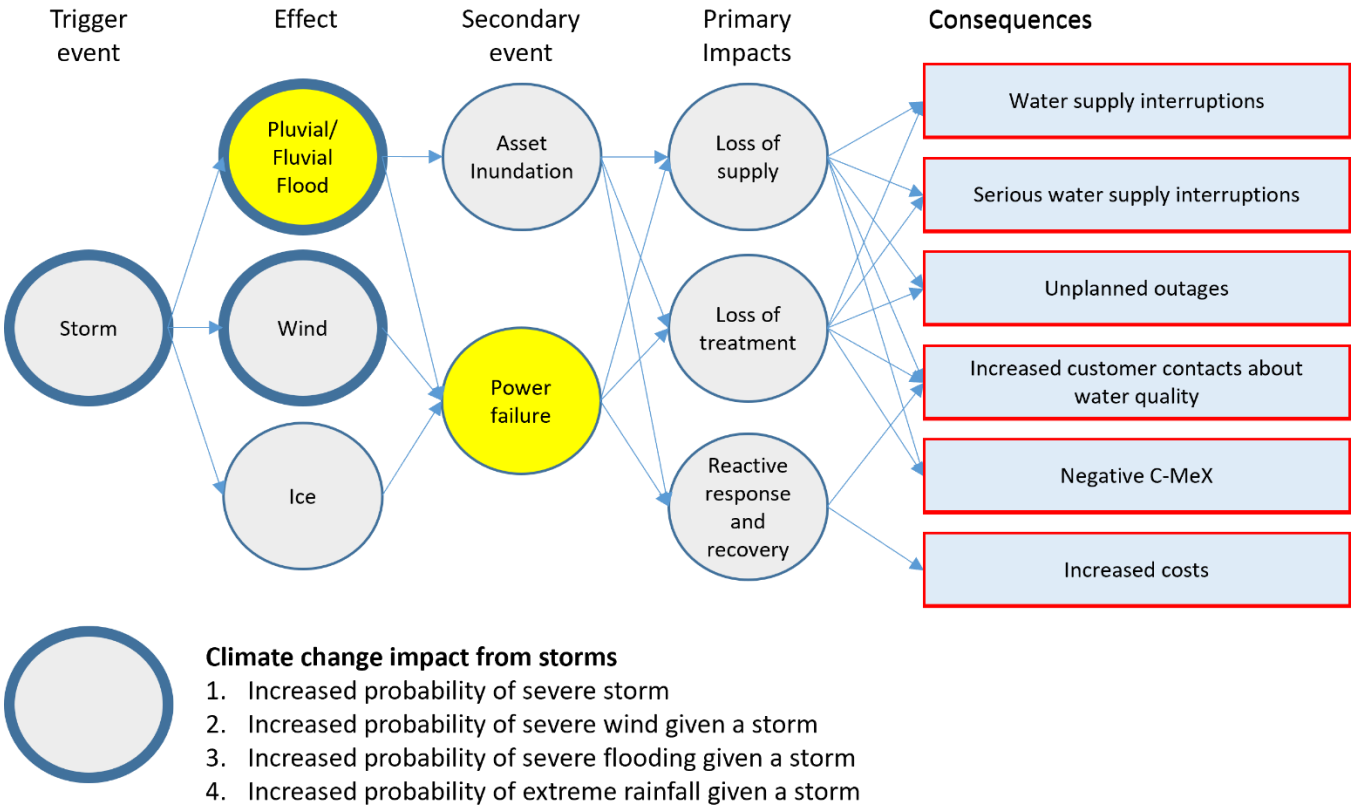
In this section we set out our approach to selecting and prioritising schemes for inclusion in the resilience uplift investment case.

Using the new guidance included within Ofwat publication - PR24 draft determination expenditure allowances[8] page 115, we have developed a programme of works and candidate schemes with deliverables that will increase resilience to communities, services and assets from climate change.

Our approach takes into consideration both the new guidance issued in the draft determination for schemes to address as a minimum power and flooding risks that are resulting from climate change. We have also considered the feedback received in the draft determination for the specific enhancement cases (power resilience and rainwater management).

We have developed two value assessment frameworks to aid in the selection of suitable schemes. These are shown below in Figure 3 (water) and Figure 4 (waste water).

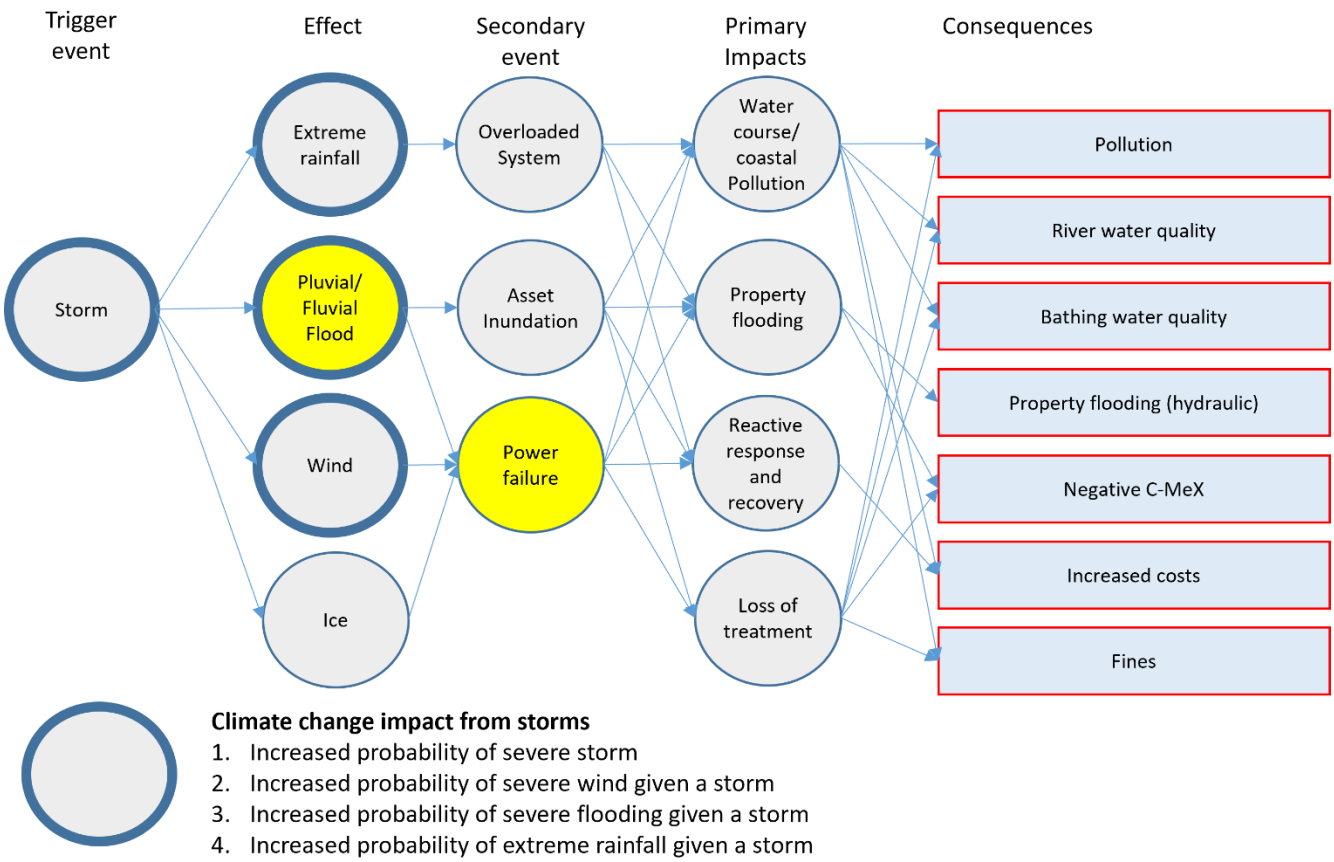
Figure 3: Value assessment framework for water scheme selection



Source: Option screening matrix for storm related risks (water)

[8] PR24-draft-determinations-Expenditure-allowances-to-upload.pdf (ofwat.gov.uk)

Figure 4: Value assessment framework for waste water scheme selection



Source: Option screening matrix for storm related risks (waste water)

Proposed solutions that were not impacted by the trigger event or where the primary benefits were unlikely to align to this framework were discounted.

Only schemes where climate change could be attributed as a direct causal link to increased risk were included.

Schemes where the climate change impact were deemed to be too far into the future, or uncertain due to the actual climate change scenario that is likely to manifest were discounted from this scheme list but retained as part of our long-term adaptive planning approach and included within our strategic asset management plans.

Only schemes where we have a high level of confidence of deliverability within the period 2025-2030 were included. To ensure that only the most efficient schemes were selected only schemes that are likely to have benefit within the 2025 – 2030 period have been included. Schemes with benefit in later asset management periods will be retained within our strategic asset management plans and inform our long-term adaptive pathways.

In employing this value assessment and screening matrix we have been able to define the below list of schemes. Further granularity of the proposed candidate projects is included within the Appendix Table 7 to Table 12.

6.1 Schemes

The below section details the schemes that have been shortlisted for inclusion in this programme of works. They are grouped by common impacts and are attributed to climate change via increased storm frequency and storm intensity as a common causal factor.

6.1.1 Flooding – protection of assets and communities

Summary

In this section we link flooding resilience to climate change. For this grouping of schemes, we have determined that flood protection or flood alleviation investment is required at two sites, detailed in Table 1.

We have selected scope based on current known fluvial flooding risk to sites and populations of people served. We can link an increasing risk directly to changes in rainfall and flood characteristics because of climate change.

Climate change effects

Analysis of our own datasets and records of flooding events confirm the link between climate change and increased flood risk in the North West, and at the sites that we are including within the scope of this document.

External peer reviewed data from the Centre for Ecology and Hydrology also confirms that human inducted climate change has had an impact on the likely return periods of extreme rainfall and river flood levels.

A multinational research team, which looked at river flow data from thousands of locations over a 50-year period, found that flood events are becoming increasingly severe in north-western Europe, including the UK, but decreasing in severity in southern and Eastern Europe.

