



Draft Water Resources Management Plan 2019

Technical Report - Customer and stakeholder engagement



Draft WRMP19 Technical Report - Customer and stakeholder engagement

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1. Introduction

We believe that effective engagement with customers, stakeholders and regulators is a critical to the development of a successful Water Resources Management Plan. Regulators and government also emphasise this. In the Defra guiding principles for water resources planning in May 2016 (Department for Environment, Food and Rural Affairs, 2016), Defra state that:

“customer support, with evidence about preferences and willingness to pay; discussions with stakeholders and regulators”

The guiding principles go on to state that the plan the plan must account for:

“we want to see you [the company] collaborate with customers, partners and regulators to develop a strong understanding of future needs, explore every option, and build consensus on delivery plans.”

Such statements are complemented in the planning guidelines.

Therefore, in developing this Draft Water Resources Management Plan 2019 we have set out to conduct a large and varied set of customer and stakeholder engagement, and actively engage with regulators. We started these activities much earlier in the planning process than previously to maximise the benefit of this dialogue and to ensure we can take customer, stakeholder and regulator feedback fully on-board in developing the plan. For example, we commenced our stakeholder pre-consultation process in autumn 2016. By commencing our research activities earlier, it helped ensure that we were engaging early, engaging widely and using different or innovative approaches to prioritise the major issues affecting customers and stakeholders within the North West when developing the Water Resources Management Plan 2019.

This technical report summarises the aims, methodologies and outcomes of research conducted as part of the Water Resources Management Plan 2019 (WRMP19). As part of building our plan, we sought to engage widely on potential solutions and options. This ensures our options are as broad as possible and includes liaison with 3rd party suppliers. Further information on our interactions with 3rd party water suppliers can be found in the *Draft WRMP19 Technical Report - Options Identification*.

An aim of the WRMP19 was for less reliance from water companies on traditional methods of surveying or capturing willingness-to-pay. We have therefore used different ways of capturing the views of customers and stakeholders¹. In response to this we employed a number of different and innovative approaches to engage with customers and stakeholders, as outlined in Figure 1, ensuring that we are not reliant on any single method of data capture, which might bias results. Leakage is a particular area of focus on the Water Resources Management Plan, therefore we have done additional work in this area. Resilience is a key theme for this WRMP planning round, so we have explored views on water resources drought severity risk, as well as conducted wider innovative

¹ In our plan we have also used ‘business as usual’ data sources as part of collecting evidence to support plan development. Despite this, given the inherent nature of water resources and water supply resilience considerations typically covering low likelihood yet potentially high consequence events, there is a need to conduct specific surveys and other experiments as a major component of our engagement activity.

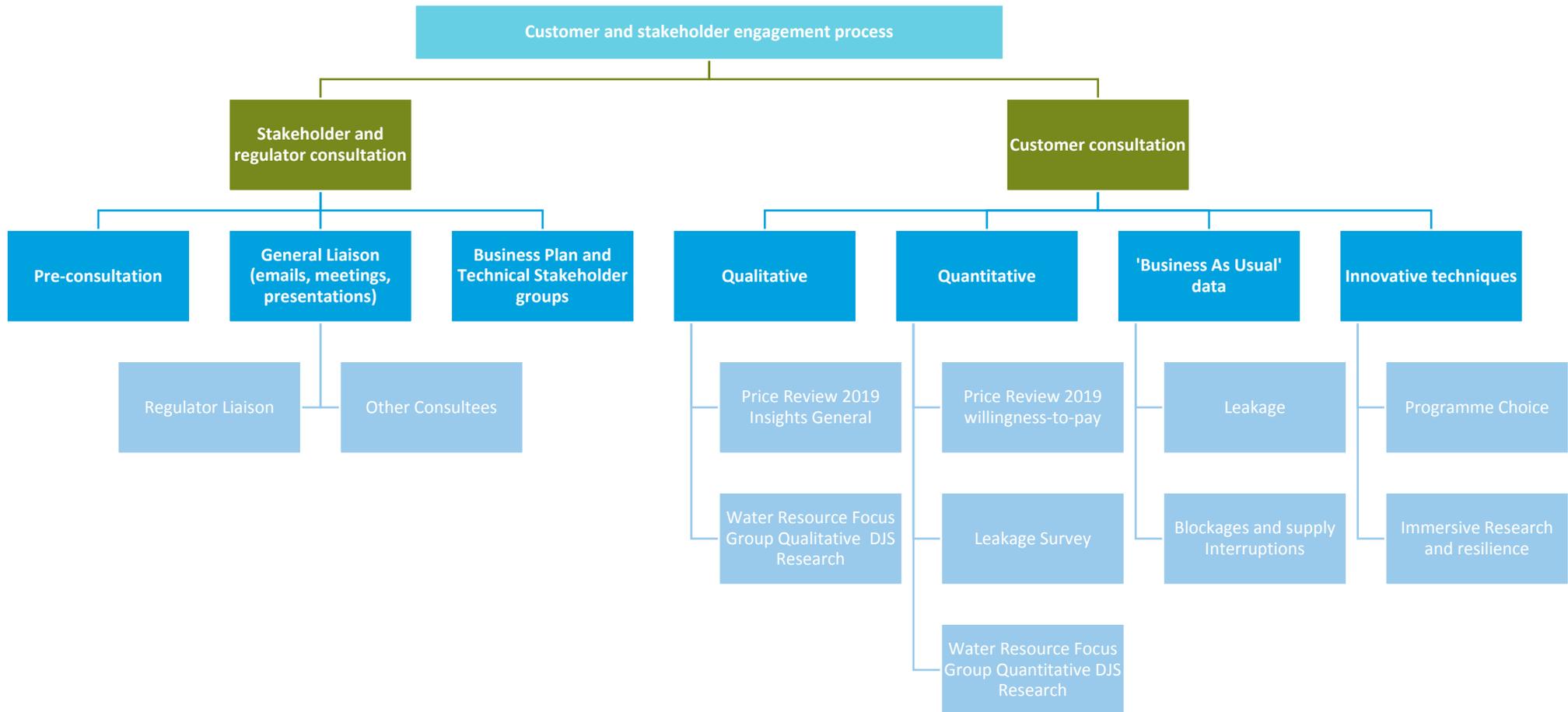
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research on water supply resilience. Another key national theme this time is water trading, therefore we have made this a part of our engagement in this plan.

Figure 1 below shows an overview of the customer and stakeholder engagement process associated with the Water Resources Management Plan, which has been done in combination with wider our company Business Planning process:

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Figure 1 Structure of research and engagement activities conducted for the Draft Water Resources Management Plan 2019



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2. Stakeholder and regulator engagement

2.1 Regulator liaison

We have sought regular engagement with our regulators throughout the plan development process. This has included targeted Water Resources Management Plan engagement activities, but also updates within general liaison forums where appropriate. These are in addition to our extensive pre-consultation process in autumn 2016, which is summarised in Section 2.2.

In summary, we have:

- Engaged on a bi-monthly basis with the Environment Agency in specific WRMP19 liaison meetings, which started in May 2015. This has been supported by key 'special interest sessions' for example on options identification, water trading and water resources modelling and hydrology;
- Included Natural Resources Wales and Natural England in updates and/or key meetings, where appropriate. All three environmental regulators were included as part of scoping our Strategic Environmental Assessment and Habitats Regulations Assessment processes;
- Completed two engagement meetings with Ofwat on the development of our plan, once prior to our own pre-consultation in September 2016, and with a follow-up session in July 2017 as part of Ofwat's own pre-consultation programme with water companies;
- Updated the Drinking Water Inspectorate on plan development and our approach to protecting water quality as part of our plans in company liaison meetings during 2017;
- Fully participated in an Environment Agency WRMP19 Technical Advisory Group, whereby companies and regulators discussed the development of latest planning guidelines;
- Shared copies of detailed internal work stream methodologies with the Environment Agency well in advance of plan development and pre-consultation during Spring-Summer 2016. This was supported by submission of an overarching method statement at pre-consultation in autumn 2016 (to Ofwat, the Environment Agency and Natural Resources Wales);
- Shared customer engagement material with the Environment Agency for comment prior to completed surveys or research; and
- Worked collaboratively with stakeholders, particularly Natural Resources Wales, and other companies/organisations as part of the River Dee Technical Group on our climate change assessments:
 - Natural Resources Wales assessed climate change impacts for the 2080s (aligning to our selected approach) for the River Dee catchment model;
 - This provided a water resources modelling input for our climate change assessments for the Strategic Resource Zone, which were subsequently shared with the group. This collaboration ensured a comprehensive review of the impacts of climate change across both the River Dee system and our Strategic Resource Zone; and
 - Numerous other abstractors rely on the River Dee as a source, as well as ourselves, and the coherence of the climate change assessment has proven to be of significant value.

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2.2 Pre-consultation – autumn 2016

2.2.1 Aims of pre-consultation

Pre-consultation is a requirement of all water companies for their WRMPs, although the approach individual companies taken can vary widely. The pre-consultation lets regulators and stakeholders comment on how we should develop our next plan and the priorities we should tackle. As part of our pre-consultation process we contacted both statutory and non-statutory stakeholders as recommended in Section 2.3 of the Water Resources Planning Guidelines. We also sought to engage as early as possible in the process, beginning pre-consultation in autumn 2016², and with new ways of engaging compared to previous planning rounds.

2.2.2 Approach to pre-consultation

Using previous customer and stakeholder feedback, national studies and policy work we identified six main themes as being the most pertinent and pressing matters that will affect the North West region over the next 25 years. We did this to support and target dialogue on the development of the draft plan, as well as requesting any general feedback through the process. The key themes we identified are shown in Figure 2.

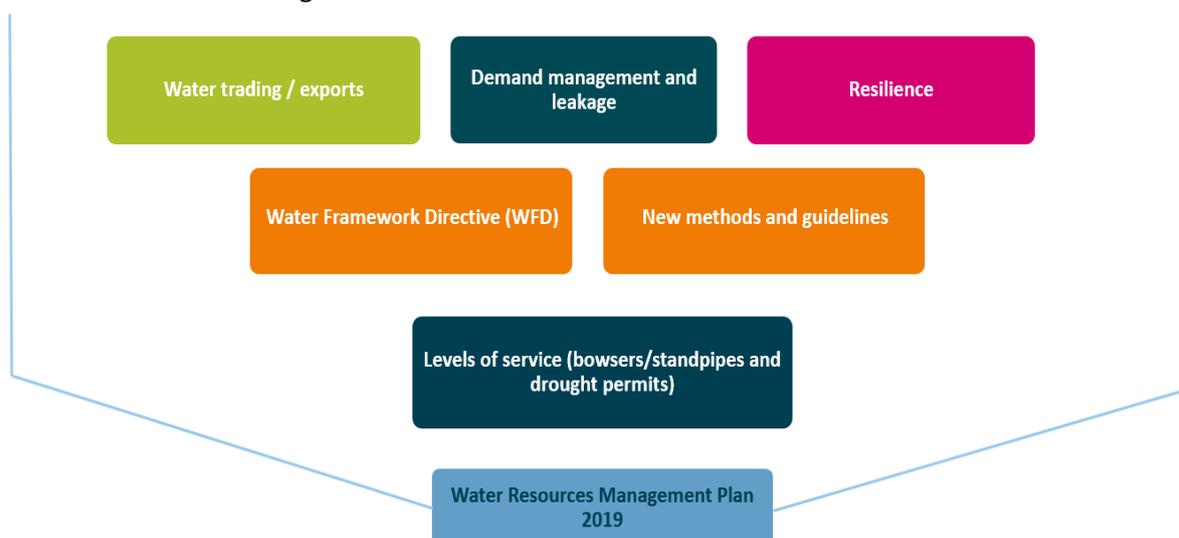


Figure 2 Main themes of WRMP19

Letters and accompanying briefing notes were sent to statutory and non-statutory consultees and all known stakeholders. This included stakeholders from our previous WRMPs and Drought Plans, such as environmental groups, local authorities, business groups, and regulators. We then held four events across the region in combination with our Drought Plan consultation. The accompanying briefing notes we sent out with the letter were Crystal Mark³ accredited and focussed on the Defra guiding principles and key themes (as outlined above). Ofwat, the Environment Agency and Natural Resources Wales all received a more detailed methodology statement as required by the planning guidelines; this cumulated feedback from previous discussions on our approach.

² Around the same time, we also initiated market engagement activities on potential third-party options, including a market engagement event. This is detailed further in *Draft WRMP19 technical report – Options identification*.

³ We got this 'Crystal Mark' accredited by the Plain English campaign as part of making our material as accessible to stakeholders as possible.

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We received responses from 17 regulators and stakeholders with an interest in water resources within the North West. The questions we asked (see box below) helped to promote and facilitate discussion with the stakeholders. The seven questions linked to the main themes set out above and are detailed in the box below.

1. Do you consider the current 1 in 20 year (5% annual average risk) level of service to be appropriate for:
 - a. temporary water use restrictions (commonly referred to as ‘hosepipe bans’)
 - b. implementation of drought permits (powers to take more water from the environment during times of drought)
2. We would welcome views on the level of drought severity we plan for in the Water Resources Management Plan?
3. What are your views on how we should integrate water supply resilience planning and the Water Resources Management Plan?
4. Do you have any suggestions for options to improve the supply demand balance, either new sources of water or options to reduce the demand for water?
5. What are your views on the potential for us to export water from the North West to other areas of the country when they are at risk of drought? Are there particular aspects of water trading that you would like us to consider in our plan?
6. Looking at our current published plan, are there any other specific areas that you consider should be a priority for improvement?
7. Are there any specific ways in which you prefer to be engaged or contacted as we develop the plan, including any ideas for collaboration that we could consider?

Consultees were invited to respond to these questions within an eight week period over October and November 2016. All responses were analysed and, where needed based on the feedback, changes to the planning approach determined. A full list of respondents and our responses can be found in Appendix A.

2.2.3 Outcome of pre-consultation

Table 1 outlines the responses we received to the pre-consultation from statutory and non-statutory consultees and the way in which we have addressed them.

Table 1 Pre-consultation responses and UU’s response

References refer to the relevant section of the main Water Resources Management Plan document unless otherwise stated.

Key points raised by Environment Agency	United Utilities Response
Consider all relevant guidance including Defra Guiding Principles and the final water resources planning guidelines for all aspects of the Water Resource Management Plan.	We have followed all relevant guidance in developing our plan and completed assurance in support of this process. Compliance mapping against the guidance checklist is presented in the <i>Draft WRMP19 Technical Report – Assurance and governance</i> .
Levels of service must be clear and transparent to customers.	We have presented level of service as “1 in x years” and “% annual risk” to make it more understandable to customers in customer research to support development of the plan.

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	<p>We have also engaged extensively with YourVoice (the customer challenge group) to ensure our approach to engagement is as effective as possible. See Section 1.4 of the plan for more information on current Levels of Service and Section 6 covers our future strategic choices in this area.</p>
<p>Explore implementation of a full temporary use ban (TUB) prior to making drought permit/order applications to us/Defra.</p>	<p>Choices on levels of service has been a key area of investigation in our plans. As part of this we have also considered this specific feedback and how the plan choices, if adopted, would inform future Drought Plan revisions. Our proposals for improving level of service would allow temporary use bans to be in place at or prior to the point of drought permit or order applications. This differs from the current Drought Plan position where applications would be expected around the same time for both drought interventions. This would be facilitated by enhanced leakage reduction hence would be from 2025 onwards and be updated in a future Drought Plan revision. See Section 6.3 of the plan for more details.</p>
<p>Explore the operation of pumped sources of water such as Windermere, Ullswater and the West East Link Main in order to provide as little recourse for implementing drought powers as reasonably possible at Haweswater Reservoir.</p>	<p>This feedback was provided both as part of Drought Plan consultation and pre-consultation on this Water Resources Management Plan. The operation of pumped sources was explored in our recent Drought Plan in which we made a commitment to pump from Windermere and/or Ullswater when Haweswater is below a specified level subject to a number of conditions. This Water Resources Management Plan follows and aligns to this commitment. In the Drought Plan we also agreed to regular liaison with the Windermere stakeholders to discuss our operations. See Sections 3.4 and 3.6 of this plan, and the Drought Plan for more information.</p>
<p>Explore the costs and benefits of moving to different levels of service and improving resilience for customers.</p>	<p>This has been investigated as part of the Water Resources Management Plan, and has informed our strategic choices within the plan. The outcomes of these investigations are summarised in the strategic choices section of the main report (Section 6.3 – covering levels of service and drought resilience), with further detail included within <i>Draft WRMP19 Technical Report – Options appraisal</i>. Our consideration of choices in this area has also taken account of customer affordability and relative investment priorities.</p> <p>Specifically with regards our assessment of water supply resilience (to non-drought hazards) in the plan, we present five different plans with differing costs and benefits in Section 6.4 and are continuing to explore this area in conjunction with our Business Plan to inform the revised draft plan.</p>
<p>Justify that everything reasonably possible has been considered before implementing drought permits/order. Set out how resources will be managed during a drought, including stating where and under what conditions drought permits/orders to take more water will be sought.</p>	<p>This is detailed fully within our Drought Plan, which defines what interventions would be expected to manage a drought, and indicatively when these would be expected for implementation. As described above, as part of our Drought Plan, we reviewed the operation of our strategic pumped sources to help ensure we have done everything reasonably possible before implementing drought permits. This Water Resources Management Plan is consistent with the Drought Plan.</p> <p>The Water Resources Management Plan details our assessment of testing the future supply system under a range of drought events and the benefits of drought interventions. Specifically, the new “Drought links” process has been used for this assessment which is documented in Section 17 of the <i>Draft WRMP19 Technical Report – Supply</i></p>

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	<p><i>forecasting</i> (and summarised in the main report). Rather than duplicate or detail the contents of the Drought Plan in its entirety, this provides an overview of the drought plan interventions tested and when drought permits/orders would expect to be implemented.</p> <p>Our current stated level of service for drought permits and orders for implementation is no more than 1 in 20 years on average (5% annual risk). We consider a robust appraisal of level of service for drought permits as the most appropriate way of defining "reasonable" in this context. We have also explored the possibility of applying for drought permits and orders only once temporary use bans have been implemented (we currently implement them around the same point; Drought trigger 4 as per WRMP15 and our Drought Plan). As a result we have included a strategic choice in the draft plan (Section 6.3) to halve the frequency of implementing drought permits and orders by 2025. This would be facilitated by another strategic choice to enhance leakage reduction.</p>
<p>Investigate resilience to a range of droughts of varying severity, duration, frequency and spatial extent. The expectation is that the design drought is worse than or equal to the worst historic drought.</p>	<p>We have developed new synthetic or stochastic (a method to create alternative weather patterns that are realistic, but have not been recorded historically) hydrological datasets covering a period of 17,400 years from which to test a range of drought events and better describe drought risk (Section 4.4.8). We've also included drought risk as a key component of our options appraisal (Section 5). We detail the approach to populating new "drought links" table in Section 17 of the <i>Draft WRMP19 Technical Report – Supply forecasting</i>. The design drought for our plan remains the worst historic drought, taking account of the additional impacts of climate change through the process.</p>
<p>Consult with customers about the severity of drought to plan for.</p>	<p>This has been explored through our customer (and stakeholder) engagement activity and is detailed within <i>Draft WRMP19 Technical Report – Customer and stakeholder engagement</i>. The choices made using this research are summarised in Section 6.3 of the main plan.</p>
<p>Improve the overall resilience of your assets to drought and non-drought hazards.</p>	<p>In the plan we have fully explained the company assessments of resilience and how we plan to increase this in future in conjunction with our Business Planning process. Extreme droughts assessments are summarised in Sections 4.4.8 and 6.3, and our resilience to other hazards is covered in Sections 4.7 and 6.4. We are consulting upon the most salient risk area as part of the plan as a strategic choice (Section 6.4). Our resilience assessments and contingency plans are informed by previous events and incidents, and include the impact of flooding on our assets.</p>
<p>Choose demand-side options as part of the preferred program wherever it is reasonably likely that the benefits will outweigh the costs.</p>	<p>We have used the Average Incremental Social Cost (AISC) to compare the relative unit costs of the various options. We have identified a number of options with negative AISC for this plan, all of which are related to leakage reduction. All of these options have been considered for inclusion in our proposed programme. Further information is in Sections 5.4 and 7 of the plan.</p>
<p>Focus on options for managing demand, for example reducing leakage, helping customers to further reduce per capita consumption and increasing customer metering.</p>	<p>Section 4.2 of our plan, supported by the <i>Draft WRMP19 Technical Report – Customer and stakeholder engagement</i>, documents our baseline approach to water efficiency and increasing customer metering. We will continue to update on our work in this area as part of the Annual WRMP process (e.g. the outcome of ongoing trials). Beyond this, we have explored a wide range of demand management options in the plan (Section 5), including those provided by</p>

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	third-parties, and our preferred plan (Section 7) has a significant focus on demand management included within the selected portfolio. In line with customer and stakeholder feedback, leakage reductions make up a significant proportion of the options in the preferred plan.
Focus on ensuring appropriate maintenance of its raw water assets to ensure they are fully available when needed.	We recognise the importance of raw water assets and ensuring that sufficient water can be collected and transported across our distribution networks. We are working to maintain an optimum balance of maintenance and investment across all of our assets to ensure the long term provision of reliable drinking water supplies. The developing PR19 Business Plan programme will deliver services to customers as efficiently as possible into the future. Ongoing delivery of our maintenance activities underpins the forecasts and assessments included in the Water Resources Management Plan.
Hold detailed local discussion with our teams about WRMP options.	As part of the process the Environment Agency (as well as other environmental regulators such as Natural England and Natural Resources Wales) have been engaged on options as far as practicable following this request. This has included routine updates in bi-monthly liaison meetings, supported by specific workshops on options, scoping of the SEA/HRA process and provision of options lists following the screening stages. We would welcome and wish to continue dialogue now that a preferred portfolio of options has been selected in this draft plan as part of consultation.
Options appraisals should take into account environmental and social costs as well as economic costs.	We have used the Average Incremental Social Cost (AISC) to compare the relative unit costs of the various options. The AISC includes environmental and social costs as well as the whole life cost. Further information is in section 5.4.
Fully explore resource sharing during WRMP19 and beyond. Any options to export water from the North West must be done in a way that does not pose additional risks to water supply or the environment. It must also be done in a way that ensures compliance with Water Framework Directive actions and objectives.	We have assessed water trading as a key part of the plan. Based on feedback received, we have done this so as to protect drinking water quality, resilience, the environment and our stated level of service. At this stage we do not have the full picture of how water trading will progress in the future, and so have included this in a plan pathway and propose as part of the preferred plan to continue work in future towards WRMP24. Our plan accepts that significant future work will be required to build on the strategic assessment in this plan. This is a key topic for consultation. See Section 6.5 for more information.
Any raw water transfers should be assessed for their potential to spread Invasive Non-Native Species (INNS). Any identified risks and mitigation measures should be discussed with the Environment Agency and Natural England.	We have considered the risk of transferring invasive non-native species from one area to another as part of the options process and have endeavoured to provide innovative options e.g. new water treatment solutions to prevent the transfer of invasive non-native species (Section 5.1). The risk of transfers downstream of Vyrnwy in the Severn and Thames catchments will be assessed by Thames Water in its WRMP (see Section 7.6 for more information).
Clear links between WRMP and Drought Plan.	The WRMP is consistent with operational interventions in the Drought Plan (see Section 4.4.8 for more information). We consider use of the Drought Links table as instrumental in supporting the narrative around this aspect.
Demonstrate how the Strategic Environmental Assessment has informed development of WRMP throughout the process.	Information on the Strategic Environmental Assessment and how it has been used to assess options is in Section 5.4.2. The preferred plan has been subject to a final environmental appraisal as outlined in Section 7.7. This is also detailed further within the supporting Technical Reports.

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<p>Look to improve on Sustainable Economic Level of Leakage, engaging with stakeholders (particularly those in Cumbria) and on your choice of using 1995 as the basis for your dry year demand forecast.</p>	<p>This comment relates to EA advice items for WRMP19 provided in the last planning round and we have been fully cognisant of these throughout development of this plan.</p> <p>As detailed in <i>Draft WRMP19 Technical Report – Demand for water</i>, we have improved our Sustainable Economic Level of Leakage approach from the last planning round in line with the EA industry recommendations in this area. In addition, and linked to Annual WRMP feedback, we have completed industry benchmarking and explored fully in this plan reducing leakage in future in Section 6 of the main WRMP document. We’ve also engaged with third-parties to explore innovative demand management options (Section 5) and fully explored demand management options as part of building our preferred plan (Section 7).</p> <p>We have undertaken significant stakeholder engagement in Cumbria as part of an enhanced Water Resources Management Plan pre-consultation exercise and around our Drought Plan, supported by additional activities associated with business planning, environmental assessments and review of our operations. In combination, the output and feedback from this process has informed development of this plan.</p> <p>We are now using the 95th percentile as the basis for the dry year demand forecast, as discussed in our liaison meetings and detailed in <i>Draft WRMP19 Technical Report – Demand for water</i>.</p>
<p>Include realistic forecasts for customer metering in this next plan with clear actions to ensure you achieve those forecasts.</p>	<p>We have used an updated metering forecasts model for this plan which has been developed with Artesia Consulting a leading expert in this field. Section 4.2.4 contains our approach to customer metering.</p>
<p>Continue to consider the contingency plan for West Cumbria supplies in case the Thirlmere transfer should become undeliverable.</p>	<p>We will continue to review the contingency plan on an annual basis and update on this Annual WRMP review. This plan covers the period 2020-2045 so has been developed around the future supply system following completion of the Thirlmere project by 2022. However, we have also included a specific <i>Draft WRMP19 Technical Report – West Cumbria legacy</i> document to update on activities in this area.</p>
<p>Consider the impact of any reservoir-related flood alleviation schemes on the supply demand balance and WFD objectives.</p>	<p>In this plan we have accounted for future infrastructure changes at Thirlmere to enable greater flood drawdown release rates in future within our supply forecasting. These proposals are subject to ongoing separate detailed environmental assessments as part of our West Cumbria supplies project. This work is being completed in two phases and the Keswick Flood Action Group are being engaged as part of this work.</p> <p>We are working with Defra, EA, Ofwat and another water company to determine what opportunities may exist for future use of reservoirs for flood mitigation. There are a number of potentially conflicting issues which must be considered regarding reservoir use in such circumstances, including impacts on the supply demand balance and WFD implications. Any potential flood mitigation projects will only progress if all our statutory obligations can be met fully.</p>
<p>Clearly demonstrate commitment to protect and improve the environment.</p>	<p>The environment has been a core theme throughout development of our plan and our supply forecasts include</p>

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	<p>delivery of enhancements under the Water Industry National Environment Programme (WINEP).</p> <p>The development of options in the plan (Section 5) has been subject to the screening taking account of environmental factors. Our options appraisal process also ensures that our plans avoid any negative impacts to customers or the environment (Section 7), and we have worked closely with the Environment Agency to ensure that our preferred plan does not link to deterioration under the Water Framework Directive. Our plans also include proposals for less frequent drought permits and orders in future (Section 6.3) and promote additional demand management.</p>
Extend the use of innovative techniques such as new information and operational technologies (such as pressure management systems for leakage management and automation of abstraction assets) to help deliver catchment-based outcomes.	In this plan we have explored a range of options including a number of leakage reduction scenarios, and have put forward proposals to significantly reduce leakage in Section 6. We've also engaged with third-parties to explore innovative demand management options (Section 5/ <i>Draft WRMP19 Technical Report – Options identification</i>) and fully explored demand management options as part of building our preferred plan (Section 7).
Key points raised by Ofwat	United Utilities Response
<p>Pre-consultation engagement should focus on:</p> <ul style="list-style-type: none"> evidence of customer requirements and outcomes (e.g. level of supply resilience); the risks in delivering these outcomes and the options for managing those risks; the range of options assessed to deliver the outcomes including involving other water companies (water trading as both a supplier and purchaser), other sectors (third party options) and demand management. 	<p>Note: Since this response Ofwat have conducted a specific industry pre-consultation process on WRMP19 and wrote to companies outlining that process. We met with Ofwat in July 2017 and to some extent those activities supersede this initial response received in our own pre-consultation process.</p> <p>As discussed at the time, and detailed in this technical report, we have carried out engagement with customers and stakeholders to inform development of this plan. We have also explored a wide range of options, including those from third-parties and other companies, as summarised in Section 5 of the plan.</p>
Interested to understand how you are integrating the Water Resources Management Plan 2019 process into the development of your business plan.	These two plans are being developed in close conjunction with each other, as we detailed in our July 2017 meeting. This is particularly important in this planning round in particular given the expanded remit of WRMP19 to include water supply system resilience.
Key points raised by Natural England	United Utilities Response
Understand the desire to offer customers a 20 year level of service for temporary use bans but wonder whether there might be situations in which a lower level of service might be appropriate in order to reduce the probability of needing a drought permit, where this might cause damage to a European Site. Clearly the place where this is most relevant is West Cumbria, and particularly Ennerdale where it cannot be shown that exercise of a drought permit would not have an adverse effect on the integrity of the River Ehen Special Area of Conservation.	<p>As this plan covers the period 2020-2045 it has been developed around the future supply system following completion of the Thirlmere project by 2022 so West Cumbria is now included as part of the larger Strategic Resource Zone. The timing of drought interventions was covered within our recent Drought Plan update.</p> <p>We have explored alternative levels of service for temporary use bans fully in this plan, including consideration through customer research and as a potential option in the options identification process.</p>
Agree that it is prudent to plan for a greater level of drought severity and enhanced water supply resilience. Planning for more severe drought events than previously will raise questions about more severe environmental impacts than have been planned for historically, and this may necessitate revisiting environmental assessments and Habitats Regulations Assessments of potential drought options.	<p>The WRMP process has shown that our system is relatively resilient to an extreme drought. The environmental impact of our current drought options are identified in the environmental assessments which are refreshed on a regular basis with the latest data and information.</p> <p>As part of our environmental assessment for this WRMP we have conducted a full Strategic Environmental Assessment and Habitat Risk Assessment to ensure all potential risks are mitigated against or managed.</p>

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<p>As regards resilience more generally, with the West Cumbria supply largely dependent on one surface water supply from 2022, need to be certain there is no possible risk to supply from storm events and other potential hazards.</p>	<p>We have considered resilience to non-drought hazards in Section 6.4. This includes flooding as well as a range of other hazards.</p>
<p>Expect to see all options for reducing demand explored before new water sources were considered. These would include further improvements to leakage detection and control, and improved management of consumer demand. Would like to see some exploration of the potential for the use of smart metering and variable tariffs to enhance demand management according to water availability in different seasons and times of water shortage.</p>	<p>We have explored a range of leakage reduction scenarios, and put forward proposals to significantly reduce leakage in Section 6. Our plan also outlines our approach to managing the future demand for water, and we are currently conducting trials to promote meter uptake. We have considered a wide range of demand management options as part of the options identification process (Section 5), and engaged with third-parties to explore innovative demand management options (Section 5). Our preferred plan includes a significant contribution from demand side options (Section 7).</p> <p><i>Our Draft WRMP19 Technical Report – Demand for water technical report provides additional detail, including reference to ongoing work to explore some of these areas such as connected homes / smart meters. It is also worth noting that our policy is that, where possible, new meters installed will be Automated Meter Reading (AMR) enabled and the majority of these have the potential to upgrade to smart meter capabilities in future.</i></p>
<p>The current supply-demand balance of water does not appear to provide a significant surplus of water for export to other parts of the country. Clearly this is an extremely important element that the Strategic Environmental Assessment and the Habitats Regulations Assessment shall need to address and influence in the development of proposals for the draft and final Water Resources Management Plan. If new surface and groundwater sources need to be developed to provide additional supply, then there will be a challenge to develop sources that do not have significant environmental impacts. Furthermore, water transfers that rely on using rivers and other watercourses to move water rather than simply pipelines bring with them the risk of transferring invasive non-native species from one area to another, and this should be fully considered during the development of any transfer options. Interested to see how water transfer proposals develop in the emerging plan, and shall seek to help this process to develop sustainable and environmentally positive solutions through contribution to the work on SEA and HRA.</p>	<p>The development of options in the plan (Section 5) has been subject to the screening taking account of environmental factors. Our options appraisal process looks beyond the supply-demand balance to ensure that our plans avoid any negative impacts to customers or the environment (Section 7), and we have worked closely with the Environment Agency to ensure that our preferred plan does not link to deterioration under the Water Framework Directive. Our plans also include proposals for less frequent drought permits and orders in future Section 7.3.</p> <p>We have considered the risk of transferring invasive non-native species from one area to another as part of the options process and have endeavoured to provide innovative options e.g. new water treatment solutions to prevent the transfer of invasive non-native species (Section 5.1). The risk of transfers downstream of Vyrnwy in the Severn and Thames catchments will be assessed by Thames Water in its WRMP (see Section 7.6 for more information).</p> <p>We recognise that further investigation and assessment will be needed ultimately to facilitate any future water trade and, depending on the outcome of this plan, this would progress to inform WRMP24.</p>
<p>Key points raised by Natural Resources Wales</p>	<p>United Utilities Response</p>
<p>Continue to comply with the Dee General Directions and to consult Natural Resources Wales on all issues which involve Wales. Consider the requirements of the Well-being of Future Generations (Wales) Act 2015 and the Environment Act (Wales) 2016 for any options in the plan that are located in or affect Wales (e.g. River Dee and Lake Vyrnwy).</p>	<p>We have included the latest Dee General Directions in our water resources modelling. Throughout the development of this draft plan we have engaged with you as part of our activities. This has included pre-consultation, liaison meetings, the SEA/HRA and options process, and specific work on the River Dee where we have collaborated on our assessments of climate change. We welcome this active dialogue and wish to continue with this through the consultation period.</p> <p>Specifically with regards to the legislation, we have assessed the potential for Lake Vyrnwy to be part of a potential future water trade or export in the plan. We have discussed</p>