The change ranges from an 11 per cent increase per decade in flood levels in northern England and Southern Scotland to a 23 per cent reduction in parts of Russia, with the researchers saying their findings provide the clearest evidence yet, at the European scale, of the link between climate change and flooding.[9]

The World Weather Attribution organisational also comment on the recent exceptionally wet Autumn and Winter 2023/24 stating that,

The average precipitation on stormy days are observed to have become approximately 30% more intense, compared to a 1.2C cooler pre-industrial climate. Models agree on the direction of change, combining observations and models indicate that average precipitation on stormy days increased by about 20% due to human induced climate change, or equivalently the 2023/24 level has become about a factor of 10 more likely.[10]

The International Water Association (IWA) also conclude that following a national-scale assessment of trend in UK peak river flow data that climate change is playing an observable role in increased peak river flows[11].

Our own experiences and data confirm that the effects of climate change are resulting in increased service risk.

Scheme definition and prioritisation

We have assessed that there is sufficient risk at two of our assets to warrant investment in AMP8 to protect them from flooding and the services that they provide to customers.

River Eden intake

The River Eden intake pumping station supplying Carlisle with raw water for supply to a population of >90,000 and will experience significant growth with the development of the St Cuthberts Garden Village (10,000 new properties).

The current intake was constructed in 2004. The asset has subsequently flooded in 2005, 2009, 2013, and 2015.

We have already implemented some flood protection measures, but these are at risk of becoming overwhelmed due to ever increasing flood volumes driven by continuing climate change (see link of climate change to flooding particularly in Northern England above).

Figure 5 below, show the side profile of the River Eden intake pumping station with retrofitted flood door across the main access door.

[9] https://www.ceh.ac.uk/press/changing-climate-linked-major-changes-flooding

[10] Autumn and winter storm rainfall in the UK and Ireland was made about 20% heavier by human-caused climate change – World Weather Attribution

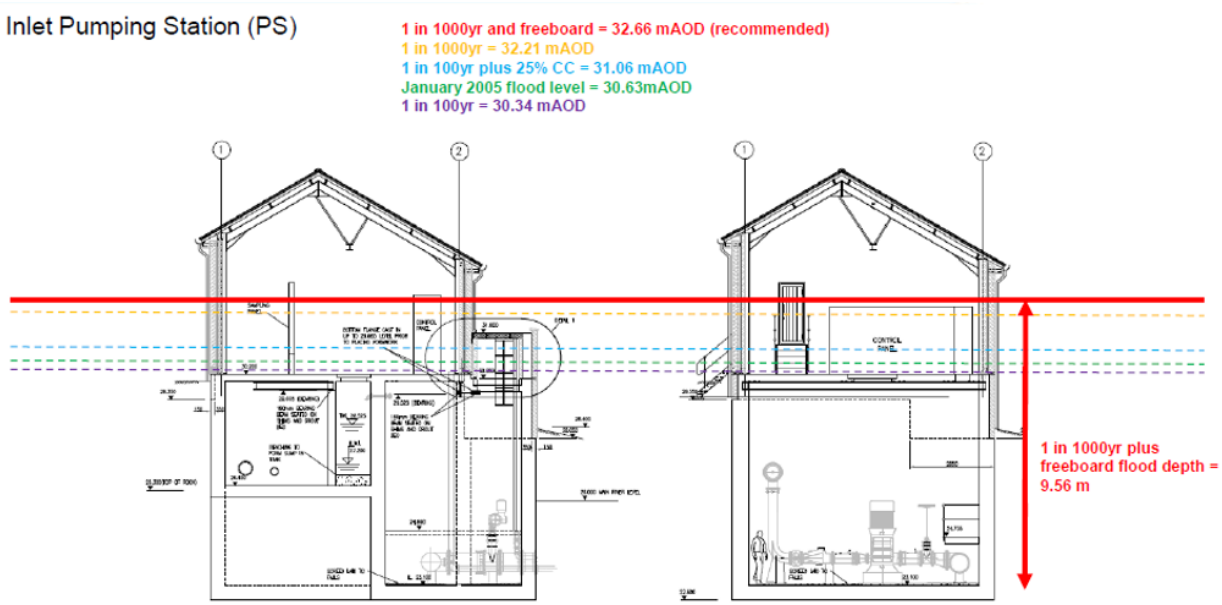
[11] An updated national-scale assessment of trends in UK peak river flow data: how robust are observed increases in flooding? | Hydrology Research | IWA Publishing (iwaponline.com)

Figure 5: River Eden intake – showing flood protection door

Figure 6, below, shows the side elevation of the River Eden intake pumping station with superimposed flood depth assessments based on published Environment Agency flood assessment datasets.

The green line denotes the January 2005 flood level that breached the building, and the blue line denotes the calculated flood depth of a 1 in 100yr event accounting for climate change.

Figure 6: Side elevation of River Eden intake pumphouse



The superimposed lines show the actual flood depths recorded in 2005 and the modelled flood levels including for climate change.

The proposed scope is to relocate the electrical and control equipment to a new building local to the site that is outside of the 1 in 1000yr flood boundary, therefore delivering enhanced resilience for now and into the future. The existing pumphouse and pumps would remain operational (even under flooding conditions) with modifications to the building prevent risk of structural damage and floatation under flood conditions.

Thirlmere Impounding Reservoir scour valves

The impounding reservoir at Thirlmere was completed in 1897 and was designed to supply Manchester with water to sustain its growing population and industry. It has remained in operation ever since, supplying significant parts of Lancashire and Greater Manchester and since completion of the West Cumbria connection project now also supplies Allerdale and Copeland in West Cumbria.

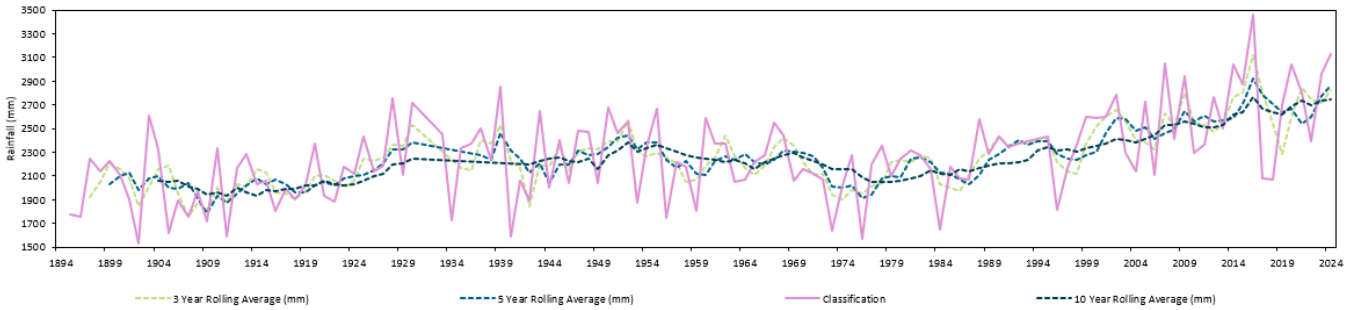
We voluntarily operate Thirlmere Reservoir to act as a flood attenuation asset for the protection of the town of Keswick and villages along the banks of St Johns Beck and the River Greta, as well as protecting our own assets downstream of the dam (which supplies approx. 6,000 people). Keswick has been subject to significant flooding events in recent years and the operation of Thirlmere as a flood attenuation asset is seen as a key component of the Cumbria Flood Action Plan[12].

We voluntarily draw down the level in Thirlmere during the Autumn and Winter months by making releases of water out of the reservoir, this provides capacity to absorb storm rainfall in the catchment.

Considering the already observed trend in increased storm frequency and intensity, with stormy periods like those observed in 2023/24 now 10 times more likely and individual storms 30% more intense compared to pre-industrial levels (referenced above) the frequency and duration of release has already increased and will continue to because of future climate change.

Figure 7 shows how rainfall within the Thirlmere catchment has already changed significantly with more forecast to come because of climate change. The long time series which include pre-industrial periods, shows that there has been an increasing trend in rainfall in the catchment post the 1980's.

Figure 7: Long time series data for rainfall in Thirlmere catchment



Source: UU analysis of rain guage data located at Dale Head (on the banks of Thirlmere)

To be able to continue to operate Thirlmere reservoir as a flood attenuation asset, the scour valves need to be upgraded. The scour valves that we currently operate are not designed for this purpose, they are butterfly valves designed for emergency draw down purposes only and lack the fine control required to release water safely and to the prescribed volumes.

The current scour capacity of the in-situ valves will remain broadly the same, but with enhanced levels of control. This enhanced level of control will allow us to make controlled flood volume releases that do not result in detriment to the environment or damage to third party land downstream or the over release of water potentially threatening public supplies later in the year.

Table 1: Scope of flood protection schemes

ID	Scheme name	Scheme Location	Value (£k)
1	Water Flood – River Eden	Cumbria	9,712
2	Water Flood – Thirlmere	Cumbria	3,000

Customer protection

Customers will receive an enhanced level of resilience from this investment.

- Reduced risk of water supply interruptions from assets being protected against flood (+90,000 population);
- Reduced flood risk for properties downstream of Thirlmere Impounding Reservoir.

[12] Cumbria Flood Action Plan - reducing flood risk from source to sea (publishing.service.gov.uk)

All solutions will be value engineered and multiple options assessed with only the best value options being selected for delivery, the River Eden intake scheme has already undergone optioneering and value engineering. Construction and installation costs have been developed in line with our assured AMP8 delivery frameworks.

6.1.2 Power resilience – securing safe and reliable services for customers and the environment

Summary

In this section we will link power resilience risk to climate change. For this grouping of schemes, we have determined that power resilience solutions are needed at 81 sites across the region, detailed in Appendix A. We have excluded schemes in areas that currently have good power supply resilience (see below for the regional risk profile).

We have selected scope based on current known power supply performance, where we have frequent power interruptions or a history of pollution because of a supply side power failure, or where there is an immediate risk to a sensitive water body, and where we can evidence that the supply network is vulnerable to the effects of weather and in particular storms of increasing frequency and intensity because of climate change.

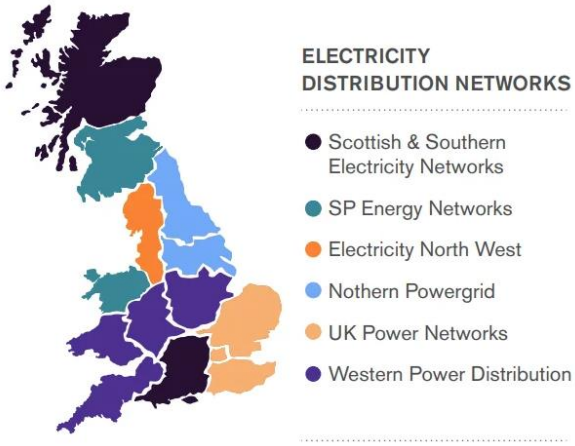
The development of this scope of work is based on the successful pilot of the installation of a Battery Energy Storage Solution (BESS) in Cumbria that had been experiencing frequent site shutdowns because of supply side power losses.

Risk to power disruption from climate change

Aligned to the new guidance, and to support this representation, we have reviewed our climate change evidence base and analysed available distribution network operator performance for most of our region. This has been a key component of our scheme selection and prioritisation approach discussed earlier in this document.

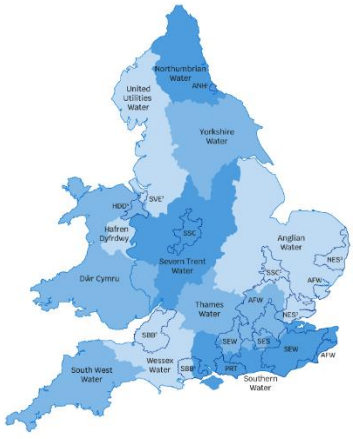
Analysis of published outage data from the major supplier to our area of operations (Electricity North West) has identified an increasing trend in outages because of weather/storm events or their consequences. Categories analysed include wind/gale, blizzard, tree fall, flood, and windborne materials, importantly they do not include faults associated with general asset condition, operation or third-party impacts such as contractor asset strikes.

Figure 8: UK map of DNO operational areas



Area of operation of ENW alignment with the UUW supply region

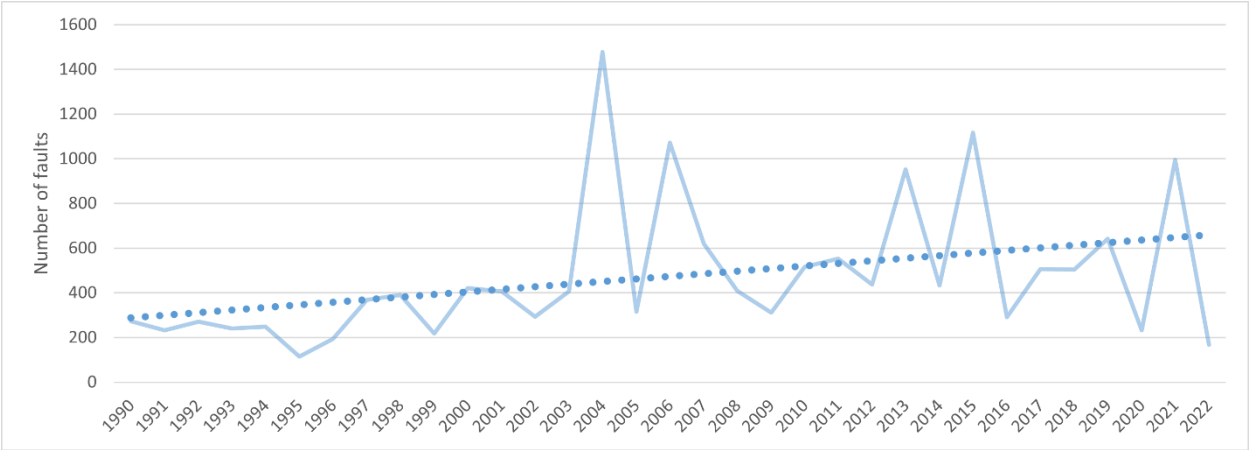
Figure 9: England & Wales water company boundaries



As can be seen in the comparison between Figure 8 and Figure 9 above, ENW's area of operation is the majority of UUW's area of operation, it is therefore appropriate to use ENW's performance information in support of this case. Notable areas that are not supplied by ENW include the Merseyside area, however through engagement with the DNO for this area (SP Energy Networks), we understand that the area has good resilience to wind / storms on account of the network largely being buried and configured in a mesh, providing good resilience.

Analysis of fault data over a long time series (1990 – 2022) has identified an increasing trend in weather related network incidents on ENWs supply network. See Figure 10 below.

Figure 10: Number of faults attributed to weather related causes



Source: ENW outage data

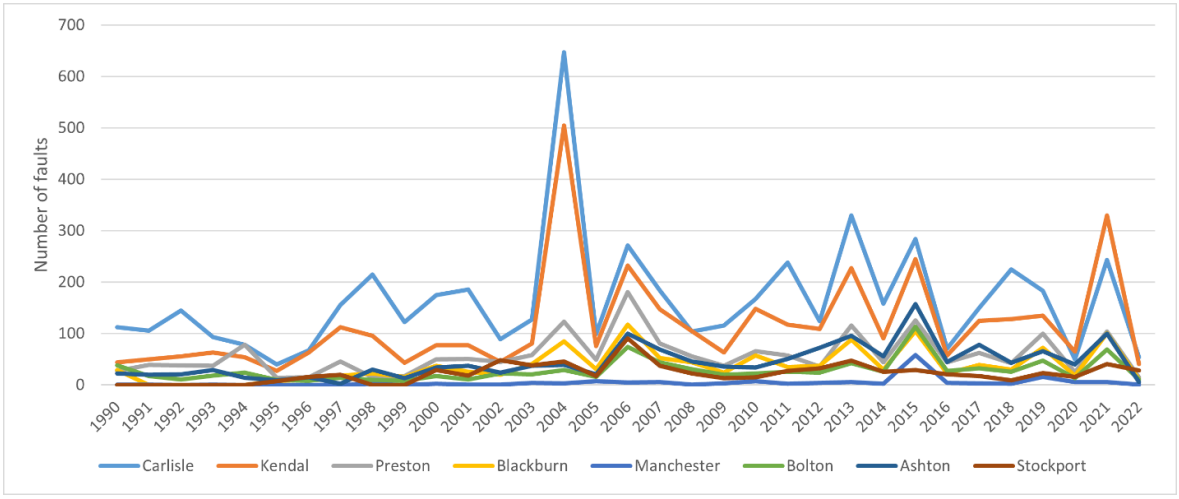
The trend analysis shows that the number of weather-related network incidents has increased by approximately 100% since 1990 to the last complete year of data in 2022.

Additionally, the impacts of major storms can be seen in the dataset, demonstrating the vulnerability of the power supply system to storms which can be attributed to human induced climate change. Analysis by the World Weather Attribution organisation conclude, with reference to Storm Desmond (2015), that.

Such extreme regional rainfall has a return period of about five years (20% chance in any given year) and is at present roughly 60% more likely due to human-caused climate change. This estimate includes the overall effect of climate change: changes in the amount of moisture in the atmosphere, potential changes in atmospheric circulation and storm occurrence.[13]

Supplementary analysis at circuit level (sub-regional), Figure 11 below, shows this same trend in all areas with all circuits bar one (Manchester) showing at least a 100% increase in weather related faults. This is most notable in the Cumbria region (Carlisle and Kendal circuits). Manchester, where we know that cables are largely buried and well interconnected already has a good level of resilience.

Figure 11: Number of faults attributed to weather related causes by circuit



Source: ENW outage data

We are already observing a deteriorating trend in performance for power because of increasing storm frequency and anticipate that the risk is likely to increase with further climate change, driving the need to invest.

[13] UK Storm Desmond revisited, December 2017 – World Weather Attribution

Scheme definition

In completing our option screening, we have determined that the original proposed power resilience scope (document *UUW67 - Cross Price Control Enhancement Cas*) no longer met our revised criteria. The original power resilience scope had been developed based on the loss of operational assets in response to HM Government revising the likelihood of a regional or national power outage up from severe to catastrophic. These sites were selected based on high impact low likelihood.

Our revised scope of work is targeted to address sites that are currently experiencing frequent power outages, sites where pollution can be attributed to supply side power loss should they shut down or be within the worst severed region of our operations and have significant consequences should they fail.

We have grouped the schemes into three priority investment areas

(1) Water treatment works that are experiencing multiple site shut downs due to supply side power loss each year, where the supply side power loss can be attributed to weather / storm impact on DNO infrastructure.

(2) Wastewater treatment and wastewater pumping stations that have experienced a pollution incident in the last 3 years due to site shut down because of supply side power loss attributed to weather / storm impact on DNO infrastructure.

(3) Wastewater treatment and wastewater pumping stations that are in our Cumbria region which is the worst served and most severely affected area as shown in Figure 11 above, where there is a sensitive water body including bathing water.

See Table 2 for a summary of the scheme groupings.

We will install power resilience solutions at these assets, appropriate to the level of service risk, to ensure that.

- Normal service is maintained during the power outage, or
- Normal service can be maintained until we can respond with temporary power supplies or enact a contingency plan and re-supply, or
- The control systems including telemetry, alarms and quality assurance equipment remain energised so that rapid recovery of the asset can be made post power supply restoration.

We have included a list of candidate projects within the appendix to this document for further definition.

Table 2: Scope of flood protection schemes

ID	Scheme name	Number of sites protected	Value (£k)
1	Water – Power resilience	13	1,829
2	Wastewater – Power Pollution	38	5,346
3	Wastewater – Windermere Pollution and Bathing water	30	4,221

A breakdown of the candidate projects for each of the scheme groupings discussed above is included within the appendix to this document, Table 8, Table 9, and Table 10 detail the respective named sites of the candidate projects.

Customer protection

Customers will receive an enhanced level of resilience from this investment, including:

- Reduced risk of water supply interruptions form assets being protected against power failure.
- Reduced risk of water quality infringements because of frequent works shut down.
- Reduced pollution risk to the environment during power outages.
- Increased amenity value of key bathing waters in the lake district national park.

Our solutions costs have been market tested with Battery Energy Storage Solution (BESS) suppliers in combination with the distribution network operator (Electricity North West), ensuring value for money investment. Construction and installation costs have been developed in line with our assured AMP8 delivery frameworks.

6.1.3 Water quality – securing long-term water quality

Summary

In this section we will link water quality risk to climate change, identify key risks and proposed mitigations. For this grouping of schemes, we have determined that schemes and investigations are required at two sites across the region.