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	<p>this with you previously, including in a specific special interest session on water trading. At this stage, we are exploring this potential future pathway in the plan, and this would result in further more detailed work towards WRMP24. Given this, and other sources located in Wales, we are carefully considering the priorities of Welsh Government, in particular focussing on the Well-being of Future Generations Act. We will continue to explore this if these plans are progressed and any potential trades become more defined, supported by stakeholder engagement and research.</p> <p>The risk of transfers downstream of Vyrnwy in the Severn catchment will be assessed by Thames Water in its WRMP (see Section 7.6 for more information), however, as studies progress we will continue to input to this process and as part of the River Severn Working Group.</p>
<p>In principle no objection to water trading provided that it is done in an environmentally sustainable manner and does not have an adverse impact on their own resources. The impact should be investigated to ensure that the source remains sustainable and no deterioration of the water body occurs.</p>	<p>As described in responses above, our plan ensures that the environment is protected as part of the water trading proposal assessed, and this would be subject to further detailed investigation should these proposals be progressed. The risk of transfers downstream of Vyrnwy in the Severn and Thames catchments is being led by Thames Water as part of its WRMP19 process.</p>
<p>Key points raised by the Consumer Council for Water</p>	<p>United Utilities Response</p>
<p>Expect the WRMP to:</p> <ul style="list-style-type: none"> • address issues relating to the long-term resilience of water supplies • demonstrate an understanding of customers’ priorities and preferences • have a comprehensive demand management strategy • explain the approach to household metering • explain the approach to leakage 	<p>We have carried out significant engagement with customers in order to understand their priorities and fully incorporated these into our proposed plans. We have engaged with YourVoice (our customer challenge group, which has two representatives from CCW), on our customer engagement activities and welcome this input. More information on this included in <i>WRMP19 Technical Report – Customer and stakeholder engagement</i>.</p> <p>We have explored a wide range of options in order to identify ones which will deliver the outcomes desired by customers as indicated by our research. More information on options is in Section 5. Demand management is a key component of our plans. Our approach to water efficiency is defined in Section 4.2 of the plan, and we outline proposals to reduce leakage further in Section 6.2. Demand management forms a major component of our preferred plan in Section 7.</p>
<p>Agree that plans should be tested against more extreme scenarios than those which are a matter of historical record.</p>	<p>We have developed new synthetic or stochastic (a method to create alternative weather patterns that are realistic, but have not been recorded historically) hydrological datasets covering a period of 17,400 years from which to test a range of drought events and better describe drought risk (Section 4.4.8). We’ve also included drought risk as a key component of our options appraisal (Section 7).</p>
<p>It is essential to ensure that water trading can be achieved in a way which does not impact negatively on customers, in terms of cost or service, or on the region’s environment.</p>	<p>We have assessed water trading in the plan with a view to protecting water quality, resilience, the environment and our stated level of service. Our new sophisticated planning techniques have enabled us to do this as effectively as possible.</p> <p>At this stage we do not have the full picture of how water trading will progress in the future. Our plan accepts that significant future work will be required in future to build on the strategic assessment in this plan. This is a key topic for consultation. See Section 7.5 for more information.</p>

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Key points raised by Lake District National Park Authority (LDNPA)	United Utilities Response
<p>Very keen to work with you on a Natural Capital approach to water resources, and other areas of work.</p>	<p>We note and welcome this intent for further collaboration in future. The Lake District National Park Authority is included on the engagement list for our wider Business Planning activities in addition to those for Water Resources Management and Drought Plans. The Lake District National Park Authority is now involved with the Petteril project, part of the Natural Course Project on Natural Capital and we hope to continue this relationship in the future.</p> <p>We provide specific update on our review of natural capital approaches in Section 5.4.1 of the plan. Whilst our plan development includes environmental and social costing, which includes many aspects of environmental 'value', we have not sought to adopt a full natural capital/ecosystem services for the WRMP19 planning round. The reasons are detailed in the report, but in part link to data constraints, the volume of feasible options newly identified in this planning round and challenges applying such new approaches that are still in development in our large Strategic Resource Zone. That said, we are keen to build capability in this area towards the next planning round (noting that our exploration of options to facilitate water trading will continue beyond WRMP19) and are actively completing work in this area. As you are aware, we are currently trialing a Natural Capital Approach in the River Petteril catchment in Cumbria to appraise options at a catchment level from a Water Framework Directive (WFD) perspective, specifically related to nitrates, phosphates, bacterial load, flooding and operational carbon footprint.</p> <p>More generally, we own 8% of the land and water comprising the Lake District National Park, and collaboration is a key part of our work. We are a partner on the Lake District National Park Partnership and therefore a key contributor in the development and delivery of the National Park Plan. Like all such overarching plans there are numerous working groups and action groups leading on specific plan topics, e.g. Forestry and Farming, Natural environment and peat soils to name a few where our Catchment team are represented and can contribute to shaping the park. In addition we are represented on the Land Owners forum which meets from for updates on private park land management and our particular business interests. At an operational level we have been long term supporters of 'fix the fells', which is a National Park and National Trust led initiative to repair upland paths. We contribute by providing materials and other aids such as Helicopter take off and storage sites for the projects. We support the rural apprenticeship scheme to ensure young people are coming through to be trained countryside workers. We invested in the largest Archaeological study in the park by working with the LDNPA archaeologist and Oxford University to have all UU land surveyed. We have an ongoing close working relationship with the LDNPA rangers and field staff sharing best practice on public access and recreation including rights of way maintenance. We look forward to ongoing collaboration in future.</p>

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Continue to explore further the potential to reduce the frequency of drought permits.	In Section 7.3 we outline our proposal to improve levels of service for drought permits by 2025 following delivery of our first tranche of leakage reduction activities.
Maintain downward pressure on leakage rates. Support ongoing commitment to driving water efficiency.	This plan goes further than in the last planning round. We have explored a range of leakage reduction scenarios, and put forward proposals to significantly reduce leakage in Section 6. We've also engaged with third-parties to explore innovative demand management options (Section 5) and fully explored demand management options as part of building our preferred plan (Section 7).
Want any benefits accrued from trading to be re-invested in increasing our region's water supply resilience to hazards.	We have assessed water trading in the plan with a view to protecting water quality, resilience, the environment and our stated level of service. At this stage we do not have the full picture of how water trading will progress in the future. Our plan accepts that significant future work will be required in future to build on the strategic assessment in this plan, and this includes how such proposals would be funded and benefits shared. This is a key topic for consultation. See Section 6.5 and 7.6 for more information.
Work with us and other stakeholders to ensure that the future de-commissioning of water resource infrastructure creates positive enhancements to the National Park.	As this plan covers the period 2020-2045, it has been developed around the future supply system following completion of the Thirlmere project by 2022. Based on this feedback, we have therefore covered the future of West Cumbria as part of a new and specific technical appendix focussed on the future of decommissioned infrastructure associated with our plans.
Believe that "1 in 20 years" is difficult to understand and could be misleading. It would be better to use the percentage probability in any one year.	We have referred to both "1 in x years" and as % annual occurrence. When we discussed this at events during pre-consultation feedback, such as this, we thought to initiate a full change to % annual occurrence throughout the document, but subsequent feedback and experience during customer research has resulted in some opposing views. We have therefore chosen to present both in this draft plan.
Key points raised by South Lakeland District Council	United Utilities Response
Local organisations are concerned that leakage is very high with consequential impacts on the South Lakeland economy and environment.	This plan goes further than in the last planning round. We have explored a range of leakage reduction scenarios, and put forward proposal to significantly reduce leakage in Section 6. We've also engaged with third-parties to explore innovative demand management options (Section 5) and fully explored demand management options as part of building our preferred plan (Section 7). We have carefully balanced our aspirations to reduce leakage with the affordability to customers and to ensure a cost-effective delivery of reductions over time. These changes also unlock supplementary benefits in terms of improved drought resilience and a lower stated frequency of drought permits or orders to augment supply.
Support the Windermere stakeholders request for a review of the Water Order.	We have commissioned a study to assess the impact of our abstraction licence in relation to recreational users, commercial interests and the environment. This study will assess a range of scenarios and the implications of each on UU's abstraction, lake users and the environment.
Key points raised by Windermere stakeholders (Windermere Lake User Forum, Windermere Lake Cruises, Holker Estates)	United Utilities Response

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<p>Should review the existing options for supply and improvements in service to ensure that a drought permit scenario 2 at Windermere is not part of the WRMP or Drought Plan.</p>	<p>We reviewed the operation of abstraction from Windermere in the Drought Plan 2017 where we have made a commitment regarding future pumping. This Water Resources Management Plan also outlines proposals to reduce leakage further, which will bring some supplementary benefit of lower frequency of drought permits in future and greater drought resilience.</p> <p>In addition, we have commissioned a study to investigate the feasibility of mitigation measures for a scenario 2 lake drawdown drought permit. We will continue to work with stakeholders to better understand the mitigation required and from this the implications for inclusion in future plans.</p>
<p>Recommend that a review of the Water Order is carried out and suggest that the hands-off flow is increased to 500 MI/d all year round.</p>	<p>We have commissioned a study working with the EA, Lake Users and other interested parties, to assess the impact of our abstraction licence in relation to recreational users, commercial interests and the environment. This study will assess a range of scenarios and the implications of each on UU's abstraction, lake users and the environment. Any implications of this review on the Water Resources Management Plan process will be considered when we have the results of the study.</p>
<p>Do not feel that sufficient financial resource is allocated to leakage reduction; further investment into reducing leakage is needed.</p>	<p>This plan goes further than in the last planning round. We have explored a range of leakage reduction scenarios, and put forward proposal to significantly reduce leakage in Section 6. We've also engaged with third-parties to explore innovative demand management options (Section 5) and fully explored demand management options as part of building our preferred plan (Section 7). We put forward leakage reductions and the level of investment for these reductions has been balanced carefully with affordability for customers. We have also balanced investment in this area against other business needs.</p>
<p>Endorse the suggestion to assess to a 0.5% probability (1 in 200 year event) and a 0.2% probability (1 in 500 year event) so that meaningful sensitivity analysis can be conducted. Data are based on historic weather patterns. The frequency of serious flood events in recent years may raise questions over the validity of this data.</p>	<p>We have developed new synthetic or stochastic (a method to create alternative weather patterns that are realistic, but have not been recorded historically) hydrological datasets covering a period of 17,400 years from which to test a range of drought events and better describe drought risk (Section 4.4.8). We've also included drought risk as a key component of our options appraisal (Section 7).</p>
<p>Should consider innovative solutions that may help mitigate both flood and drought impacts. For example, the replacement of the fixed Newby Bridge weir with a tilting weir may give greater control of lower lake levels and improve ability to abstract under drought conditions.</p>	<p>As described above, we are completing a review to assess the impact of our abstraction license in relation to recreational users, commercial interests and the environment. At this stage, a tilting weir has not been considered as an option in the WRMP, but could be considered in the future. As discussed, in our recent liaison meeting, the weir is owned by the Environment Agency. If it is considered an appropriate option in the future, we will work with the Environment Agency and other interested parties to assess the feasibility of such a weir and the impact it would have on the abstraction and the local environment.</p>
<p>Propose that any export of water should be developed with plans for an import of water in the form of a national water grid. This will ensure that resilience is on a national and balanced basis. No water should be exported until there is a greater predicted surplus.</p>	<p>We have assessed water trading in the plan with a view to protecting water quality, resilience, the environment and our stated level of service. Our plan outlines the proposed options to facilitate a future water trade for consultation. Our assessment of water exports does not rely upon use of the existing surplus, but instead is driven by the strategy to achieve the above objectives. A surplus is maintained as part of our plans, and actually increases as a result of our proposed leakage reductions from the baseline position.</p>

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	<p>Our approach to develop the plan has been designed to assess all options equitably to ensure we can select the most cost-effective, sustainable long-term solution. As part of this, we have included a third-party import option in our preferred plan.</p> <p>We note that in pre-consultation responses that there is specific support for a Kielder import. However, this has not been selected as part of the preferred plan (this option was discounted as part of our secondary screening process). However, the plan has proposed the most appropriate supply-demand options to facilitate a water trade which ensure there is sufficient resources to meet the needs of the North West in future.</p> <p>At this stage we do not have the full picture of how water trading will progress in the future. Our plan accepts that significant future work will be required in future to build on the strategic assessment in this plan if there is support to explore this further following consultation. See Section 6.5 for more information.</p>
<p>Key points raised by Friends of the Lake District</p>	<p>United Utilities Response</p>
<p>There needs to be a clear understanding of the impacts and of any compensating benefits should any surplus in the North West be redeployed to meet the demands of the South East.</p>	<p>We have assessed water trading in the plan with a view to protecting water quality, resilience, the environment and our stated level of service. Our new sophisticated planning techniques have enabled us to do this.</p> <p>At this stage we do not have the full picture of how water trading will progress in the future. Our plan accepts that significant future work will be required to build on the strategic assessment in this plan if there is support to explore this further following consultation. See Section 6.5 for more information.</p>
<p>A risk based approach (stochastic modelling and synthetic hydrology) is a positive development and may help to clarify the impacts of any reduction in surplus between supply and deployable output.</p>	<p>We have developed new synthetic or stochastic (a method to create alternative weather patterns that are realistic, but have not been recorded historically) hydrological datasets covering a period of 17,400 years from which to test a range of drought events and better describe drought risk (Section 4.4.8). We've also included drought risk as a key component of our options appraisal (Section 7).</p>
<p>Would like the following to be covered:</p> <ul style="list-style-type: none"> • disposal of redundant assets; • future plans for Crummock and Ennerdale post 2022; and • options for sites which will become redundant. 	<p>As this plan covers the period 2020-2045, it has been developed around the future supply system following completion of the Thirlmere project by 2022. Based on this feedback, we have therefore covered the future of West Cumbria as part of a new and specific technical appendix. Redundant and unused sources/assets have also been considered as part of the options identification process.</p>
<p>When will compulsory metering happen and other more imaginative demand management solutions.</p>	<p>Currently there is no mechanism for compulsory metering in our area and this would be driven by government policy. We have engaged with third-parties to explore innovative demand management options (Section 5) and fully explored demand management options as part of building our preferred plan (Section 7).</p>
<p>Innovative catchment management on a bigger scale.</p>	<p>Through the delivery of the ground breaking 'Sustainable Catchment Management Programme' (SCaMP), we are recognised within the UK water industry as being at the forefront of catchment management, which aims at securing multiple benefits at a landscape scale. We own 56,385 hectares of land in North West England, which is held to protect the quality of water entering the reservoirs, and we work with partners and third parties to encourage</p>

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	<p>the principles of SCaMP to be adopted on the remaining 720,000 hectares of catchment land not in our ownership, and as part of wider catchment initiatives to improve the water quality of downstream rivers and bathing waters impacted by our wastewater discharges.</p>
<p>Key points raised by Windermere Town Council</p> <p>Support water trading if it's feasible without water imports and if residents of South Lakeland benefit from any financial rewards. Will only support if level of Windermere can be guaranteed for environmental and amenity use.</p>	<p>United Utilities Response</p> <p>We have assessed water trading in the plan with a view to protecting water quality, resilience, the environment and our stated level of service.</p> <p>With regards specifically the options to facilitate a future water trade, our proposed portfolio options at this draft plan stage are outlined in Section 7.</p> <p>Financial rewards in terms of a relative reduction in customer bills will apply equally to those in South Lakeland as it will to all customers in the North West. Our plan also proposes reductions in leakage and associated improvements to our stated levels of service (to reduce the frequency of drought permits) that is consistent with feedback from stakeholders in the Windermere and South Lakeland area.</p> <p>At this stage we do not have the full picture of how water trading will progress in the future. Our plan accepts that significant future work will be required in future to build on the strategic assessment in this plan. This is a key topic for consultation. See Section 6.5 for more information.</p> <p>It is also worth noting that we have commissioned a study to assess the impact of our abstraction licence at Windermere in relation to recreational users, commercial interests and the environment. This study will assess a range of scenarios and the implications of each on UU's abstraction, lake users and the environment.</p>
<p>Key points raised by River Eden and District Fisheries Association (REDFA)</p> <p>Interested to see how environmental considerations are defined and valued in measuring best-value.</p>	<p>United Utilities Response</p> <p>The development of options in the plan (Section 5) has been subject to the screening taking account of environmental factors. Our options appraisal process also ensures that our plans avoid any negative impacts to customers or the environment (Section 7), and we have worked closely with the Environment Agency to ensure that our preferred plan does not link to deterioration under the Water Framework Directive. Our plans also include proposals for less frequent drought permits and orders in future Section 7.3. Using this process we have defined what we believe to be the most cost-effective and sustainable long-term plan, and are seeking views on this through consultation.</p>
<p>Major concerns over how options will impact on already vulnerable waterbodies and fish stocks in the north west.</p>	<p>As part of the options appraisal process we have considered the environmental impact of our options. See Section 5 for more information. Our preferred plan has also been tested for any potential in-combination impacts as part of the options appraisal process, as defined in Section 7.</p>
<p>Key points raised by West Cumbria Rivers Trust</p> <p>Support 1 in 30 year level of service for temporary use restrictions and 1 in 200 year event for resilience.</p>	<p>United Utilities Response</p> <p>Our customer research showed there is little support for an improvement to the level of service for temporary use restrictions so this remains at 1 in 20 years (5% annual average). In Section 7.3 we outline our proposal to improve levels of service for drought permits to no more than 1 in 40 years on average (2.5% annual average risk) by 2025</p>