We have selected scope based on current known water quality risks driven by climate change, including where the effects of climate change present a significant risk to the future operation of our water treatment works near Kendal that supplies up to 2.5m people with water every day.

Climate change effects

The increase in high intensity and high frequency rainfall events because of climate change is evidenced earlier in this document.

This increase poses a significant risk to the quality of raw water being presented for treatment. High intensity rainfall can lead to the mobilisation of material and in extreme examples landslip, such as experienced in our Thirlmere catchment during Storm Desmond. This in turn can lead to increased contamination of raw water systems, increasing the turbidity, suspended solids and organic carbon levels beyond the design capability of the treatment works being supplied. This is especially true post periods of extended dry weather, which we are seeing with increasing regularity such as in 2018 and 2022, when there are greater rates of surface runoff due to ground compaction. This is true of large parts of our region and in particular the Lake District which is a principal water resource for our integrated water supply zone[14].

A research project[15], funded by the UK climate resilience programme, with participation from water companies with upland water resources, completed by a consortium of universities and research organisations has concluded that;

Concentrations of dissolved organic matter in upland drinking water supplies have been rising over recent decades, largely as a consequence of soil organic matter becoming more soluble as soils recover from effects of acid rain. However, concentrations reaching WTWs may be further exacerbated by anticipated changes in climate.

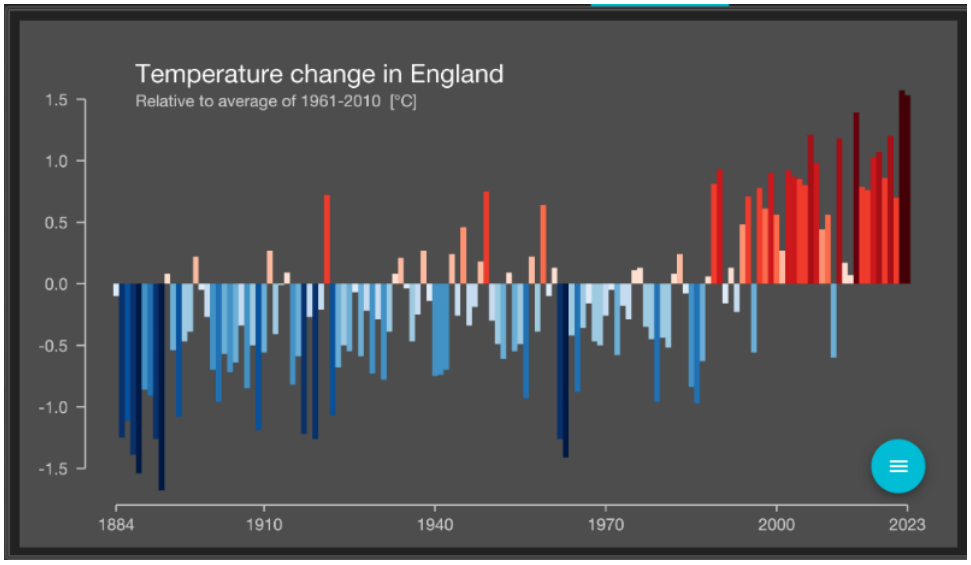
In order for the water industry to increase the resilience of their assets, there is a need to determine where current treatment capacity is most vulnerable to these effects, and to consider the range of potential adaptation and mitigation options across the catchment to WTW continuum….

[14] Climate change: Lake District facing 'dramatic' soil erosion - BBC News

[15] FREEDOM_BCCR_Climate_Effects_Modelling_05.pdf (ceh.ac.uk)

Figure 12 shows the increasing temperature trend for England, demonstrating the levels of climate change already being seen across England.

Figure 12: Climate 'stripes' for England



Source: #ShowYourStripes using MetOffice data

Additionally, risks from increasing temperatures and the resulting biological activity within our reservoirs (both in terms of spring summer temperatures but also warmer temperatures arriving earlier and remaining later in the year) increases the risk of physical issues with algae and plant material blocking treatment assets as well as the chemical issues that result from the lifecycle of algae - namely taste and odour causing compounds such as 2-MIB and Geosmin.

The UK Centre for Ecology & Hydrology have analysed long-time series temperature data and have concluded that Windermere (both North and South basin), which is a raw water source for our treatment works near Kendal, are now an average of +0.8°C above the 1981-2010 baseline[16].

See Table 3 for water quality scheme summary.

Scheme definition and prioritisation

Raw water resilience

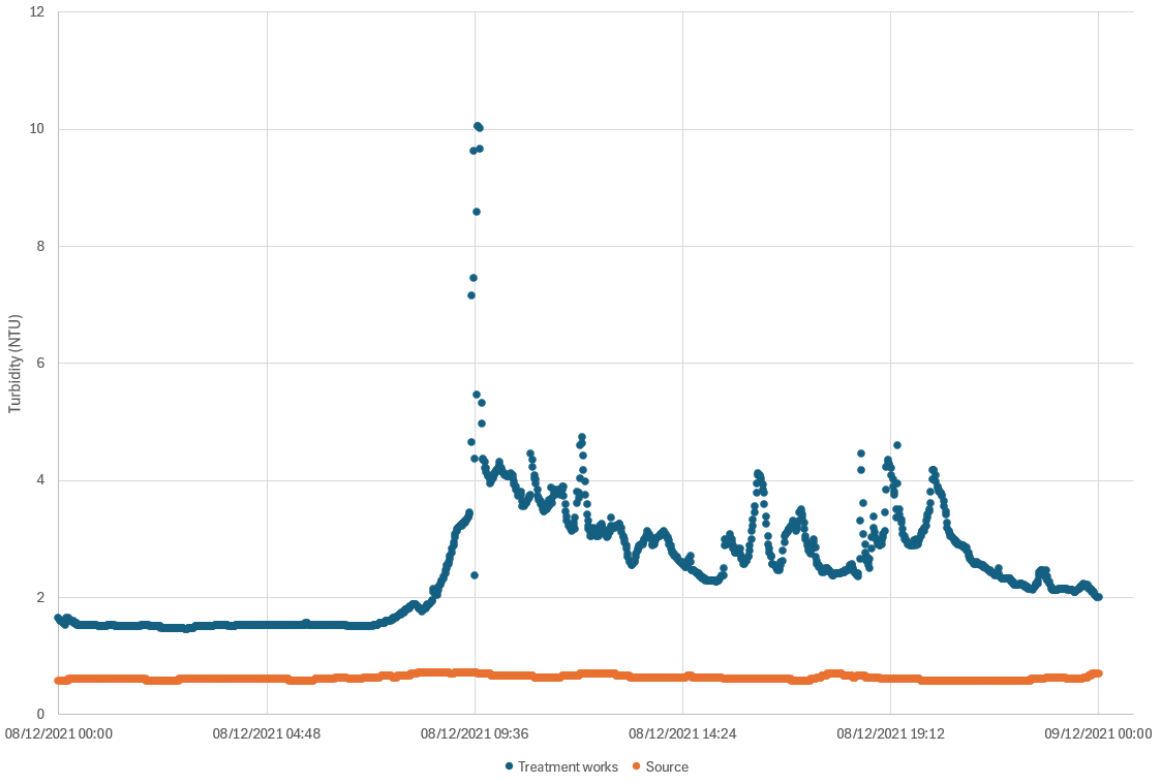
We have identified one site in Greater Manchester that is experiencing source water contamination due to high intensity rainfall events beyond the treatment capabilities of the treatment works, limiting the throughput of the works below its design capacity to address the contamination. This asset can supply a population of [✂].

Our wider systems resilience approach is currently mitigating this impact, but with the forecast increase in frequency and intensity of rainfall events, driven by climate change, will increase the risk of customer impacts.

Figure 13 shows the site recorded turbidity monitoring between the outlet and the inlet to the water treatment works.

[16] The state of lakes in the Windermere catchment – a long-term view | UK Centre for Ecology & Hydrology (ceh.ac.uk)

Figure 13: Recorded raw water turbidity between source and treatment works 08/12/2021



Source: UU data retrieval from site SCADA

The orange line shows the turbidity (measured in NTU) leaving the source works and blue line shows the turbidity arriving at the receiving works. As can be seen for this instance on the 8th of December 2021 there is a significant 'spike' in turbidity arriving at the works for treatment, because of ingress of mobilised materials resulting from a high intensity rainfall event in the hours preceding.

Figure 14 below, shows the RADAR rainfall data for the corresponding day (an hour before the turbidity spike) showing a heavy rainfall event in the area around the asset. For reference the nearest town as labelled on the map is Glossop to the east of Manchester – marked with a red circle.

Further analysis of the high-resolution RADAR data for the 8th of December 2021 also shows further high intensity rainfall events in the same 12-hour period that correlate with the prolonged high turbidity events and subsequent spikes.

Figure 14: High resolution RADAR rainfall plot for area covering raw water main 08/12/2021

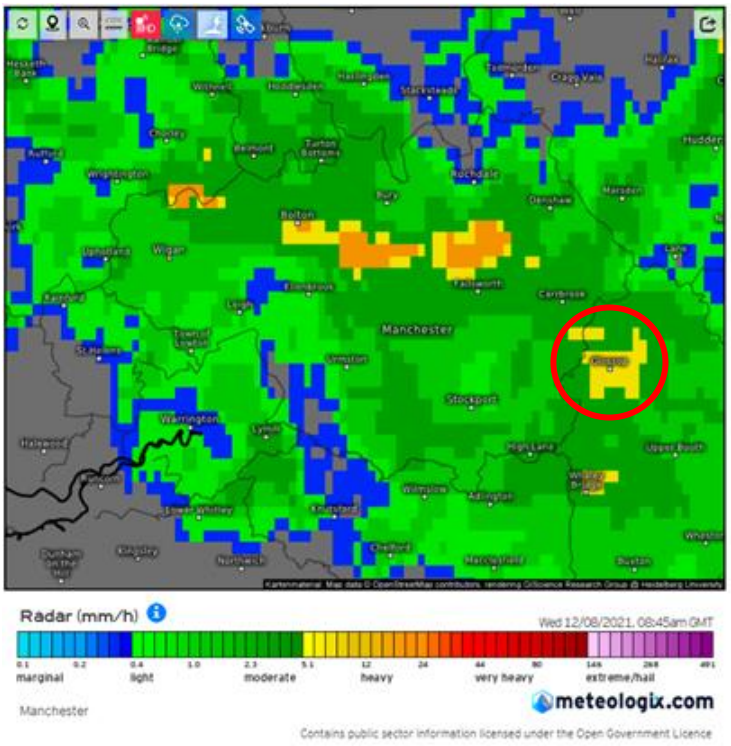
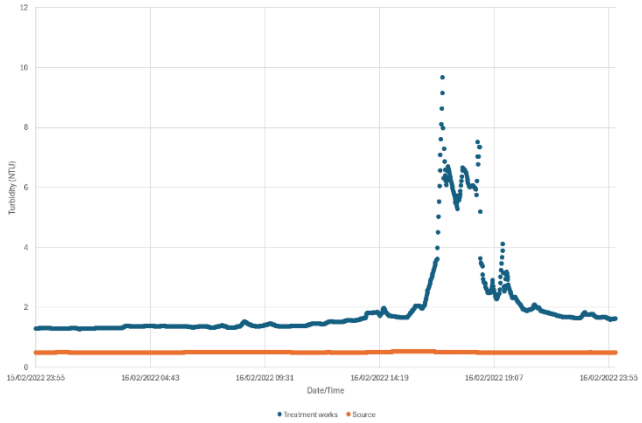


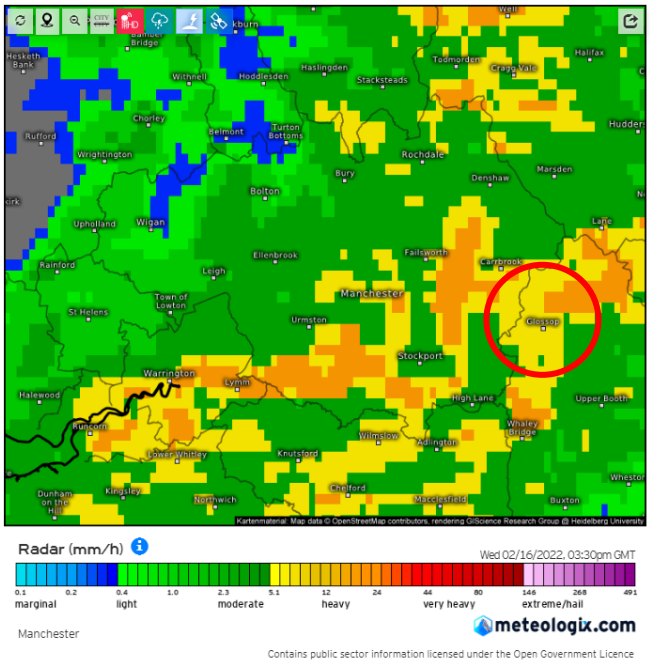
Figure 15 and Figure 16 (below) show similar data for the same site / area for another date. Note that this rainfall event was more intense (as measured by the rate of rainfall in mm/hr) for a shorter duration of time. This is evident in the higher peak (more samples recording higher NTU values) but for a shorter duration of time as a band of rainfall cross the area.

Figure 15: Recorded raw water turbidity between source and treatment works 16/02/2022



Source - UU data retrieval from site SCADA

Figure 16: High resolution RADAR rainfall plot for area covering raw water main 16/02/2022



Source – Meteologix.com.

Our preferred solution is to provide an enhanced level of resilience to both the loss (both total and partial treatment restrictions) of the raw water aqueduct by;

- providing new variable speed pumping capability from the adjoining water distribution network (Greater Manchester supply network) using existing infrastructure

- a new connection into the raw water open reservoir at the treatment works thus providing alternative raw water for re-treatment and resilience to loss of the raw water main
- a new connection into the final water contact tank at the treatment works, providing resilience for a complete loss of treatment capability.

This will provide a fully resilient supply option if the raw water source becomes contaminated because of a high intensity rain fall now and into the future.

Future treatment solution

Our water treatment works near Kendal is a clean water production asset in the company's asset base. It supplies water from Haweswater and Windermere to large parts of Cumbria, Lancashire, and Greater Manchester. It can even support areas of Merseyside.

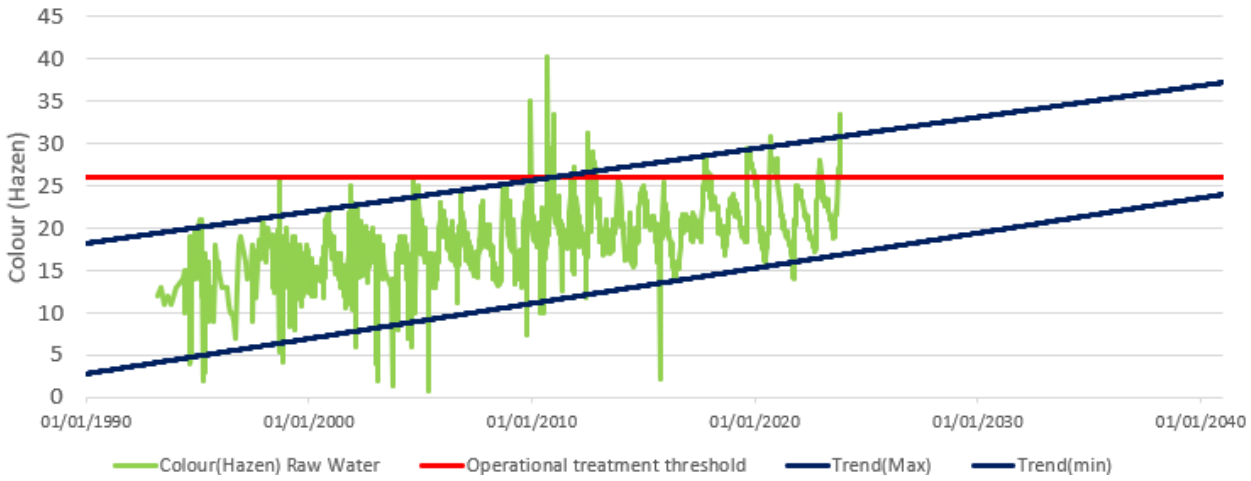
The treatment works is a two stage water treatment works, meaning that it has a filtration and disinfection treatment solution. It does not have a clarification stage at the front of the works. This is by design, the quality of the raw water that the works was designed to treat, and continues to treat, is some of the best in the region in that it has relatively low colour / suspended solids / dissolved organic carbon and has therefore never needed a clarification stage.

However, with increasing climate change resulting in higher intensity rainfall events and higher temperatures, the source water is deteriorating. As can been seen in Figure 17 we are already observing a trend of increased colour in the raw water. The chart shows that in recent history we have experienced high colour events beyond the design capability of the works, we currently manage this risk by reducing works production capacity during these events to provide adequate treatment, reducing regional production capacity and resilience (headroom).

Within the next 10 years we forecast that the raw water colour will continue to deteriorate to the point that raw water colour will more often than not be exceed the treatment capability of the works, requiring almost year-round production capacity reductions to meet water quality regulations.

We have determined that within the next 10 years alternative treatment capabilities will be required at the site to maintain its operational throughput.

Figure 17: Raw water colour deterioration and trend forecast for our treatment works near Kendal



Source: UU raw water quality sampling data

In addition to issues of colour increased lake temperature and prolonged growing seasons has resulted in significant algal blooms in Windermere (one of the sources of raw water to the works) Algal blooms not only represent an increasing treatment challenge to meet quality and customer expectations because of chemical changes to the water (taste and odour compounds) but also a physical one. In recent years the raw water abstraction from one source has had to be stopped due to issues of physical 'blocking' of treatment assets.

Due to the scale and significance of the site to our supply operations we are requesting funding to conduct an engineering study into what the future requirements of treatment capability are and a feasibility / optioneering assessment of the best value intervention.

Table 3: Scope of water quality schemes

ID	Scheme name	Scheme Location	Value (£k)
1	Raw water resilience	Greater Manchester	4,900
2	Future treatment optioneering	Cumbria	500

Customer protection
Customers will receive an enhanced level of resilience from this investment.

- Reduced risk of water supply interruptions form assets being unable to treat contaminated raw water.
- Reduced risk of water quality infringements and improved aesthetics of supplied water.

All solutions will be value engineered and multiple options assessed with only the best value options being selected for delivery, the raw water resilience scheme has already undergone optioneering. Construction and installation costs have been developed in line with our assured AMP8 delivery frameworks

The principle aim of the investigation at our treatment works near Kendal is to determine that the future treatment option ensures that customers are protected from maladaptation, and to confirm what the best value option is that will secure efficient enduring resilience to the water quality of up to 2.5m people.

6.1.4 Rainwater Management

Summary
In this section we will link the need for enhanced rainwater management in high priority areas of our operating region because of already occurred climate change and increasing future risk to wastewater services. For this grouping of schemes, we have determined that investment in sustainable urban drainage is required in six priority catchments.

The scope of work has been identified as part of our DWMP risk assessment and investment optimisation processes. We have further rationalised the highest priority catchments based on;

- a high observed rate of hydraulic flooding incidents, compared to other causes of flooding,
- the opportunity for delivery via green solutions, and
- the forecast impact on additional catchment flooding due to climate change in the period 2025-2030.

This ensures that an improved level of service performance will be delivered in-period and beyond.

Introduction
This programme will mitigate the risk of future deterioration in sewer flooding performance due to climate change; responding to Ofwat's calls for the resilience uplift to aid in meeting sewer flooding PCLs[17]. A sustained programme of surface water management needs to be initiated now to protect customers and the environment from the effects of sewer flooding. If we do not invest now, flooding performance will deteriorate despite efficient investment through base expenditure due to the increased hydraulic risk our region is facing because of climate change. The historic costs for such resilience activities are not contained within the PR24 base cost models and as such, cannot be allocated by them.

As discussed extensively in our Drainage and Wastewater Management Plan[18] (DWMP) we adopted a 2D approach to our hydraulic modelling (rather than standard 1D), making use of latest available data and industry adopted tools to enable assessment of the future impacts on our assets and customers due to growth and climate

[17] PR24-draft-determinations-Delivering-outcomes-for-customers-and-the-environment.pdf (ofwat.gov.uk), page 108

[18] https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/dwmp-2023/ta5_assessing-future-risk.pdf

change. This demonstrated a 63% increase in properties at risk of internal sewer flooding by 2050 from a 2020 baseline.