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	<p>following delivery of our first tranche of leakage reduction activities.</p> <p>We have developed new synthetic or stochastic (a method to create alternative weather patterns that are realistic, but have not been recorded historically) hydrological datasets covering a period of 17,400 years from which to test a range of drought events and better describe drought risk (Section 5.4.8). We've also included drought risk as a key component of our options appraisal (Section 7). These assessments have shown drought resilience to be in excess of the Defra reference level of service of 1 in 200 years (0.5% annual average risk) for emergency drought orders (rota cuts and standpipes).</p>
Suggested options include increasing supply from groundwater, new reservoirs, compulsory metering, artificial aquifer recharge, active support for improved land management practices.	We have explored a wide range of options including the impact on the environment and their resilience and reliability. See Section 5 of our Water Resources Management Plan for more information. Please note also our responses above to Friends of the Lake District with regards common points on compulsory metering and catchment/land management.
Deep rooted concerns about water trading. Not only is the potential for some water companies to increase their profits but current resources are stretched during a drought. If trading was considered we would need to significantly increase the North West's resilience and resources.	<p>We have assessed water trading in the plan with a view to protecting water quality, resilience, the environment and our stated level of service. Our new sophisticated planning techniques have enabled us to do this.</p> <p>At this stage we do not have the full picture of how water trading will progress in the future. Our plan accepts that significant future work will be required in future to build on the strategic assessment in this plan. This is a key topic for consultation. See Section 6.5 for more information.</p>
Key points raised by North Western Inshore Fisheries and Conservation Authority	United Utilities Response
Seeks assurance that the WRMP is consistent with the WFD and the riverine, estuarine, coastal and marine environment is safe guarded.	<p>The environment has been a core theme throughout development of our plan and our supply forecasts include delivery of enhancements under the Water Industry National Environment Programme (WINEP).</p> <p>The development of options in the plan (Section 5) has been subject to screening which has taken account of environmental factors. Our options appraisal process also ensures that our plans avoid any negative impacts to customers or the environment (Section 7), and we have worked closely with the Environment Agency to ensure that our preferred plan does not link to deterioration under the Water Framework Directive. Our plans also include proposals for less frequent drought permits and orders in future (Section 7.3).</p>
Key points raised by Lancashire Constabulary	United Utilities Response
The terminology "1 in x years" confuses the public if an event occurs again the following year.	We have referred to both "1 in x years" and a % probability of the event occurring in a given year. During pre-consultation, based on such feedback, we had initially perceived a full change to % annual occurrence throughout the document, but subsequent feedback and experience during customer research has resulted in some opposing views. We have therefore chosen to present both in this draft plan.
Key points raised by an individual respondent	United Utilities Response
The price for export options should be based on value to other areas not just the resource cost of provision.	We have assessed water trading in the plan with a view to protecting water quality, resilience, the environment and

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	<p>our stated level of service. Our new sophisticated planning techniques have enabled us to do this.</p> <p>Any pricing of exports should be compliant with the relevant guidance from Ofwat, and this has been the basis for developing our plan.</p> <p>At this stage we do not have the full picture of how water trading will progress in the future. Our plan accepts that significant further work will be required in future to build on the strategic assessment in this plan. This is a key topic for consultation. See Section 7.5 for more information.</p>
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As an output of pre-consultation we also requested volunteers for a Technical Stakeholder Group, essentially a small working group to engage on plan development outside of the main consultation exercises. This is detailed further in Section 2.3.3 below.

2.3 Other stakeholder engagement activities

The pre-consultation is a formal part of the water resource management plan process, however, we have also undertaken other stakeholder engagement activities that are of relevance to the Water Resources Management Plan. These are detailed in this section.

2.3.1 Business Planning: Stakeholder events – July 2017

As part of the business planning process a number of stakeholder events were run across the North West region in July and November to gain an insight into the opinions of stakeholders within the North West. Some of the themes that were raised by stakeholders at the July 2017 events relate to the Water Resource Management Plan as well. These topics are outlined in Table 2 below. At the time of publishing this draft plan the compilation of results from the November events were not yet available.

Table 2 Summary of stakeholder views from business plan July events

Topic	What stakeholders said
Drought	Cumbrian stakeholders stated a preference for the lake drawdown drought permit to be removed from the Drought Plan until suitable mitigation identified and delivered.
Flooding	Stakeholders thought there should be continuing and greater investment into natural flood management.
Water efficiency	More education of customers is needed. Smart metering roll-out.
Natural Capital	Stakeholders general support the work of Natural Capital and stressed the importance of recognising the economic value of the environment for the local economy.
Resilience	Stakeholders said they would like to see greater resilience measures on: <ul style="list-style-type: none"> • Flooding; • Drought; • Cost; • Climate change; • Population growth; • Environment; and • Supply.
Metering	Some stakeholders wanted mandatory metering to be introduced.
Leakage	Stakeholders supported continuing improvement to leakage detection and reducing leakage.
Water Trading	Water trading was only raised by Cumbrian stakeholders and they showed some support for water trading as long as UU customers were protected. They were also concerned on what impacts it might have on the resilience in Cumbria.
Windermere	Cumbrian stakeholders raised concerns that the drought permit at Windermere could have a seriously adverse impact on the economy of the Lake District.

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2.3.2 Drought Plan 2016-17 activities

During 2016 and 2017 we have been working to update our Drought Plan from the previous version published in 2014. These plan outlines our approach in managing water supplies to make sure there is always enough water available for nearly seven million customers and 200,000 businesses across the North West, even during drought conditions.

As part of revising the Drought Plan we investigated drought management options which include:

- Operational actions;
- Communication actions;
- Demand side actions (water efficiency campaigns, campaign for voluntary water use restraint, temporary use ban, drought order to ban non-essential use);
- Leakage control actions;
- Supply side actions (non-commissioned sources; tankering); and
- Drought permit/order actions.

A number of points or suggestions were raised by stakeholders, particularly relating to temporary use bans, drought orders and drought permits, which are covered more extensively in the Drought Plan 2017 which is available on our website here: <https://www.unitedutilities.com/drought-plan>.

A number of responses from stakeholders received during the Drought Plan consultation were more specifically related to the Water Resources Management Plan. Where these correspond to similar points raised in the Water Resources Management Plan pre-consultation, our responses are provided in Table 1 above. Any responses not captured in this table are addressed below.

Table 3 Summary of stakeholder responses to the Drought Plan

References refer to the relevant section of the main Water Resources Management Plan document unless otherwise stated.

Response from Friends of the Lake District	United Utilities response
Temporary use bans should be brought in at Trigger 3 to send messages to consumers that there is a potential issue, although we accept they save relatively little water.	<p>Our drought plan includes a campaign for voluntary water use restraint at trigger 3 with a temporary use ban at trigger 4. This approach will give the message that there is a potential issue before the temporary use ban comes into force.</p> <p>One of the strategic choices in this plan is to improve the level of service for drought permits. In Section 7.3 we outline our proposal to improve levels of service for drought permits to no more than 1 in 40 years on average (2.5% annual average risk) by 2025 following delivery of our first tranche of leakage reduction activities. This would ensure that temporary use bans are in place for longer prior to implementation of drought permits.</p>
Response from West Cumbria Rivers Trust	United Utilities response
United Utilities should provide increased advice and financial support to industry e.g. promotion of best practices, grants etc.	<p>Water retailers now also have the duty to work with non-household businesses to encourage efficient use of water. We will continue to work with retailers to share our experience in this area.</p> <p>This plan has ensured we can continue to meet future demand as set by economic growth aspirations from government. We have explored non-domestic demand by sectors in conjunction with Experian, an expert in this field.</p>
Response from Windermere Lake Cruises	United Utilities response

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<p>Welcome voluntary demand restrictions after crossing Trigger 3 but question their effectiveness. While such a proposal can only be beneficial, we wonder what research has been undertaken to ascertain whether there are more effective ways of managing demand, such as metering.</p>	<p>Currently there is no mechanism for compulsory metering in our area and this would be driven by government policy. We have engaged with third-parties to explore innovative demand management options (Section 5) and fully explored demand management options as part of building our preferred plan (Section 7).</p>
<p>Response from Windermere Lake User Forum</p> <p>Concerned that customers in the Integrated Resource Zone are not fully informed or aware of the implications of drawing water from Windermere at times of drought. Believe that the research questions used to establish what water users are willing to pay for their water are insufficient to fully inform those who are taking part. Is the true cost of supply and risk being explained and fully taken into account in this process? We recommend that research into pricing of water and charges to customers should ensure that consultees are fully informed and can demonstrate that they are aware of the social, economic and environmental impact of any proposed water resource management schemes before questions of charges are included into the consultation mechanism. Customers should understand both cost, impact and the wider value of what is being proposed across the network of catchment, collection, processing and delivery, otherwise it is like the phrase "asking Turkeys to vote for Christmas" which has no value in terms of data on which to base serious decisions.</p>	<p>United Utilities response</p> <p>During the development of this WRMP we have conducted new innovative research techniques such as the Programme Choice experiment and Immersive experience. These techniques look to better immerse customers in potential situations so that they can make fuller and more informed decisions on topics like drought resilience, levels of service and flooding.</p>
<p>Response from Lake District National Park</p> <p>Education of the public about where their water comes from and the impacts of using it on the landscape and environment of the Lake District National Park needs to be a key theme of the next Water Resources Management Plan.</p>	<p>United Utilities response</p> <p>We run an education programme aimed at primary and secondary school children to reach pupils at a young age to retain a lifelong appreciation that water is a precious resource which should be conserved, not wasted.</p> <p>We have held a number of consultation events for the WRMP and PR19 to inform customers and stakeholders about their water supply.</p>

2.3.3 Technical Stakeholder Group – March & July 2017

Two sessions have been conducted, March and July 2017, with representatives from a number of key external technical stakeholder groups. These groups were carried out in order to support the pre-consultation and consultation processes. These sessions included workshops conducted by DJS Research to engage the representatives in the key themes to be addressed in this water resources plan, as well as updates on plan development to raise awareness of the process.

The workshops included exercises to determine stakeholders’ opinions on the following:

- *Understanding stakeholders opinion on what United Utilities does;*
- *Stakeholder acceptability of levels of service on a range of water use restrictions; and*
- *Preferences for 14 water resource planning options to address both changes to levels in service and the supply-demand balance.*

The stakeholders that were invited to attend the events that originally volunteered were: Allerdale Borough Council, River Eden & District Fisheries Association, Friends of the Lakes, The Rivers Trust, National Farmers Union/Your-Voice, Confederation of British Industry, Environment Agency and the Federation of Small Businesses. Not all stakeholders attended both events.

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2.3.3.1 March 2017 event

The first technical stakeholder group event was held at our offices on 20 March 2017. The day began with a general question and answer session covering our approach to plan development. This included describing our approach to plan development and the key themes and influences on the plan.

The second half of the day included two interactive sessions. The first session was on option preferences and the second on metrics/measures for 'extended methods'.

In the Option Preferences session, representatives were given the following scenario:

'There is a deficit in the integrated zone and there is a need to make up a material or sizeable deficit. With the information provided (from customer focus group sessions), without cost information presented (as accounted for separately in options appraisal), what are the gross preferences?'

They were then asked to rank the 14 possible options for this scenario from best to worst (Figure 3).

Top Ranked Options

1. Reduce leakage further
2. Further promote & support water efficiency
3. Encouraging customers to have a meter
4. Recycle or re-use water directly
5. Recycle or re-use water indirectly
6. Transfer more water within the North West region
7. Increase the size of existing reservoirs
8. Store more water in a new reservoir
9. Transfer water from other regions
10. Take more water from under the ground
11. Take more water from rivers
12. More frequent temporary use bans (hosepipe bans)
13. More frequent Drought Permits
14. Take sea water via desalination

Bottom Ranked Options

Figure 3 Ranked options in the March Stakeholder event

In the metrics/measures for 'extended methods' session the representatives were asked to rank the metrics in the same way, however, they found this more difficult. Although stakeholders did not disagree with the metrics, they found it hard to rank them in order of priority and in some cases raised the importance of more accessible naming and explanation. Interactive exercises showed this type of approach was valuable for the next meeting and discussion.

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How does the March event relate to the Water Resources Management Plan 2019?

Similar to the pre-consultation, reducing leakage and further promoting water efficiency was a top priority for stakeholders. Stakeholders in this exercise were also wary about water trading, demonstrating a consistent theme to pre-consultation to be addressed in the plan.

Stakeholders were not keen to increase the frequency of any type of water use bans or drought permits as part of the options exercise. Taking water from the sea (desalination) was also adversely viewed.

2.3.3.2 July 2017 event

The second technical stakeholder group event was held in the Rheged Centre in Penrith on 31 July 2017. The day was split into further exploration of preferences and views in detail in the morning (through sessions run by DJS Research) and then in the afternoon we provided an update on the main themes of the plan via a presentation.

In this second event we invited DJS Research to carry out a focus group style interactive session in the morning, based on the experience of the previous meeting. The main objectives of this task were to gain views on the following:

- *What United Utilities does – members priorities of service;*
- *Currents levels of service for temporary use bans, non-essential use bans and drought permit;*
- *Acceptability of a number of levels of service for temporary use bans, non-essential use bans, drought permits and extreme droughts;*
- *Acceptability of choices for different demand management policies (i.e. various levels of leakage reduction over 25 years); and*
- *Preferences across the 14 water resources options.*

The session was split into four main parts based on the research objectives outlined in Table 4, in order to engage the stakeholders with each area under consideration. The results are outlined in Table 4 below.

Table 4 Summary of stakeholder quantitative research

Research objective	Stakeholders preferences
United Utilities role	The top four options chosen by stakeholders as areas they think we should be prioritising for improvement are: <ul style="list-style-type: none"> • Offering a reliable water service; • Protecting various water bodies; • Providing clean and safe drinking water; and • Providing a reliable wastewater service.
Leakage reduction	<ul style="list-style-type: none"> • The scale of leakage reduction was considered more important than the pace of leakage reduction; • Indicative bill impacts for an 18% leakage reduction (the highest from the choices offered) was considered acceptable by stakeholders, but we would need to communicate why there was an increase to the bill, stipulate it was not adding to profits and for environmental benefit; and • More generally needs to be done to encourage households to save water.
Acceptance of restrictions	<ul style="list-style-type: none"> • Temporary use bans of no more than 1 in 20 years (5% annual average risk) and 1 in 40 years (2.5% annual average risk) on average was considered most acceptable. The

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Research objective	Stakeholders preferences
	<p>work showed a drop in the acceptance once the frequency of temporary restrictions reduces beyond this due to stakeholders considering it important to keep water in the environment;</p> <ul style="list-style-type: none"> • Non-essential use bans of no more than 1 in 20 years (5% annual average risk) and 1 in 35 years (2.8% annual average risk) on average was considered the most acceptable, so very similar to temporary use bans as seen in customer research. Stakeholders saw more frequent (1 in 5 years (20% annual average risk) and 1 in 10 years (10% annual average risk)) non-essential use bans as much less acceptable and less frequent bans (1 in 60 years (1.7% annual average risk) and less) reasonably acceptable; • Stakeholders found more frequent (1 in 5 years (20% annual average risk) and 1 in 10 years (10% annual average risk)) drought permits unacceptable, but anything less than 1 in 20 years (5% annual average risk) was considered generally acceptable; and • The majority of extreme drought interventions were considered acceptable (similar to customer research, there was little distinction between different risk levels). However, less than 1 in 100 years (1% annual average risk) would not be acceptable and it was stipulated that these events should last for weeks not months.
Water resources options	<ul style="list-style-type: none"> • Reducing demand for water was generally preferred over new sources; • Stakeholders most favoured money being spent on reducing leakage further, encouraging customers to use meters and further promotion and support of water efficiency; and • Stakeholders least favoured money being spent on taking more water from rivers, desalination, storing water in new reservoirs, increasing existing reservoirs, transferring water from other regions and more frequent drought permits.