Hydraulic modelling demonstrates that in the North West, regional modelled flood volumes following a 1 in 20-year event are forecast to increase by 1.4 million m^3 by 2030 due to climate change and urban creep, equivalent to 560 Olympic swimming pools. It is therefore imperative that we act now to deliver an enhanced capability above base maintenance requirements to mitigate the impact of increasing hydraulic flooding risk upon customers and communities.

UUW submitted a £132 million rainwater management enhancement case as part of our PR24 business plan. We understand that Ofwat rejected this case on the basis that UUW provided insufficient evidence to demonstrate that there is a quantified problem requiring a step change and that the investment proposed does not overlap with base expenditure/other enhancement areas. We have therefore refined this case and set out our proposals to proceed with the most urgent £50 million of investment into AMP8 and provide additional evidence to demonstrate to Ofwat the critical need for this investment.

We propose investment in rainwater management as identified via our optimised DWMP programme. Our proposal has prioritised six catchments (Table 4) that are disproportionally impacted by rainfall driven by climate change, are outside of any existing enhancement programmes and in which the DWMP optimiser identified opportunity for the implementation of rainwater management solutions. These catchments:

(1) Have experienced almost 500 cases of hydraulic flooding over the last 10 years, with hydraulic flooding accounting for 36% of total incidents recorded;

(2) Experienced two-thirds of all hydraulic flooding from severe (> 1 in 20) events, demonstrating the impacts of climate change here and now;

(3) Collectively account for an optimised investment of £148m in rainwater management solutions as part of our DWMP, of which we propose to prioritise investment of £50m in AMP8;

(4) Have an extremely low overlap with proposed enhancement investment for hybrid WINEP schemes (0.37%).

Through our proposed investment, we will:

- Invest in rainwater management solutions to increase the storage of rainwater runoff in our priority catchments by 22,750 m^3, mitigating the impact of additional flooding from climate change by 2030, thus preventing an additional 30 sewer flooding incidents. Without this investment, forecasts indicate there would be a further 9 Olympic sized swimming pools of wastewater flooding across these towns and cities in the North West in a 1 in 20-year storm.

Table 4: Scope of Rainwater Management Schemes

ID	Scheme name	Scheme Location	Value (£k)
1	Kendal	Cumbria	3,506
2	St Helens	Merseyside	7,787
3	Lancaster	Lancashire	4,870
4	Hazel Grove	Greater Manchester	2,343
5	Glossop	Derbyshire	5,883
6	Preston	Lancashire	25,611

Hydraulic Flood Risk is Significant & Increasing

In its reasons for the rejection of the rainwater management enhancement case as submitted in our PR24 business plan, Ofwat expressed the view that *'hydraulic events currently account for a small proportion of sewer flooding incidents'*[19]. Elsewhere in its draft determination, including within its base cost modelling appendix,

[19] https://www.ofwat.gov.uk/wp-content/uploads/2024/07/PR24-DD-WW-Freeform-1.xlsx

Ofwat has reiterated this view: *'as corroborated by United Utilities PR14 business plan submission that said only 13-15 percent of sewer flooding incidents are caused by hydraulic overload'*[20]. We provide evidence to dispel this claim in *UUWR_12 - Internal Sewer Flooding* but replicate this evidence below for ease:

"This data has been interpreted entirely out of context and relies on data submitted over 10 years ago in our PR14 business plan. At PR14, sewer flooding performance was measured using the Sewer Flooding Index, which only included those properties which flooded internally on a 1 in 20-year storm or less, with hydraulic flooding in severe weather events (> 1 in 20 year) being excluded from the measure. The 13-15% figure has therefore been derived from a total incident level which excluded the majority of UUW's hydraulic events. Further, since AMP5, UUW has reduced the incidence of internal FoC flooding by over 35% due to investment in our blockage resolution model, customer awareness campaigns and DNM. It is therefore highly inappropriate for Ofwat to use an outdated statistic, which excludes incidents recorded during severe weather to imply that internal sewer flooding performance is almost entirely within management control. In actual fact, on average, between FY17-FY24, 28% of incidents have been caused by hydraulic overload and this masks inter-year variation whereby in some years hydraulic incidents have exceeded 50% of incident totals".

Between July 2014 and July 2024, 29% of all reportable internal sewer flooding incidents occurred on the wettest 1% of the days, coincident with severe weather events, underscoring the susceptibility of our region to extreme weather. We therefore consider that Ofwat appears to be understating the incidence of existing hydraulic flooding within our region. To provide further reassurance to Ofwat and customers, in reducing the scope of this claim from our original submission, we have refined the selected locations such that they are constrained to those priority catchments in which there is a significant historic hydraulic sewer flooding risk, and this deteriorates significantly in the 2020-2030 period. Over the past 10 years there have been nearly 500 hydraulic incidents in the six selected catchments, where modelled flood volume in a 1 in 20-year storm is forecast to increase by 35% by 2030, relative to a 2020 baseline, which equates to an estimated additional 34 flooding incidents per annum.

Whilst we acknowledge Ofwat's concern that 'the investment is not likely to be efficient during the 2025-30 period if the risk from growth creep and climate change does not materialise, given that no improvement in the existing service is offered [21], we do not consider this concern to preclude the need to invest swiftly. Firstly, while all forecasts have a degree of uncertainty, we have presented strong scientific evidence that climate change has already occurred and with an increasing rate of impact beyond that seen historically and addressed through base expenditure to date. There is minimal discrepancy between all RCP scenarios in 2030 showing that climate change forecasts on this horizon are relatively insensitive to the pathway assumed as discussed in the following section. Secondly, whilst highly unlikely, if such risk does not materialise, the outcome of the removal of 22,750 m^3 of flood volume will still be realised – it will instead reduce flooding numbers against a stable baseline for these catchments.

Hydraulic Modelling

In order to address the observation made by Ofwat that UUW has failed to demonstrate the need for enhancement expenditure, including quantifying the problem requiring a step change in service (*PR24 Draft Determinations: Total expenditure allowances – by company, page 47, section 10.1.2*) UUW has undertaken a sensitivity analysis on the three components of future design horizon planning; growth, urban creep and climate change.

Our standard design horizon methodology is to apply all three components to the verified present-day model (baseline) to represent the 2050 Defra Storm Overflow Discharge Reduction Plan (SODRP) design performance target, this design horizon approach also applies to our modelling for flood solution design.

For this sensitivity analysis, the impact of each design horizon component was individually assessed against the baseline position in order to quantify the relative impact of each on future system performance. Design rainfall uplifts were based on the FUTURE-DRAINAGE UK Climate Resilience Programme[3] rainfall uplift estimates.

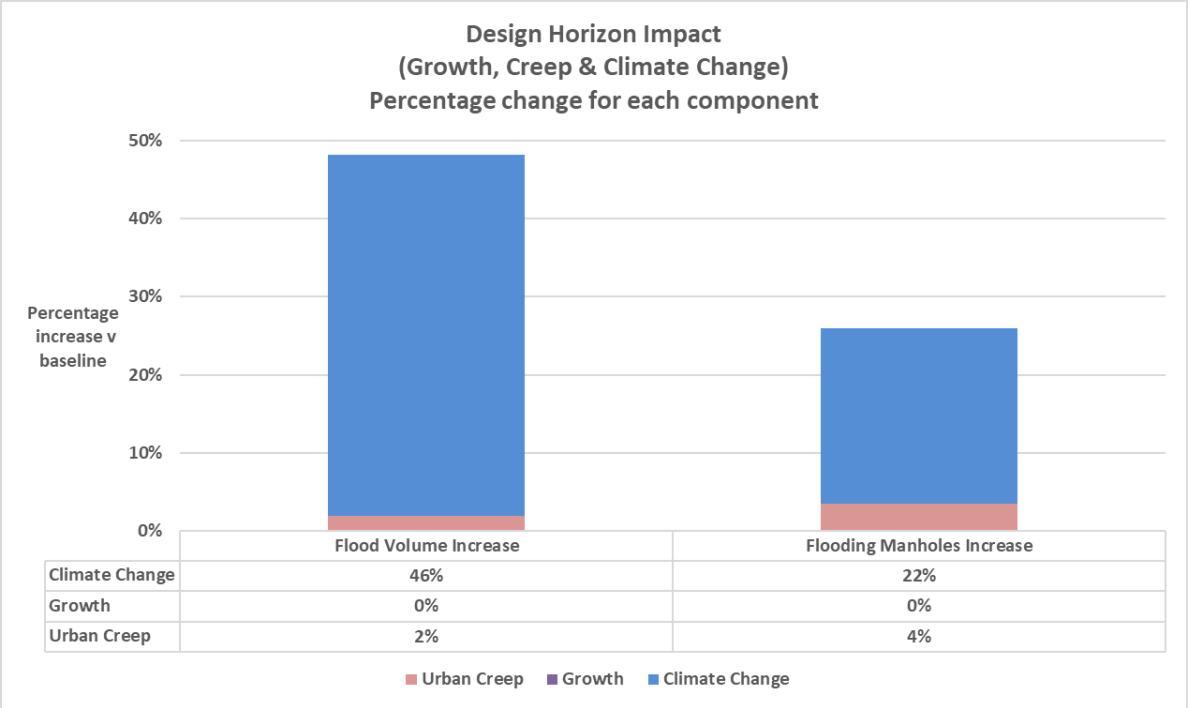
[20] PR24-draft-determinations-Expenditure-allowances-Base-cost-modelling-decision-appendix.pdf (ofwat.gov.uk), page 46

[21] https://www.ofwat.gov.uk/wp-content/uploads/2024/07/PR24-DD-WW-Freeform-1.xlsx

Figure 18 and Figure 19 summarise the analysis of the different model scenarios against performance indicators relating to flooding. It can be seen from the results that climate change has by far the most significant impact on network flood volume and predictions.