Following this exercise, we will seek to engage with members of the Technical Stakeholder Group to gain feedback on our Draft Water Resources Management Plan 2019 through the consultation period, building on their more detailed insight into development of the plan covered to date. Following the meeting we also circulated the customer programme choice experiment to all stakeholders in the technical group.

How does this July event relate to the Water Resources Management Plan 2019?

There was perhaps a better understanding of the effect of water restriction bans on the environment and the potential economic as well as environmental problems this might cause, than there necessarily is among customers. However, the stakeholders generally accepted the same or similar frequency of drought interventions as those chosen during our customers' research.

2.3.4 Engagement with local authorities and non-household retailers

We conducted individual meetings with 24 councils and local authorities between October 2016 and September 2017. Each meeting included a presentation by us on what the water resources management plan is and then discussed the potential impact on that individual council/local authority. A full list of the councils and local authorities can be found in Appendix B. The local authorities and councils also provided us with information on the forecasted property predictions in their area. This information was used to model future water resource scenarios. We have also sought engagement with non-household retailers in line with the Water Resources Planning Guidelines. Further information on this can be found in the *Draft WRMP19 Technical Report - Demand Forecasting*.

2.3.4.1 Engagement with other water companies or suppliers

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We have engaged with a wide range of water companies or licensed water suppliers, and not just those which are our neighbours. In addition to discussing transfer solutions and existing bulk supply contracts, we have been actively involved in a number of companies' stakeholder engagement programmes. This is explained further in *Draft WRMP19 Technical Report – Options identification*.

We also informed Water Resources South East (WRSE) and Water Resources East (WRE) of our overarching approach to WRMP19 development as part of stakeholder communications at pre-consultation, and were an active participant in the Water UK long-term water resources planning study that has been very influential to our plan development. We are actively working as part of the River Severn Working Group and are also a key participant in the recently inaugurated Water Resources North group.

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3. Customer engagement

3.1 How we conduct customer research

During AMP6 (the 2015-2020 business planning period), we have conducted a wide range of customer research, which has included surveys, focus groups, face to face interviews, an online interactive 'game' and immersive resilience research. This breadth of customer research ensures we do not rely on single surveys or traditional stated preference willingness to pay research, and instead we have enhanced our approach with new innovative techniques such as the Programme Choice 'game' we have developed. We have also established an online community panel, known as "WaterTalk", recruiting 7,300 customers from our region to take part. These customers, reflecting the regional demographics, are an important voice in our decision making. This online panel will become a more informed community over time, and will be able to provide a more educated input on customer concerns and priorities.

Section 3 provides a summary of all water resources relevant research.

3.1.1 Your-Voice

In September 2015 we established a new panel of representatives which succeeded the former Customer Challenge Group. This new panel is known as 'Your-Voice – customer and stakeholder panel'. The Your-Voice panel comprises an independent body of individuals from different sectors, backgrounds and with different areas of expertise. This helps us to ensure that customers are at the heart of the company's business planning engagement.

The expertise embodied in the panel ranges from Citizen's Advice to the Confederation of British Industry and from environmental organisations to public health. Your-Voice is integral to monitoring, assuring and reporting on the delivery of our commitments to customers and other stakeholders. It also looks at how company research can continue to capture and strengthen the views of its customers, ensuring that customer views influence and shape our plans. The Your-Voice panel's main objective is to help us reflect on what type of consumer representation is needed and how this relates to the company's existing governance arrangement.

To this end, we have involved Your-Voice in our engagement approach, which has proven useful and we have used this engagement to refine our approach. Any such engagement we have is also supported by providing copies of draft material to the Environment Agency as well.

3.1.2 Customer Panels

Verve, a company offering community panel expertise, was commissioned to build an online customer community for discussing various business topics to help develop our understanding of customer beliefs, opinions and behaviours towards us and our operations. This online platform has been called the United Utilities WaterTalk panel and has recruited 7,300 members to date. It allows us to approach a broad range of individuals and groups of customers from across our North West region and invite them to participate in a range of qualitative and quantitative studies through surveys, interviews, pop-up communities and workshops to gain an insight into customers' opinions and needs. The online platform interface means that customers can respond to questions at a time that suits them and allows multiple studies to be conducted at the same time in more up-to-date and modern formats. This approach is designed to supplement, rather than replace other forms of customer engagement or survey methods.

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3.1.3 Innovation

Throughout this WRMP19 we have tried to engage customers in a more innovative manner than in previous planning rounds, pledging to move away from industry reliance on traditional willingness-to-pay surveys. We have done this through the quantitative work we have carried out with customers to engage them on drought risk (Section 3.3.6 and 3.3.7) and using alternative methods to test acceptability (Gabor Granger, Section 3.3.6). On top of this we have also created two new techniques in order to reach out and involve customers: Programme Choice – our interactive game and Immersive Resilience research. These are outlined further in Sections 3.3.7 and 3.3.8.

3.2 Previous work in Water Resource Management Plan 2015

Engagement in the previous 2015 Water Resource Management Plan both sets the scene and context for the development of the 2019 Water Resources Management Plan, whilst also allowing us to understand where there are continuing consistent, or changing themes to account for in developing the latest plan. Table 5 summarises the work that was carried out as part of the water resources management plan 2015 customer research.

Table 5 Water Resource Management Plan 2015

Date of Research	Research carried out	Outcomes of research
2012/2013	Customer preference survey	Preferred option for customers included reducing leakage and increasing water efficiency. When financial and environmental costs were considered, the majority of customers wanted to keep their bills the same or reduce them by accepting more frequent water use restrictions.
January 2013	Stage 1: willingness-to-pay survey	Customers were asked how they feel about the current level of water use restrictions. Customers do not value fewer water use restrictions and were not willing to pay higher bills for the frequency of water use restrictions to be reduced. They also do not want to see a deterioration in level of service i.e. more frequent water use restrictions.
August 2013	Stage 2: willingness-to-pay survey	This survey asked customers to consider environmental, recreational and economic impacts of drought permits and non-essential use bans. It was concluded from both the stage 1 and stage 2 studies that customers support maintaining the existing hosepipe ban frequency of no more than 1 in 20 years (5% annual average risk), however, they would be more willing to pay for a reduction in the frequency of drought permits.
June to August 2013	Acceptability testing	Customers were asked to consider the overall acceptability of the package of service levels and the bills that they will pay. This helps inform United Utilities business plan. The research included the proposals to maintain the supply demand balance in West Cumbria and the proposed approach to leakage control (maintain target level only). These proposals were acceptable to 75% of the customers asked. It found affordability was a very significant factor in determining whether proposals were acceptable to customers.
August 2013	Customer focus groups	Focus groups were commissioned in West Cumbria to gather views from customers on the alternatives for their future water supply (as the central question in the last planning round). Six focus groups were held covering the different socio-economic groups of domestic customers and two focus groups were held with business customers. The customers generally agreed that the freshwater mussels in Ennerdale should be protected and that alternative water sources should be found. Some are not so concerned about the mussels and questions whether we need to stop taking water from Ennerdale at all. The groups were then presented with the three alternative options devised by United Utilities to supply West Cumbria once abstraction from Ennerdale ceases. The most popular option was the building of a new pipeline from Thirlmere reservoir.

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3.3 What customer research have we conducted?

3.3.1 Water efficiency: Customer behaviour change study – March 2016

We have on-going water efficiency studies being carried out in order to establish how customers value water efficiency measures and to inform our approach to this area of demand management. Of particular interest to the WRMP19 is the water efficiency behaviours and perceptions study carried out in March 2016 by Corporate Culture. This study was conducted with 1300 customers and sought to better understand customer motivations and barriers to metering/water efficiency. The study highlighted a need for positive communications and a need to overcome a potential suspicion of the drivers for water companies in meter promotion. There was relatively low customer recollection of water efficiency campaigns or an awareness of free meters. Bill saving is still the primary motivator for water metering, but the research did show how different groups of customers (i.e. customers in Merseyside or different age groups) may respond to alternative messaging. There were recommendations to adopt a trial and feedback approach moving forward and a draft strategy has been developed using this.

3.3.2 Business Plan: Customer priorities research – June 2016

Research was conducted by Box Clever in June 2016 to support considerations for the five year business planning period 2020 to 2025. The remit of this research was to:

“Explore customer priorities in relation to water service provision within the North West to identify a clear hierarchy of what is core and where energies and investment may be focused in future”

A final report was received in November 2016. The research was conducted in two stages:

- Stage 1: qualitative exploration and understanding. This included face to face interviews and focus groups which included capturing vox-pops (comments); and
- Stage 2: quantitative communications testing & channel evaluation. This included 3,340 online surveys.

Each stage in the research was concerned with establishing the overall priorities of customers, their willingness to pay and highlight any future challenges. Clear priorities identified during this research were:

- Safe, clean drinking water; and
- Reliable water supply.

Other key priorities were:

- Preventing homes from flooding;
- Preventing accidental pollution; and
- Reducing level of leakage/responding quickly to reported leaks.

A number of key future challenges were identified:

- Reducing water wastages and leaks;
- Ensuring appropriate plans are in place to service a growing population and cope with climate change; and
- Putting preventative measures in place that guard against water quality issues.

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Furthermore, when presented with the 10 future issues and challenges, water trading ranked nine out of 10 as something we should be focussing on, with only 45% of people rating this as an important issue. However, to some degree this may be expected, as customers are likely to prioritise direct elements of service or challenge to those that primarily support wider national need. This research also found that two-thirds of customers feel that the current bill amounts are reasonable. However, three in 10 customers feel the bill amount is unreasonable. Affordability was a key factor and there was little significant indicative willingness to pay for additional service.

How does this Business Planning research relate to the Water Resources Management Plan 2019?

The plan is concerned with providing reliable sources of water and therefore understanding that this is particularly important to customers in the wider sense as well as during our more detailed research is useful. It was also important for us to see that leakage reductions are seen also as a relative priority.

3.3.3 WRMP19 customer preferences: Phase 1 qualitative focus groups – September 2016

We worked with DJS Research to carry out both qualitative and quantitative research into customers' thoughts on the forthcoming WRMP. This section describes Phase 1, to conduct qualitative focus group research. Phase 2 was a quantitative stage of research, which included a contingent valuation willingness to pay assessment. The quantitative research provides a more statistically robust report of household and non-household customers across Cumbria and the Integrated Resource Zone and this is further detailed in Section 3.3.6. However, initial focus group research allows for a broader coverage of issues, and may also be used to inform later phases of work. The overarching objective of the qualitative research was:

This research was conducted in September 2016, and included seven focus groups with domestic customers and 15 face to face depth interviews (five vulnerable customers and 10 non-household customers). For the focus groups a mixture of socio-economic-geographic, age and metered/unmetered customers were included. A summary of the results is in Table 6.

Table 6 Summary of the qualitative research carried out by DJS Research

Research objective	Household customers	Non-household customers
The role of United Utilities and priorities towards water management	<p>In general customers had a good understanding of the role of United Utilities has and the list below summarises the main activities customers believe United Utilities carry out:</p> <ul style="list-style-type: none"> • Maintenance of water utilities; • Providing clean water; • Providing clear water; and • Removal of waste water. <p>However, customers did think that further education is required for customers to understand what they are getting for their money.</p>	
Attitudes towards water saving and customer metering	<ul style="list-style-type: none"> • Attitudes in domestic groups differed across a number of different areas: age, family and affordability (cost consciousness); and • Large differences in attitude between metered and un-metered customers. 	<ul style="list-style-type: none"> • Non-household customers attitudes differed depending on their type of business; and • Potential future actions: incentive tariffs, bonus monetary reductions if there is a reduction in use, one off financial saving if households agree to have a water saving kit or meter fitted.
Interruptions to supply and service expectations	<ul style="list-style-type: none"> • Shorter more frequent interruptions to level of service were favoured over longer, lengthier ones by all types of customers; 	

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Research objective	Household customers	Non-household customers
	<ul style="list-style-type: none"> Few issues with restrictions applying to temporary use bans, many favoured an increase in frequency if it resulted in a lower water bill. Temporary use bans apply to domestic (household) customers only; Non-essential use bans were seen in a similar view to temporary use bans by both domestic and non-household customers; and Drought permits were again viewed in a similar vein to temporary use bans and non-essential use bans, i.e. fine if the intervention is justified. However, some expressed a concern that it was an extreme measure and should be used only after water use restrictions. 	
Water supply/demand management options	<ul style="list-style-type: none"> Initially participants favoured: desalination, reservoir storage, leakage reductions and water efficiency products; After cost, environmental impact and reliability were accounted for they favoured: leakage reductions, water efficiency measures, reservoir storage and groundwater abstraction; and Whilst the reliability criteria are quite subjective, and thus this wasn't included in latter areas of research, the exercise did show reliability to be the dominant attribute in options choice based on the alteration of choices during the exercise. 	
Water trading	<ul style="list-style-type: none"> The main concerns raised when asked about water trading were that the North West should not suffer as a consequence of it and safeguards should be put in place; Water quality should not suffer in the North West; and There were some concerns over the potential costs and environmental impact. 	

How does this Phase 1 research relate to the Water Resources Management Plan 2019?

The qualitative stage of research is used to inform the direction in which to focus the quantitative research. This research showed that customers generally had a good sense of what role United Utilities fulfil for them. This research highlighted that cost of services was important to customers, something that was not necessarily so important to stakeholders. The reliability of services was also a key concern for customers, above cost and environment.

3.3.4 Quantitative leakage survey – June 2017

In June 2017 Verve carried out a quantitative Water Talk research report to find out:

Are customers willing to pay to help reduce water leakage?

Conducted as part of the planning process for the business plan and water resources management plan 2019, a survey was conducted to collect feedback from our customer panel on opinions about leakage that we can ensure are taken account of when decisions are made. The survey was conducted with 3,261 Water Talk members from 2 – 9 June 2017. The collected data was weighted by age, gender and region to be demographically representative of the customer base.

The research set out to answer the following questions:

- Do customers think that leakage reduction is an important issue?;*
- Are customers willing to pay extra to support the reduction of leakages, and if so, how much?; and*
- What impact will addressing leakages have on United Utilities' brand perceptions?*

It was found that customers believe leakage reduction is important, ranking 4th out of eight priorities, behind 'providing safe, clean drinking water', 'providing a reliable water service' and 'providing a reliable wastewater service'. Nine out of ten participants, and particularly older

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participants, believe that it's important for us to work to reduce leaks. Many see that reducing leakage will not only prevent water wastage, but also contribute to lower water bills (although in reality this may not be the case).

Many respondents (80%) would pay an extra 20p on top of their annual bill to help us meet leakage targets, of reducing leakage by 40 million litres, by 2030, whilst 61% would be willing to pay an extra £1 per year. Reducing leakage by 80 million litres by 2040, a greater reduction target, is supported by 68% of people surveyed, saying they would be willing to pay £1.80 to support this goal. Both these bill increases are supported more by females, under 35s and higher earners.

The more customers know about leakage and how we are working to improve it, the more our brand perception improves. Further promotion of our efforts in this area, particularly on preventing water wastage and the ensuing environmental benefits would have a positive brand impact.

How does this leakage survey relate to the Water Resources Management Plan 2019?

Customers believe leakage to be an important priority for us and are willing to pay more to reduce leakage further. We have considered several leakage reduction options in this plan and considered the outcomes from this research alongside our other engagement in our preferred plan.

3.3.5 Business Plan: Quantitative service valuation (willingness to pay survey) – June 2017

As part of the five-yearly business planning process, a quantitative service valuation (willingness to pay survey) is conducted with customers to gauge their opinions on how they value different elements of service. By understanding how customers value services and how much they are willing to pay we can ensure that we are tailoring our plan to best fulfil these views and needs.

This survey also assesses the importance customers place on different aspects of our service and what they might be willing to see decrease or increase and how much they would be willing to see their bill increased for this to happen. However, the survey conducted on behalf of business planning does not include several aspects that are key to the Water Resources Management Plan such as questions on level of service, water trading and supply/demand balance options. This is due to time limitations on the survey length which resulted in us not being able to go into specific sub-topics in detail. Therefore we also conducted a Water Resource specific willingness to pay survey which is outlined below in Section 3.3.6.