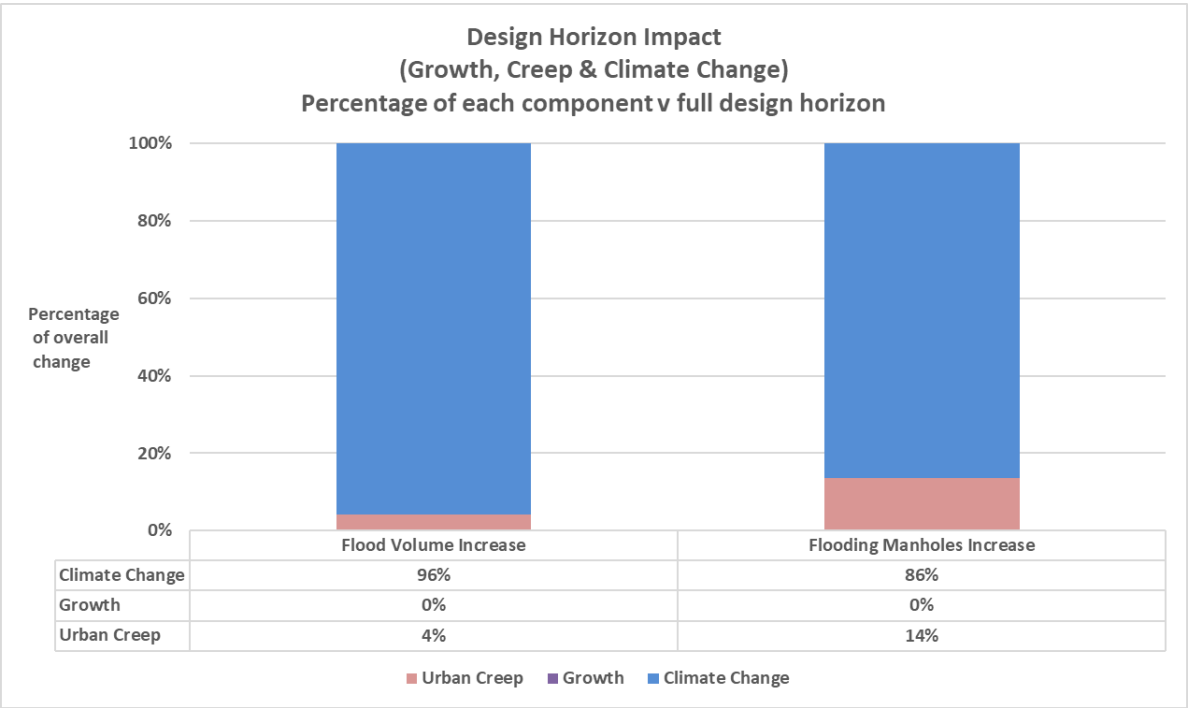
In the catchment assessment growth didn't impact the scale of flooding on a 30-year design storm event to a measurable level. In catchments with lower growth projections, the population increase can be offset by future per capita consumption efficiency.

Figure 18: Impact on baseline performance



	Flood Volume Increase	Flooding Manholes Increase
Climate Change	46%	22%
Growth	0%	0%
Urban Creep	2%	4%

Figure 19: Impact of each component on overall change

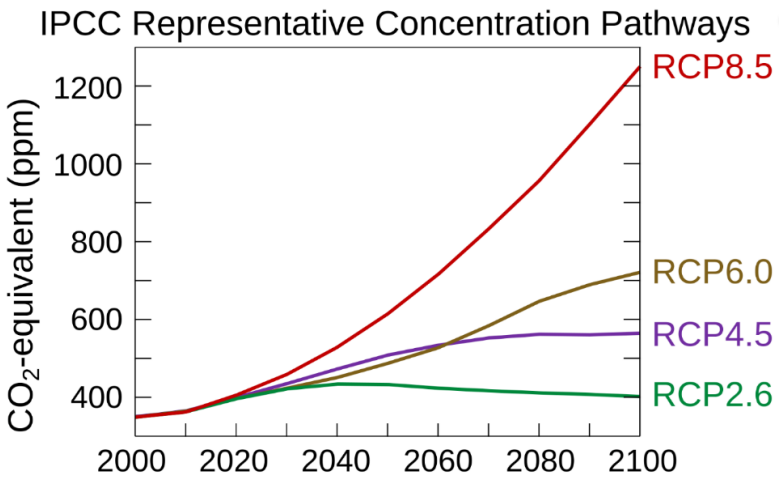


	Flood Volume Increase	Flooding Manholes Increase
Climate Change	96%	86%
Growth	0%	0%
Urban Creep	4%	14%

With the above results in mind, it is important not to overstate the potential risk or benefit derived from a component as inherently uncertain as climate change given how significant a driver it is on the future

performance of the sewer network. As stated in *UUW65 – Wastewater Quality Additional Requirements Enhancement Claims,* (4.2.8, page 10), the UKWIR 2017 report 'Rainfall Intensity for Sewer Design, 17/CL/10/17' is the basis of all climate change uplifts applied to the hydraulic network models for UUW's Drainage and Wastewater Management Plan hydraulic modelling. Therefore, the basis for both the 2030 and 2050 DWMP planning horizons is the RCP8.5 high emissions scenario. As demonstrated in Figure 20 however, by 2030 the deviation between the various Representative Concentration Pathways is relatively small, and we therefore quote only the benefits we expect within this representation document relative to the 2030 planning horizon, in order to demonstrate only the most likely of outcomes from the proposed investment.

Figure 20: The IPCC Representation Concentration Pathways (RCPs)



Scheme definition and prioritisation

The basis of this investment is rooted in UUW's Drainage and Wastewater Management Plan (DWMP) published in May 2023. The DWMP outlines a 25-year adaptive plan to both mitigate future risk realised through growth and climate change but also drive service improvement in order to meet regulatory, environmental and customer needs. A critical part in determining our investment plan for non-statutory drivers such as flooding was via implementation of a third-party optimiser in order to derive the optimal, best value solution for the North West.

The approach adopted in our DWMP optimisation is discussed extensively in both *UUW65 – Wastewater Quality Additional Requirements Enhancement Claims* (section 5, pages 16-21) and Technical Appendix 8 Programme Optimisation[22] (section 3, pages 13-14). Ultimately the DWMP prioritised investment using a 'Best Value' model rather than 'Lowest Whole Life Cost', driven through research and engagement with customers and stakeholders across the North West (*UUW65*, 5.2.18 – 5.2.19).

As the DWMP uses a 25-year long-term high-level methodology, it inherently does not produce a deliverable programme of work due to the top-down approach taken to derive a regional adaptive plan. We have therefore identified and prioritised for this investment case six of the wastewater catchments within the North West that require immediate intervention. This investment is intended to address significant deterioration anticipated by 2030 through the risks posed by climate change, as well as current observed hydraulic incapacity within their combined sewer networks.

Of 567 total wastewater drainage areas, we applied the following successive constraints to prioritise the areas where investment into Rainwater Management is most required now.

- Optimised investment to reduce flooding - 179 catchments had Grey or Rainwater Management interventions
- Optimised rainwater management interventions to reduce flooding - 92 catchments had Rainwater Management interventions as part of a hybrid or blue green approach

[22] https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/dwmp-2023/ta8_programme-optimisation.pdf

- Negligible overlap with enhancement schemes - 60 catchments had 1.5% or less overlap with hybrid WINEP catchments.
- Proportion of hydraulic flooding – 19 catchments had 20% or greater hydraulic flooding (FY14 – FY24)
- Number of severe flooding weather events – of the remaining catchments, six had over 10 cases of flooding from severe rainfall events, over 300 between them (FY14 – FY24).

The total optimised investment resulting from applying a prioritised approach is £148m, we propose to deliver 34% of that ambition, representing the first AMP, in AMP8. The prioritised catchments identified for investment as part of this enhancement case are detailed in Table 5.

Table 5: Underlying statistics on the profile of selected catchments for resilience measures

		SuDS Interventions Proposed		Historic Internal Flooding FY14 - FY24	Modelled Climate Change - Flood Volume increase to 2030 (1 in 20yr)	
Name	County	SuDS CAPEX (£k)	SuDS Storage m^3	Hydraulic Incidents	m^3	%
Kendal	Cumbria	£3,506	2,354	15	6,673	40%
St Helens	Merseyside	£7,787	5,229	45	10,920	50%
Lancaster	Lancashire	£4,870	3,271	125	11,296	24%
Hazel Grove	Greater Manchester	£2,343	1,573	133	10,148	30%
Glossop	Derbyshire	£5,883	3,418	25	5,559	38%
Preston	Lancashire	£25,611	6,906	130	69,895	36%

The options that we will deliver as part of the programme are defined through the DWMP options development process, and specifically refer to the generic options around surface water management. These can be defined as:

- Installation of surface control SuDS at strategic locations
- Strategic blue / green corridors: combination of the management of blue and green spaces in urban environments
- SuDS delivered through partnerships with local authorities

UUW has a proven track record of delivering these types of projects through our Green Recovery SuDS and NFM (Natural Flood Management) programme. Fourteen schemes have been awarded funding which will have an average UUW contribution of 23% and provide a partnership contribution rate more than £23.9 million offering an average 24.11% water volume difference in the areas the SuDS have been installed. In addition, the schemes are expected to achieve a £57 million natural capital benefit for the North West, exceeding natural capital targets and providing invaluable learning for AMP8.

The schemes under delivery include major public realm improvements in town centres across Greater Manchester including Oldham, Bolton, Stockport, Stretford, Altrincham and Walkden. These schemes include raingardens, tree pits, permeable pocket parks and recreational parks with cycle ways to connect the access round the town centre.

Case Study 1: Altrincham Public Realm

The Altrincham public realm regeneration scheme targeted a better pedestrian experience, improved cycle infrastructure and reduced highway to create a greener town centre. The scheme included implementation of sustainable drainage systems to enhance these green spaces and improve the towns resilience to climate

change. The raingarden locations were designed to re-direct and disrupt the flow of this water. The scheme has been successful and has met its aims. The overall cost was £2.81 million with UUW contributing 6%, achieving £4.1 million natural capital benefit.