The overall outcome of the business plan service valuation survey was the following:

- On average household customers were willing to see their annual bill increase by 6.2%;
- However, vulnerable household customers were only willing to see a 0.3% increase;
- Annual bill level was the largest driver for household choices of how we might alter our service;
- Safe clean drinking water, cleanliness of our rivers and lakes and cleanliness of the sea and lakes for swimming were the top three service attributes that drove household customer choices; and
- Customers highly valued supply resilience based on short-term supply interruptions.

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These outcomes have been used to inform our business plan and are therefore still subject to acceptability testing with customers in winter 2017. These tests will inform the final Water Resource Management Plan, including a component on leakage management. This research only assessed customers opinions on shorter-term supply interruptions, for information on customers' valuation of long-term interruptions see Section 3.3.7 on immersive research.

How does this Business Plan quantitative survey relate to the Water Resources Management Plan 2019?

The business plan is a much broader look at customer preferences for the future. However, there are certain aspects that also relate to the water resource management plan such as resilience work.

3.3.6 WRMP19 customer preferences: Phase 2 quantitative research – June 2017

The overarching objective of the quantitative research was:

Willingness to pay exercises were included in this quantitative research, but it also used a Gabor Granger⁴ acceptability exercise to compare results and gain a greater understanding. Furthermore, it tested views on severe and extreme drought resilience for the first time.

This research was conducted with 595 face to face CAPI interviews, 302 business interviews, 266 online panel surveys and 36 face to face CAPI interviews (in Cumbria). It was ensured that a mixture of socio-economic-geographic, age and metered/unmetered household customers were approached. It was also ensured that a range of businesses in different sectors with different needs, water consumptions, geographic regions and water uses were all targeted.

The research was split into four sections: Measuring attitudes towards the environment, Levels of Service – Acceptability, Levels of Service – Willingness to Pay and Priorities for Future Investment. The results for each sections are outlined below.

3.3.6.1 *Measuring attitudes towards the environment*

The results below show the top three priorities of household customers in their attitudes towards water saving:

- 92% of customers prioritised protecting lakes, rivers, reservoirs, fish and other aquatic plants and wildlife;
- 81% thought that they make a conscious effort to save water; and
- 75% say they are happy to restrict their water usage to protect species.

Whilst for non-household customers the following summarises their attitudes towards water saving:

- 66% think that their business makes a conscious effort to save water;
- 65% believe that if United Utilities did not issue hosepipe bans when water supplies are low

*To **measure** customers' preferences for water resources, levels of service and the options or plans that United Utilities might create to address any changes to levels in service or to address a supply-demand deficit.*

we could end up with no water coming out of our taps; and

⁴ This has been completed using a technique called 'Gabor Granger' analysis

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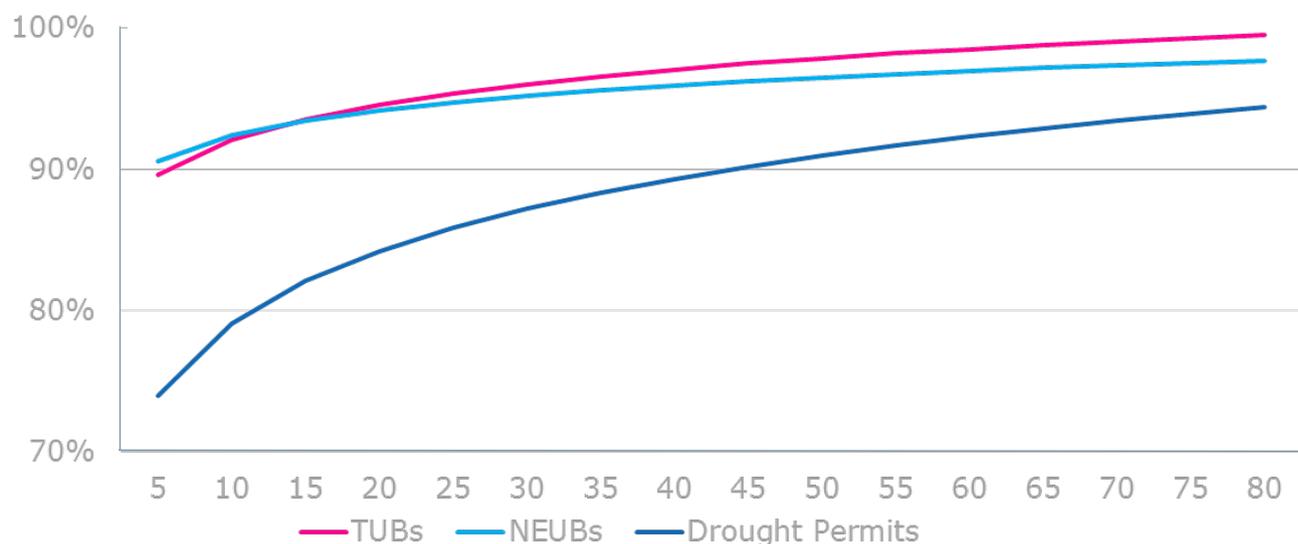
- 58% think that protecting lakes, rivers, reservoirs, fish and other aquatic plants and wildlife is really important to my business.

3.3.6.2 Levels of service – acceptability

A Gabor Granger exercise was used to assess customers’ attitudes towards level of service. The Gabor Granger exercise allows customers to express their views about the frequency that they might experience water supply restrictions and how acceptable they find these restrictions.

Figure 4 shows the household views from the Gabor Granger exercise towards levels of service and Figure 5 shows the household views to extreme events. In Figure 4 there is little distinction between the temporary use ban and non-essential use ban curve showing a very similar level of acceptability amongst household customers. Drought permits have a lower acceptance and have a much higher level of reaction to change in frequency which shows a higher level of elasticity.

There are no significant differences between the metered and unmetered households.



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Figure 4 Gabor Granger exercise: Household views of level of service

Household views to extreme events change very little throughout the various risk levels. It may be that due to the very small chance of it actually happening in a lifetime, respondents felt they could not judge the subtle differences between the various risk levels.

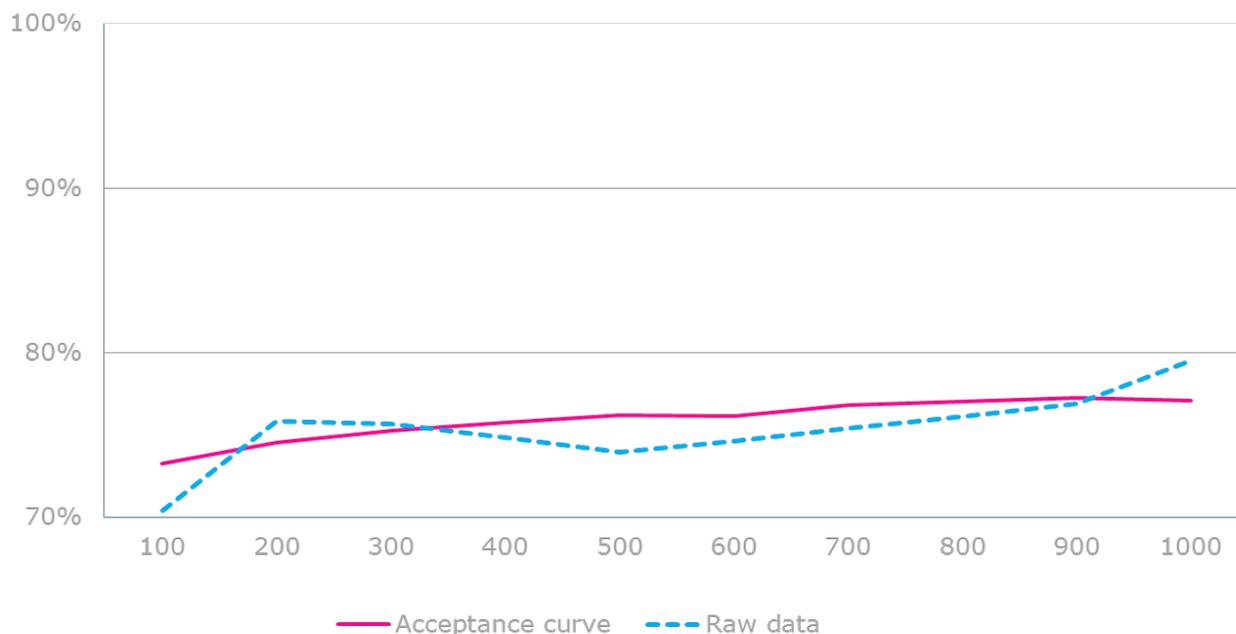


Figure 5 Gabor Granger exercise: Household views to extreme events

Figure 6 and Figure 7 show the Gabor Granger curves for business customers. Figure 6 shows that there is little change in acceptance of the various levels of risk for temporary use bans and non-essentials use bans. Figure 7 shows that there is less acceptance of drought permits, particularly in higher risk scenarios (between 1 in 5 years (20% annual average risk) to 1 in 25 years (4% annual average risk)).

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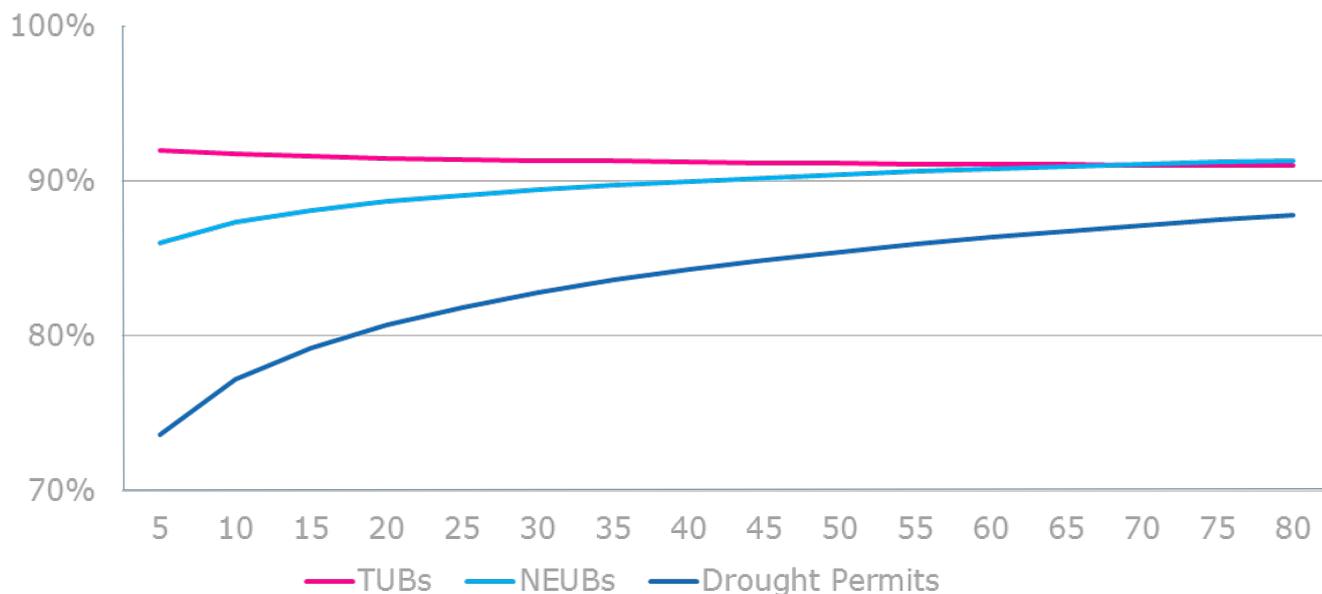


Figure 6 Gabor Granger exercise: Business customers' views

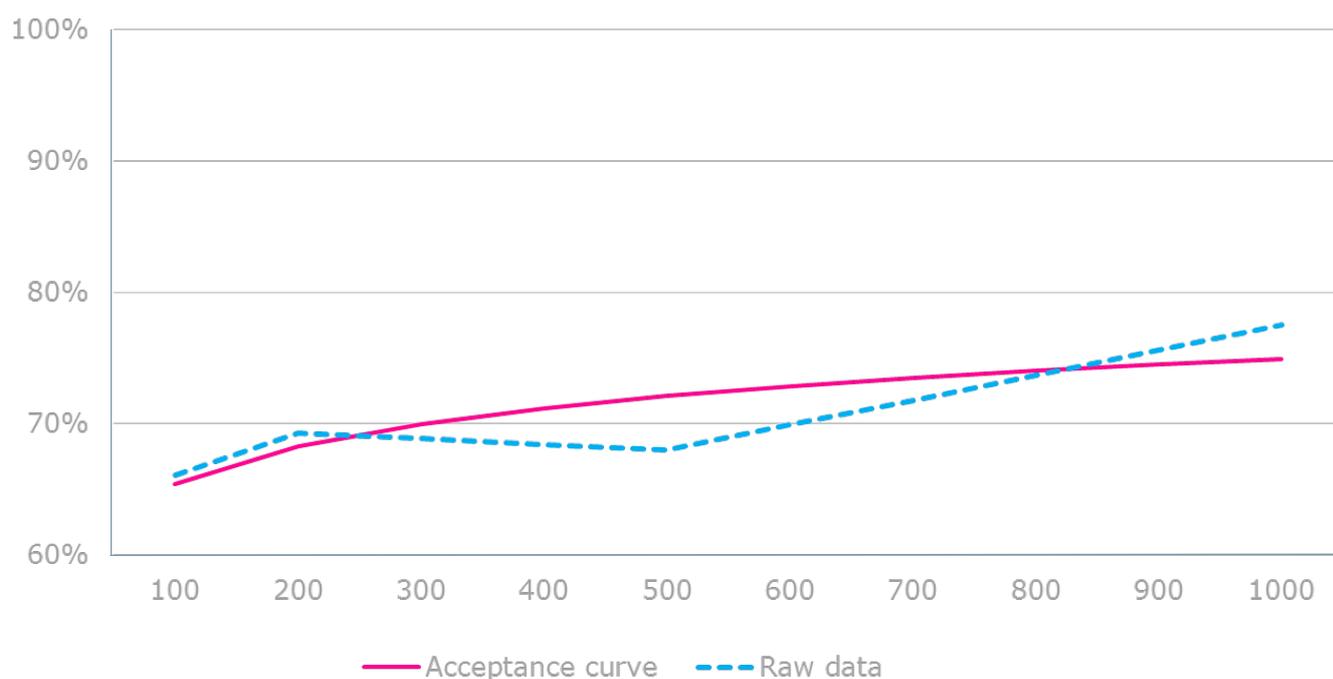


Figure 7 Gabor Granger exercise: Business customers' views on extreme events

In an extreme drought scenario 43% of household customers and 23% of business customers believed they could not tolerate an extreme drought scenario for more than one week. Tolerance of customers to extreme droughts decreased for the longer time periods, with only 12% of household customers and 13% of business customers saying they could tolerate an extreme drought scenario for three months.

3.3.6.3 Levels of Service – willingness to pay

Generally household customers were willing to pay for the following:

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- The willingness to pay estimate for temporary use bans is £4.26; this increases to £7.39 for those who expressed a desire for service improvement;
- The willingness to pay estimate for drought permits is £4.35; this increases to £8.57 for those who expressed a desire for service improvement;
- The willingness to accept (to avoid deterioration) estimate for temporary use bans is £6.22; this increases to £6.98 for those who expressed a desire for decrease in service; and
- The willingness to accept estimate for Drought Permits is £6.78; this increases to £8.31 for those who expressed a desire for decrease in service.

Whilst business customers expressed a willingness to pay for the following:

- The willingness to pay estimate for temporary use bans is 2.7%; this increases to 4.2% for those who expressed a desire for service improvement;
- The willingness to pay estimate for Drought Permits is 2.8%; this increases to 4.6% for those who expressed a desire for service improvement;
- The willingness to accept (to avoid deterioration) estimate for temporary use bans is 2.9%; this increases to 3.8% for those who expressed a desire for a decrease in service; and
- The willingness to accept estimate for Drought Permits is 2.8%; this increases to 3.2% for those who expressed a desire for decrease in service.

It should be noted that the valuations provided here are only one element of work to capture customer willingness to pay. Section 3.3.8 describes our programme choice experiment, which we subsequently have used as the primary method for customer valuations, and which has also been combined with this more traditional willingness to pay research as described in Section 3.4.

3.3.6.4 Priorities for investment – water supply options

The last part of the quantitative research looked to the future and what customers wanted to see us invest in. It should be noted that the preferences given by customers did not take account of cost per unit saving in the exercise, but rather sought to understand ‘raw’ views on the type of option (recognising that the link between cost and option size is often not linear even within an option type). This is consistent with our approach in the last plan, and also recognised that cost would explicitly be tested in the programme choice experiment, allowing a comparison of views. The top three things household customers wanted to see investment in are:

- Reduce leakage further;
- Further promote and support water efficiency; and
- Take sea water via “desalination”.

Whilst the top three things business customers wanted to see investment in are:

- Reduce leakage further;
- Take sea water via “desalination”; and
- Encouraging customers to use meters.