Figure 21: SuDS within Altrincham

Figure 22: Further examples of interventions

Overlap with base expenditure & other enhancement programmes

At draft determination, Ofwat considered that UUW failed to provide sufficient and convincing evidence that our rainwater management enhancement case was not overlapping with base allowances or other enhancement areas. Ofwat also stated that '*the company provides no evidence that it has considered how flooding performance could be managed through operational measures funded through base allowances, such as by going further on managing flooding due to blockage, collapse and equipment failures as opposed to seeking to address future flooding risk that has yet to materialise'*. It therefore appears that Ofwat failed to consider this case in conjunction with our 'reducing sewer flooding risk for properties' enhancement case in which we outlined a suite of operational interventions that we will undertake to reduce operational flooding, as well as historic hydraulic flooding. Our strategy to 'control the controllable' by reducing FoC flooding and increase resilience to severe weather, comprises 3 key complementary components, of which offsetting deterioration due to climate change is a critical component:

- **A base programme** - a programme delivering continuing gradual improvements in performance, focused on avoiding maintenance/operational failures. This includes activities such as our 'What not to Flush' and 'Stop the Block' customer awareness campaigns as well as engagement with food service establishments regarding appropriate FOG disposal practices; our targeted planned cleaning and sewer serviceability programmes; ongoing maintenance costs for our Dynamic Network Management (DNM) monitors and platform and proactive interceptor trap removal. Our base programme is therefore focused on 'controlling the controllable' through avoidance of flooding and other causes (FOC) flooding, i.e. flooding that is caused by operational issues such as blockages, tree roots, sewer collapses or mechanical failures;
- **A 'reducing risk of sewer flooding for properties' enhancement programme** - a programme that drives a step change in sewer flooding performance, allowing UUW to mitigate existing sewer flooding issues and supporting us to achieve our proposed ambition to achieve environmentally adjusted frontier levels of performance by 2030. This programme that targets both FOC and hydraulic flooding by activities such as: installation of over 1000 property-level flood mitigation devices; expansion of our Dynamic Network Management (DNM i.e. in-sewer monitoring) capabilities and enhanced targeting of proactive sewer rehabilitation in areas with a high risk of FOC flooding. A sustained programme of investment in these activities has been, and will continue to be, fundamental in delivering a step change in sewer flooding performance;
- **A rainwater management resilience enhancement programme (this case) -** This investment is targeted at offsetting deterioration in hydraulic sewer flooding risk due to climate change by implementation of Sustainable Drainage Systems (SuDS) at scale. In those six priority catchments we have identified, without

further investment, modelled flood volume in a 1 in 20-year storm is forecast to increase by 35% by 2030, relative to a 2020 baseline, which equates to an estimated additional 34 flooding incidents per annum.

Whilst the three facets of our sewer flooding strategy are complementary, they are nevertheless distinct, and this enhancement case unequivocally does not overlap with improvements being delivered through base. Specifically, this enhancement case aims to prevent deterioration in sewer flooding performance due to climate change by initiating a multi-AMP programme of investment in sustainable rainwater management solutions such as SuDS. The historic costs for such resilience activities are not contained within the PR24 base cost models and the programme represents a fundamental shift from the traditional activities aimed at delivering immediate operational benefits, such as property-level flood mitigation, towards implementation of nature-based solutions at a scale not observed historically. As such, the costs of these activities are not present within the historical dataset and therefore cannot be allocated by the cost models. At its draft determinations, Ofwat outlined concerns that *'the PCD does not specify or differentiate between equivalent storage from grey solutions as opposed to SuDS, and therefore could overlap with outputs delivered from other programmes such as expenditure on reducing flood risk'.* To address this concern, in constraining our proposed schemes for this resilience uplift, we removed any grey solutions from the selected options, thereby eliminating the risk of any overlap with expenditure on reducing flood risk.

Furthermore, to rule out any overlap with other enhancement programmes, we compared our proposed locations with the locations of hybrid projects to be delivered via the WINEP programme. As shown in Table 6, there is a negligible amount of overlap between the two, confirming the investment proposed is distinct. We have not sought to consider the overlap with traditional conventional solutions, i.e. grey storage tanks, as these will not improve the flooding level of service in the upstream catchment. Storage tanks do not remove rainwater from the system but simply allow flows to discharge into a storage tank, rather than a watercourse (via a CSO), thereby not providing any additional flood protection beyond that already provided by the CSO. Additionally, since the existence of storm overflows within the combined sewer network is to provide hydraulic relief and prevent flooding, it follows that areas prone to flooding are unlikely to have storm overflows in the local contributing sewer network. Our proposed rainwater management programme, targeted at reducing flood risk, is therefore entirely distinct from our overflow's enhancement programme.

Table 6: There is a minimal overlap between our proposed locations and hybrid WINEP schemes, demonstrating we are not double counting required expenditure.

Catchment	Percentage overlap with hybrid WINEP schemes by area
Kendal	1.2%
St Helens	0.6%
Lancaster	0.0%
Hazel Grove	0.0%
Glossop	0.7%
Preston	0.3%

In response to Ofwat's feedback, we have therefore scaled back our programme and designed our proposed schemes in a way that further minimises the risk of overlap with other areas of expenditure.

Customer protection

Ofwat defines material investments as 1% of total expenditure (totex). The value of the rainwater management schemes (£50m) does not meet the materiality threshold and we therefore consider that a price control deliverable (PCD) is not required.

However, should investment be cancelled, delayed or reduced in scope, we consider that customers have additional protection via the internal sewer flooding and external sewer flooding performance commitments. Whilst in its draft determinations Ofwat stated *'in addition, there is no protection to customers on the level of flood risk reduced, as the company states the investment will have zero impact on PC's',* we consider this to be a

fundamental misunderstanding of our submission. We argued that there is limited flooding benefit **beyond a stable baseline position**.

This investment instead seeks to offset deterioration in hydraulic flooding performance. Our hydraulic modelling predicts that, without investment, internal sewer flooding and external sewer flooding incidents will increase by 20.5 and 13.5 per annum, respectively, between 2020 and 2030 in our six priority catchments. It is therefore misplaced for Ofwat to conclude that this investment will have zero impact on PCs.

6.1.5 Third party assurance

Based on the requirements for this representation, as set out in Ofwat's publication PR24 Draft Determinations: Price control deliverables appendix, "In response to the draft determinations, we expect independent third-party assurance for the resilience uplift business case."

We commissioned Deloitte LLP to provide third-party assurance, it concluded:

"Based on a specific Ofwat requirement in relation to external assurance required on the resilience uplift business case, we undertook a short assessment on the case developed by UUW. It was evident the case was risk-based, for example with climate change being an important casual factor. There was a commitment to spend the funding within the stated Asset Management Plan period (AMP8) and address flooding and power related risks. Clear deliverables and outputs were identified. UUW had taken a prioritisation approach to the schemes and objectively assessed suitability. There is a clear definition of each scheme in the business case which should provide UUW confidence the outputs can be delivered within AMP8. This Ofwat specified requirement was captured in UUW's Requirement Traceability Matrix (RTM) as expected. It would be advisable that further independent assurance be commissioned by UUW throughout AMP8 to track delivery against the business case 'baseline.'"

Source: UUWR_06_Assurance aggregation summary report

Appendix A

The below tables detail candidate projects for investment for each of the investment scheme groupings discussed above.

Table 7: Resilience Uplift candidate projects – Flooding schemes

Scheme Grouping	Number of schemes	Candidate site
Water Flood – River Eden	1	River Eden river intake
Water Flood – Thirlmere	1	Thirlmere reservoir scour valves

Table 8: Resilience uplift candidate projects - Water Power schemes

Scheme Grouping	Number of schemes	Candidate site
Water – Power resilience	13	Adlington
		Godley
		Buckton
		Wybersley
		Cloughbottom
		Piethorme
		Hug Bridge
		Hurleston
		Sandiford
		Pex Hill
		Simmonds
		Rivington

Table 9: Resilience uplift candidate projects – Wastewater Power pollution

Scheme Grouping	Number of schemes	Candidate site
Wastewater – Power Pollution	38	Staveley WWTW
		Mickle Trafford WwPS
		Askam in Furness WwTW
		Cartmel-in-Cark WwPS
		Dukinfield WwTW
		Field Head WwPS
		Low Wood Bridge WwPS
		Abram Hall WWPS
		Alsager WwTW
		Audlem Road
		Bescar Lane WwPS
		Bewsey Bridge PS
		Bradshaw Road
		Braithwaite WwPS
		Broadbottom PS

Scheme Grouping	Number of schemes	Candidate site
		Broughton Beck (LiL) WwPS
		Bunbury WwTW
		Congleton WwTW
		Crewe WwTW
		Croston Moss LiL WwPS
		Eaton WwTW
		Elterwater PS
		Freckleton PS
		Gas Works Yard PS
		Glasson WwPS
		Grange over Sands WwTW
		Hest Bank
		Ince WwPS
		Kiln Lane
		Mere Brow WwTW
		Middlewich WwTW
		Plumbland WWTW
		Rockcliffe (Cricket Club) PS
		Soutergate Village WwPS
		Southwaite WwTW
		Tyldesley Wastewater Treatment Works
		Vicars Hall Lane

Table 10: Resilience uplift candidate projects - Wastewater Windermere Pollution and Bathing water

Scheme Grouping	Number of schemes	Candidate site
Wastewater Windermere Pollution and bathing water	30	Grasmere
		Windermere
		Near Sawrey
		Hawkshead PS
		Hawkshead
		Langdale
		Ambleside
		Grasmere
		Windermere
		GOLDRILL
		PRINCE OF WALES
		BORRANS (AMBLESIDE)
		WATERHEAD (AMBLESIDE)
		CALGARTH
		QUARRY BROW
		GLEBE ROAD (BOWNESS)
		STORRS

Scheme Grouping	Number of schemes	Candidate site
		COLTHOUSE
		GOODY BRIDGE
		BROOMHILL
		KINGS WHEEL (CLAPPERSGATE)
		BADGER WHEEL
		ESTHWAITE
		WHITE CROSS BAY (PRIVATE)
		MORTAL MAN
		LOW WOOD MARINA
		LOW WOOD HOTEL
		WINDERMERE MARINA VILLAGE (PRIVATE)
		WINDERMERE MARINA VILLAGE RECEPTION

Table 11: Resilience uplift candidate projects - Water Quality

Scheme Grouping	Number of schemes	Candidate site
Arnfield to Godley Resilience	1	Arnfield to Godley raw water main
Watchgate future treatment optioneering	1	Watchgate water treatment works

Table 12: Resilience uplift candidate project areas - Rainwater management

Scheme Grouping	SuDS Storage (m3)	Candidate site
Rainwater Management (SuDS)	2,354	Kendal
	5,229	St Helens
	3,271	Lancaster
	1,573	Hazel Grove
	3,418	Glossop
	6,906	Preston