Whilst the support for demand management is consistent with views of stakeholders, it is noteworthy that desalination results in opposing views.

3.3.6.5 Overview

Table 7 below summarises the support shown by both household and non-household customers for different improvement options.

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Table 7 Summary of customer preferences for options

Improvement	Household	Non-Household
BASE CASE TUBs	1.000	1.000
1. River abstraction	1.000	2.726
2. Desalination	4.163	4.645
3. New reservoir	3.259	2.048
4. Increase existing reservoirs	2.654	2.303
5. Transfer (outside North West)	1.000	1.000
6. Transfer (within North West)	1.719	1.000
7. Metering	3.070	3.282
8. Efficiency	5.180	2.675
9. Recycle direct	2.173	1.863
10. Recycle indirect	1.443	1.960
11. Leakage	10.115	5.692
12. Underground	1.495	1.000
14. Drought Permits	0.446	0.600

Generally leakage and water efficiency options were supported over other options. This is reflected in further in the *'Draft Technical Report – Options appraisal'*.

How does this WRMP Phase 2 research relate to the WRMP19?

The Gabor Granger work on level of service shows that customers are happy with the level of service for water use restrictions and would generally support a decrease to this service. Part of this water resource management plan is looking to move from a level of service of no more than once every 20 years (5% annual average risk) on average to a 1 in 40 year (2.5% annual average risk) on average service. This research suggests that this would be supported by most customers.

Similar to previous customer research, customers wanted to see a reduction in leakage and promoting water efficiency as priorities for future investment. Several options relating to these issues were included within our options appraisal. Non-household customers also showed a preference for taking water via 'desalination' as a potential future option, this is the opposite view to that expressed by stakeholders.

3.3.7 Immersive experience – July 2017

One of the problems that we have encountered when trying to understand customers attitudes to loss of service is that customers have very little experience of having no water or in other words low likelihood, but high consequence events, and so find it hard to make economic decisions about such events. In order to overcome this issue we employed the research company, Frontier Economics, to create an immersive experience for customers, the first research in the water industry to roleplay with customers the consequence of a service failure. This immersive experience was designed to specifically target the idea of resilience amongst customers, a key theme for the Water Resource Management Plan. The workshop was carried out on the 18 and 19 July 2017. This immersive experience was split into two separate workshops that were run concurrently:

1. *Long-term supply interruptions – resilience*
2. *Ecosystem services – River Irwell a case study*

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These topics were thought to best encompass all aspects of the questions we are looking to ask our customers. Each workshop was an hour and a half long and we recruited 100 participants for each one. Figure 8 shows how each workshop was set up.

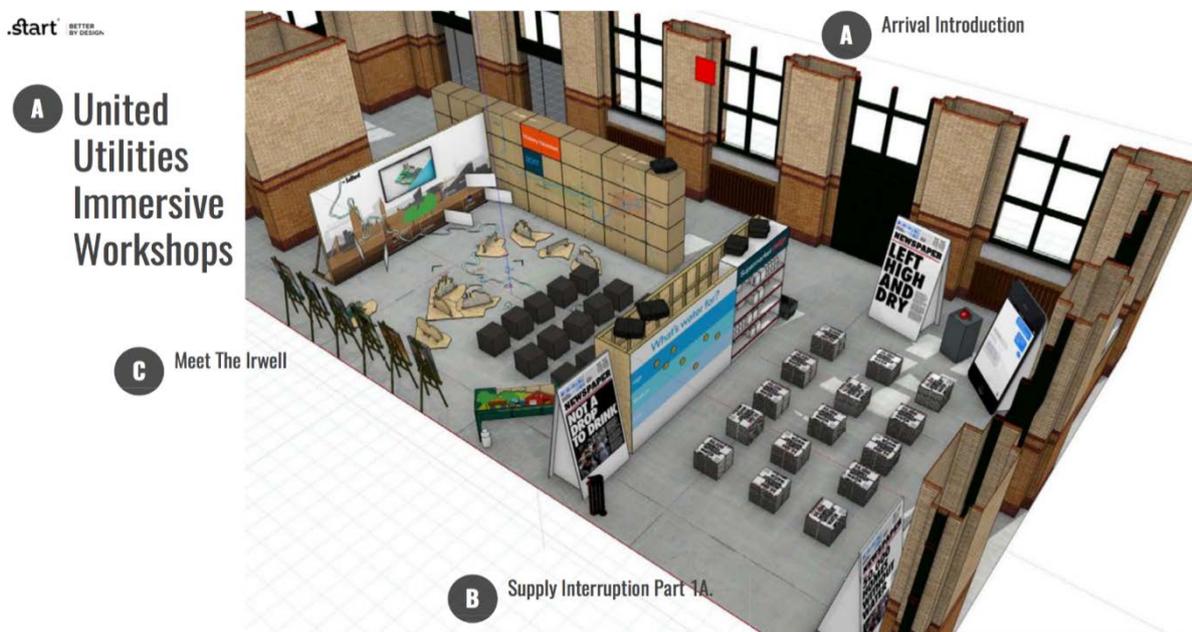


Figure 8 A schematic diagram of the Immersive workshop set up

3.3.7.1 Long-term supply interruptions

In the first workshop we were interested in collecting customer valuations on long-term supply interruptions including compensation and willingness to pay, and test impact of cause of interruption on willingness to pay. This exercise is useful to understand resilience value irrespective of the cause.

The first exercise in this workshop was a customer experience, which explored the following questions:

- What would it feel like if you had a long term supply interruption?;
- What would happen?; and
- What would you do?

Participants were asked to keep a record of their feelings and valuations in an ‘emoji diary’ throughout the workshop.

More than half of participants were prepared to pay something to improve service on interruptions. The table below summarises the amount customers were willing to pay to reduce the risk of a supply interruption.

Table 8 Amount customers were willing to pay to reduce the risk of supply interruption. Table taken from Frontier Economics report.

Service level	WTP (per HH per year)
Reducing the risk of a 3 day supply interruption to a negligible level for 1 m people	£3.00

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Service level	WTP (per HH per year)
Reducing the risk of a 3 day supply interruption to a negligible level for 2 m people	£3.21
Reducing the risk of a 3 day supply interruption to a negligible level for 2.1 m people	£3.76

Figure 9 shows the breakdown of how long participants said they would be able to manage without water.

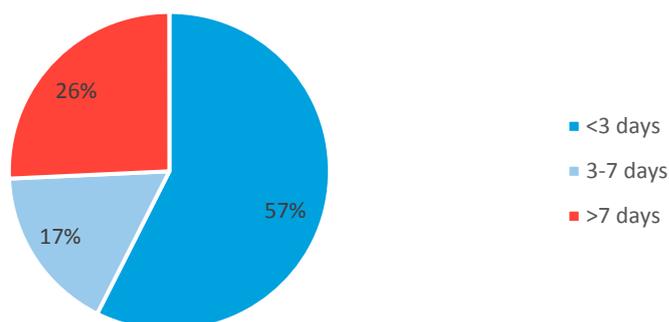


Figure 9 How long customers believe they can last without water.

Before the immersive experience, participants ranked supply interruptions as the 5th most important service out of seven, and then 4th average out of seven after the event (summarised in Table 9 below).

Table 9 Table taken from Frontier Economics Immersive Research report

Service attribute	Pre-immersion average ranking	Post-immersion average ranking	Rank change
Safe, clean drinking water	2.07	2.02	-0.04
Avoid bad taste / smell in water	3.35	3.32	-0.02
Avoid discoloured water	3.93	3.88	-0.05
Avoid supply interruptions of longer than one day	5.02	3.96	-1.06
Avoid sewer flooding (people's homes)	3.68	4.07	0.39
Avoid sewer flooding (people's gardens)	4.82	5.28	0.47
Clean sea and lakes for swimming	5.14	5.47	0.33

Before the immersive experience, participants on average thought they used around 60 L/day of water and after the workshop on average said they thought they used around 130 L/day.

3.3.7.2 Ecosystem services

In the second workshop we were interested in collecting customer valuations on five ecosystem services. This is used to inform our wider Business Planning process, but interfaces with relevant themes in the Water Resources Management Plan. Table 10 summarises customer ecosystem improvement preferences.

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Table 10 Summary of customer ecosystem preferences

Ecosystem service	Service level	WTP (per HH per year)
Green spaces for recreation	40 projects, including 13 big sites	£0.17
A healthy river to support wildlife	228 km more of improved rivers	£1.83
Visual appearance of rivers	200 km more of improved rivers	£1.20
Safety of river for recreational use	62 km more of improved rivers	£0.11
Biodiversity	41 projects on UU land and 25 other projects	£0.12

86% of participants opted to buy at least one service improvement, 55% bought three or more service improvements, and 20% bought service improvements on all five ecosystem services. Mean spend across all five ecosystem services was £3.43 per household per year. Green spaces for recreation and a healthy river to support wildlife were the most popular services. Some ecosystem services were ranked more highly after the workshop than before, while others were ranked lower after the workshops.

Further research has been carried out as part of the business as usual data mining, however, the leakage and supply interruptions data was considered the most relevant to the WRMP19.

How does immersive research relate to the WRMP19?

One of the aims of this planning round was to use methods other than traditional willingness to pay surveys. Therefore this immersive research is part of our research that we have conducted to branch out from the traditional surveys and incorporate more customer facing research into the plan. It clearly indicates the tangible value that customers place on avoiding long-term supply interruptions and protecting the environment.

3.3.8 Programme Choice – September 2017

In order to engage with customers to ensure our investments and activities reflect customer priorities an innovative interactive 'game' was designed. This 'game' was released to our customer panel in September and data gathered from users' choices was then analysed and a summary of this analysis is presented Table 11. The results in Table 11 are based on 866 replies as received by the 12 September 2017. The 'game' will remain active for users to participate in indefinitely, however, the results we have are based on the replies we received up until the 12 September 2017. Figures

Table 11 Summary of results as of the 12/09/2017

Theme	Outcome
Leakage	<ul style="list-style-type: none"> Willingness to pay for leakage reduction of 44 MI/d, on average (based on preference over supply schemes); and No preference for reducing visible leakage over non-visible.
Level of service: Temporary use bans (Hosepipe bans) & Drought Permits	<ul style="list-style-type: none"> Only 14% of customers wanted less frequent temporary use (hosepipe) bans; Average choice 1 in 13 years (7.7% annual average risk) on average for temporary use bans; and Slight preference for less frequent drought permits (1 in 24 years on average (4.2% annual average risk)).
Water efficiency	<ul style="list-style-type: none"> Most customers chose some water efficiency measures; and No expensive schemes included so not possible to say whether it would be chosen over schemes to increase supply capacity.

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Metering	<ul style="list-style-type: none"> 75% metering chosen on average; and 14% of customers chose no increase.
Supply options	<ul style="list-style-type: none"> Customers chose more water from reservoirs and boreholes and less from rivers, despite higher costs.

A summary of the answers to the introductory screens of this game are in Table 12. The range was from -ve 50 to +ve 50.

Table 12 Summary of results from introductory slides

	Bill vs environment	Reduce leakage despite costs vs no change in leakage	Hosepipe bans vs environment	Less water vs enough for what I want to use
Average scores	+1.6 (protect environment)	-21.3 (reduce leakage)	-22.8 (protect environment)	-23.7 (use less water)
Median score	+2	-23	-28	-28

Figure 10 shows a screenshot of the interactive slider screen used by users of the Programme Choice interactive ‘game’ to decide how to balance their water supply-demand balance. Each slider represents a different input or output that must be accounted for in this balance and describes to the users the amount of change they would see when they adjust the slider.

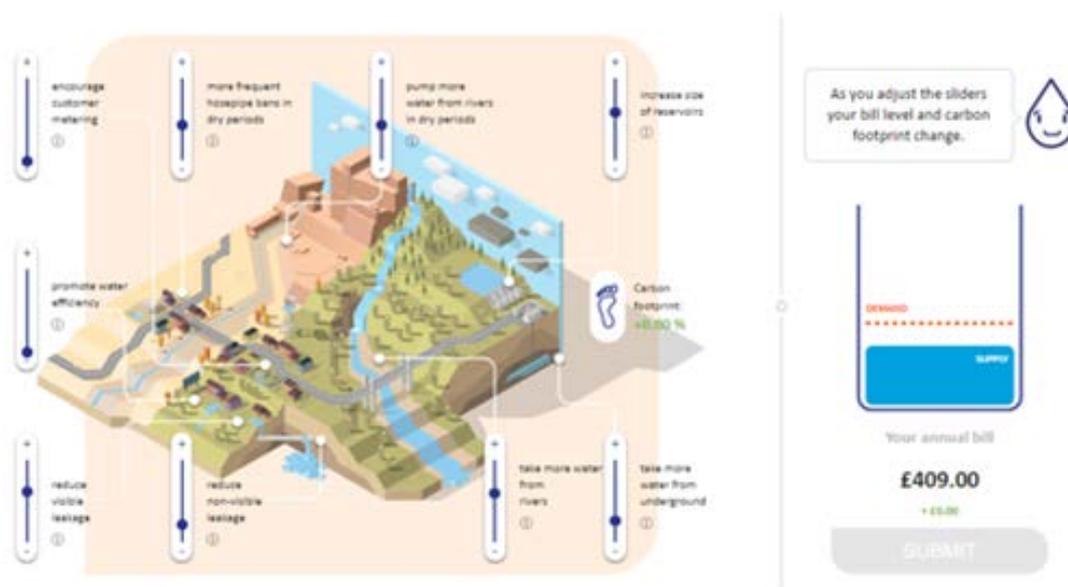


Figure 10 Screenshot of slider screen used in Programme Choice interactive game

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How does the Programme Choice research relate to the WRMP19?

One of the aims of this planning round was to use methods other than traditional willingness to pay surveys. Therefore this Programme Choice experiment is part of our research that we have conducted to branch out from the traditional surveys and incorporate more customer facing research into the plan.

The research shows that customers are willing to pay for a leakage reduction, but that there is no strong opinion to invest to alter the current level of service. Many customers chose an increase in metering and some water efficiency schemes as well. Reservoirs and boreholes are preferred supply schemes over river abstraction, despite higher costs.

3.3.9 “Business as usual” data sources – data mining

Continuously, throughout the year we are collecting, collating and analysing existing customer data, to investigate customer views and strength of opinion in certain areas. In some cases, this has shown that outside of drought, some water resources issues such water use restrictions feature little in customer interactions (by their inherent nature, these occur less frequently than other areas of customer contact), demonstrating the need for specific customer engagement in this area as part of developing the plan.

As part of this ‘analysis’ we collected primary customer contact data (from inbound calls, Live Chat conversations, Member of Parliament (MP) enquiries, Twitter and written complaints), and secondary customer contact data from customer satisfaction surveys (CSAT), Rant & Rave and service incentive mechanism (SIM) surveys to understand how customers rate our performance. This secondary data has not been included in these sections, but can be found in the appendices related to each of the themes.

The data analysed was collected from the April of the financial year 2014 to January of 2017, except hosepipe ban data which relates solely to 2010. Collection of this data provides us with a holistic understanding of trends in customer contact volumes and reasons for contact.

This data has been analysed and the most pertinent data to the WRMP relates to leakage, supply interruptions and the 2010 hosepipe ban. Table 13 summarises the number of customer contacts for each data type.

Table 13 Summary of customer contacts

Data type	Number of customer contacts
2010 Hosepipe Ban	4,130
Leakage	141,570
Supply Interruptions	219,667

To date, no data on customer responses pertaining to hosepipe bans (apart from the 2010 ban) and droughts has been collected or found. Some data relating to this from pre-2010 was collected previously, however the lack of recent data highlights the challenge in engaging on low likelihood events that occur infrequently.

3.3.9.1 2010 hosepipe ban

On the 9 July 2010 United Utilities imposed a ban on the use of hosepipes across a large section of the north-west of England. The ban was in place until the 19 August 2010, 42 days after it was initially implemented. The ban applied to the majority of residents and business in the Integrated

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Zone. The Integrated zone includes Cheshire, Greater Manchester, Lancashire, Merseyside and a third of Cumbria. Of the 4,130 inbound contacts received, 9% were received before the ban was implemented, 83% during the ban and 8% after the ban was lifted. 96% percent of the calls were from customers living in the legacy Integrated Resource Zone, where the ban was imposed. 1.3% came from customers living in West Cumbria, North Eden and Carlisle areas.

3.3.9.2 Leakage

Customers contacted us to report a variety of leaks and problems associated with defective fittings and meters. The summary of these contacts is in Figure 11. The majority of all contacts relating to leakage were from the Greater Manchester area (generally around 40%) which is where the greatest population concentration within our boundaries is located.

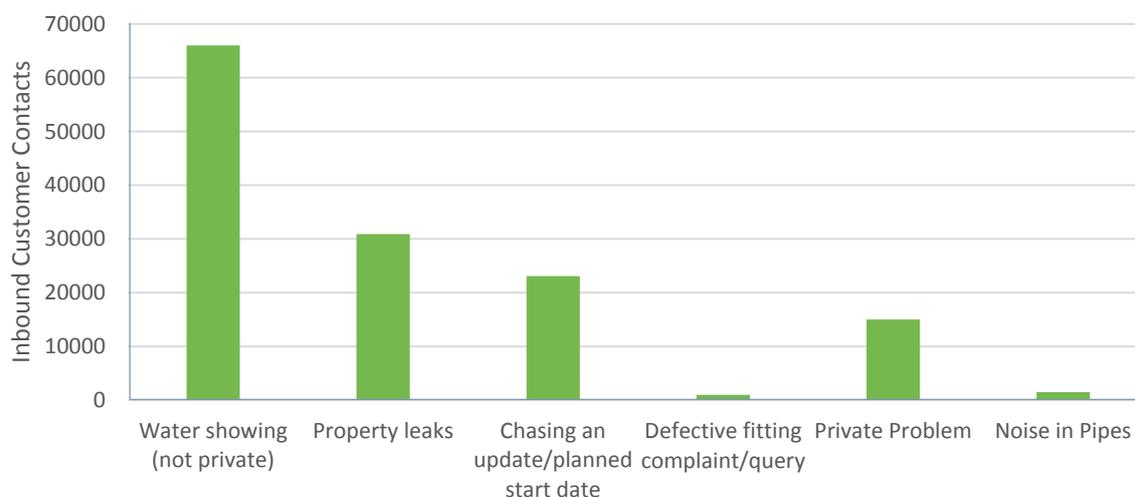


Figure 11 Summary of types of customer contact relating to leakage

3.3.9.3 Supply interruptions

Figure 12 summarises the main reasons for customer contacts due to supply interruptions from 2014 to 2017. There was a total of 219,667 primary inbound customer contacts relating to water supply between 01 April 2014 and 01 January 2017. Unplanned water supply interruptions were the main reasons customers contacted UU about water supply issues, accounting for 38% (82,658) of all customer contact in the period. Customer contacts about low water pressure (standard and urgent) accounted for 22% (48,817) and providing information and communication responses accounted for 13% (28,556).

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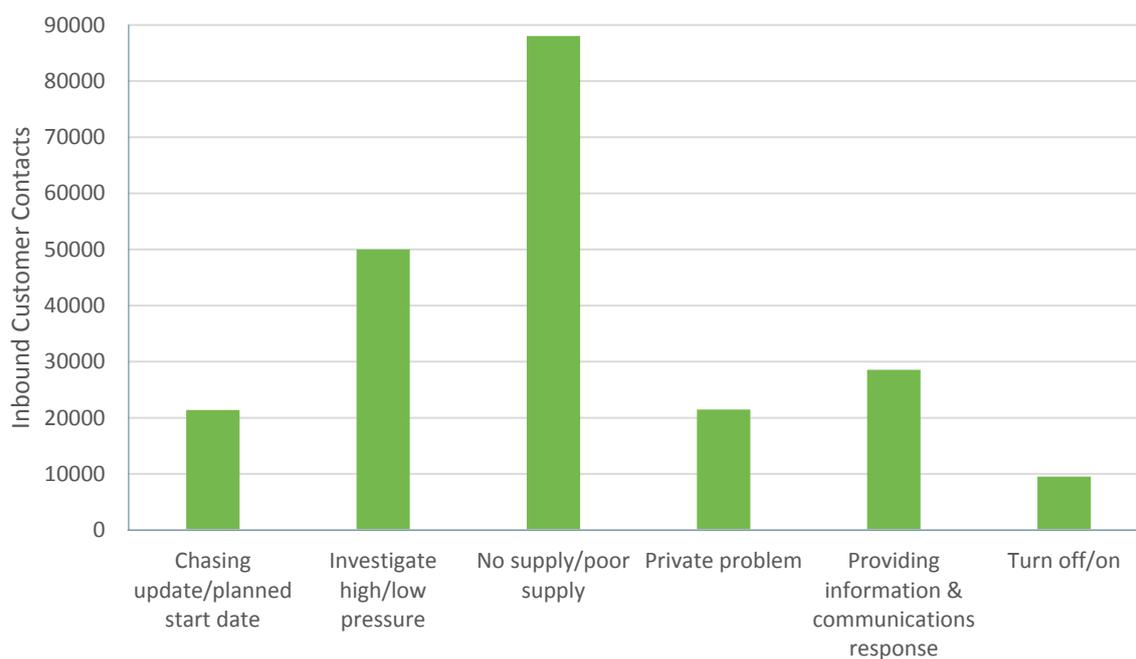


Figure 12 Summary of main reasons for customer contacts due to supply interruptions

The top five reasons for contacting us during the period being analysed was the same across each county in our boundary. These reasons included: investigate low water pressure, chasing an update/planned start date, no supply (unplanned), private problems and provide information and communication response.

How does this business as usual data relate to the WRMP19?

Business as usual data shows us what customers are contacting us about with respect to leakage, supply interruptions and temporary use bans. There are a variety of reasons customers contacted us relating to leakage and supply interruptions. Some of these would be addressed by our leakage strategy and level of service update in this plan. Others are more fundamental problems that we are trying to address on a larger scale as a business.

3.4 Summary of valuations for water resources

This section summarises the customer research outcomes, including quantitative 'willingness to pay'/benefit valuations, across the three main WRMP19 water resources customer research surveys we have conducted:

- Leakage survey;
- WRMP19 customer preferences: Phase 2 quantitative study; and
- Programme Choice experiment.

This section is important, as it explains how the different customer views and thus valuations compare across different research, how they should be viewed relative to each other, and also how they may be used in combination with one another.

Overall, the greater context provided by the Programme Choice research means that more weight should be put on this research than the other two studies. Willingness to pay is often higher for single issues than where customers are presented with choices between improvements for different aspects of service, and the Programme Choice research tests multiple aspects in a single activity.

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All the research shows a preference for demand management options (i.e. metering) over supply capacity options (i.e. increasing reservoir size), with customers willing to pay more for demand management and leakage reduction. There are significant differences in willingness to pay between the Leakage survey (Section 3.3.4), WRMP19 customer preferences: Phase 2 quantitative study (Section 3.3.6) and Programme Choice (Section 3.3.8), with the Programme Choice research giving the lowest values. This is to be expected, in view of the fact that the trade-offs between options and overall bill changes were clearest in the Programme Choice research.

For hosepipe bans (temporary use restrictions) the evidence was contradictory, with the Leakage survey (Section 3.3.4) and WRMP19 customer preferences: Phase 2 quantitative study (Section 3.3.6) showing a willingness to pay for less frequent bans, but the Programme Choice research suggested customers were not willing to pay for this (which generally complements qualitative insights).

For drought permit frequency, all three studies showed some willingness to pay for reducing frequency, but the willingness to pay value was much higher in the Leakage survey and WRMP19 customer preferences: Phase 2 quantitative study.

We consider that there are two options for determining willingness to pay valuations:

- Use the Programme Choice results, as being the most reliable.
- Use values intermediate between the Programme Choice and other research (but closer to the Programme Choice results).

This gives the following valuations, with the intermediate values based on a 2:1 ratio for weighting Programme Choice research results to other research. These valuations (Table 14) are on top of the impact on the supply–demand balance from policy changes in these areas. The values presented relate to the key strategic choice areas presented in our Water Resources Management Plan and thus are used in *Draft WRMP19 Technical Report – Options appraisal* to support the overall plan justification in Sections 6 and 7 of the main Draft Water Resources Management Report 2019.

Table 14 The value customers placed on different activities

Activity	Programme Choice value (per cu m)	Intermediate value
Leakage	44p	96p
One year change in frequency of Drought Permits	3p	9p

We propose to use the Programme Choice research, but to test the intermediate value in sensitivity analysis.

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4. Water supply resilience research

4.1 Overview of research on water supply resilience

Providing a reliable, high quality water supply is central to our business, but unfortunately sometimes things go wrong and we let our customers down. We are striving to reduce the risk of service failures and have extensively engaged with our customers and stakeholders to understand their priorities and appetite for reducing the risk of failures to provide an even better service.

The research has helped us to understand the typical customer behaviour and expectations regarding the risk of water service failures. We have developed the following model from our research. This clearly doesn't represent every customer as some have more specific needs; our response and recovery strategies are tailored for these customers.

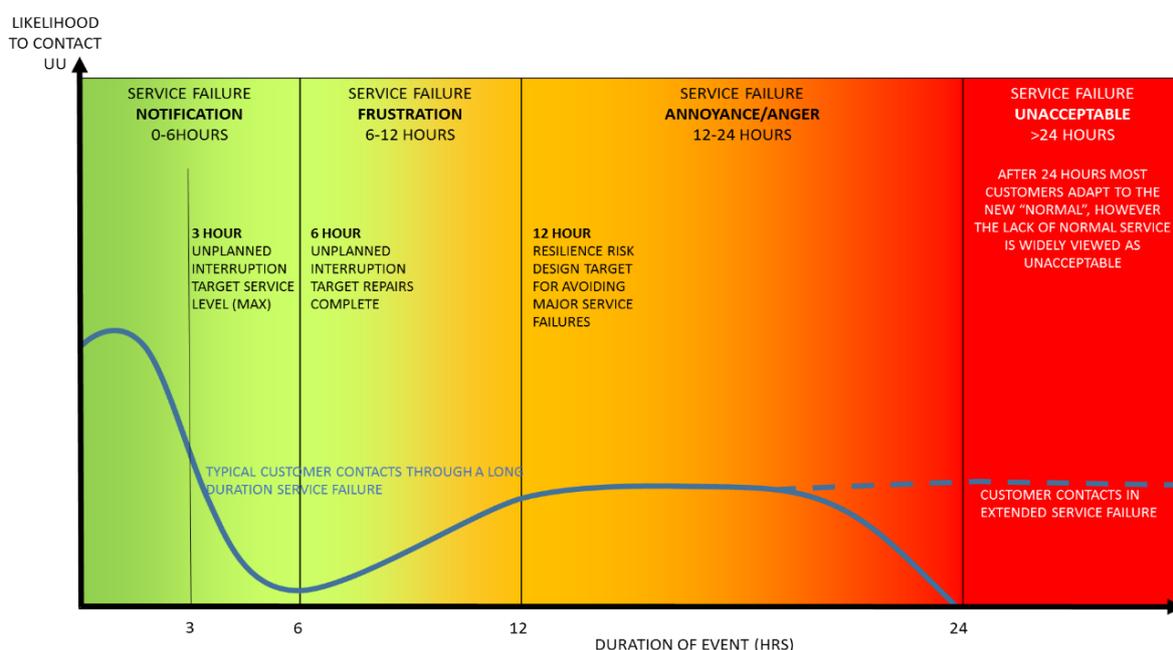


Figure 13 Typical customer behaviour following a water service failure

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Through our research we have sought our customers' answers to the following questions:

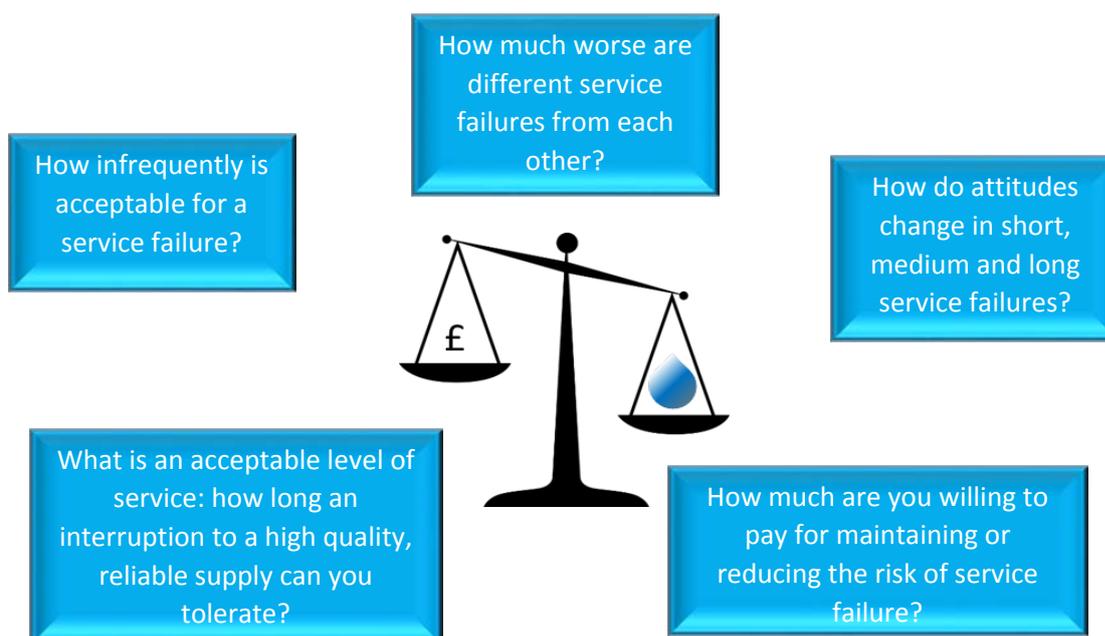


Figure 14 Questions that we have asked customers and attempted to discern from customers

4.1.1 Customer research techniques to help answer the questions

We have used a wide range of techniques to understand our customers' stated and revealed preferences for how we should manage their water service resilience risk. The immersive research we conducted looks more specifically at this (Section 3.3.7). We have used our findings to develop and prioritise appropriate interventions to manage the risk with limited investment at an acceptable and affordable pace.

Table 15 Customer research techniques

Question?	Technique	Approach
How do attitudes change in short, medium and long service failures?	Business as usual data	Review of customer telephone contacts for change in rate of contacts as incident progresses. Review of customer responses to major incidents.
	Online customer panel surveys	Survey regarding duration to "intolerable" service failure.
	Immersive experience	Customers exposed to immersive experience of a long duration service failure, coming face to face with the real issues and constraints of no usable water followed by questionnaire.
How much worse are different service failures from each other?	Business as usual data	Comparison of contact rates for sewer flooding and water supply interruptions. Review of customer responses to major incidents.
	Online customer panel surveys	Survey ranking and valuing different types of water service failures (low pressure, no water etc.).
	Stakeholder events	Ranking of different UU investment drivers.
How infrequently is acceptable for a service failure?	Immersive experience	Customers exposed to immersive experience of a long duration service failure, coming face to face with the real issues and constraints of no usable water followed by questionnaire.

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Question?	Technique	Approach
How much are you willing to pay for maintaining or reducing the risk of service failure?	Immersive experience	Customers exposed to immersive experience of a long duration service failure, coming face to face with the real issues and constraints of no usable water followed by questionnaire.
	Willingness to pay and affordability survey	Traditional stated preference willingness to pay survey.
	Business as usual data	Comparison of contact rates for sewer flooding and water supply interruptions
What is an acceptable level of service: how long an interruption to a high quality, reliable supply can you tolerate?	Business as usual data	Review of customer telephone contacts for change in rate of contacts as incident progresses.
	Immersive experience	Customers exposed to immersive experience of a long duration service failure, coming face to face with the real issues and constraints of no usable water followed by questionnaire.

4.1.2 Service interruption triangulation results

The following approach indicates how we have used our customer research to understand the value to customers of reducing interruptions.

Our approach uses a range of techniques and a range of different research studies to produce our results. Table 16 below summarises our assessment of how well each study meets Ofwat criteria for customer research, with the darker colour meaning the research is stronger.

The research studies and data used in this analysis are:

- Customer priorities research - Stakeholder events (“YourChoice”, June 2016);
- Immersive experience (August 2017);
- WRMP19 customer preferences: Phase 2 Quantitative research (June 2017);
- Online customer panel – interruptions to supply (August 2017); and
- Analysis of customer contact data – Operational Revealed Preference (August 2017).

Table 16 Customer research and Ofwat criteria

Study	Q1 – observed or response	Q2 – actual or hypo-thetical	Q3 – all benefits included	Q5 – level of information	Q6 - context	Q7 – representative
Immersive experience						
WTP and affordability						
Online customer Panel - acceptability						
Online customer Panel - WTP						
Operational “revealed preference”				n/a	n/a	

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The results from each study are shown in Table 17 below.

Table 17 Customer valuation of avoiding supply interruptions

	6 hours	1 day	3 days	14 days
Immersive – compensation		£27.30	£105	£497.10
Immersive – WTP			£609	
WTP – median	£337			
WTP – low incomes	£212			
Panel – acceptability	Very inconvenient	Unacceptable		
Panel – WTP (reducing number of interruptions)	£101			
Customer contact data	£20 to £170			

The general principles we have used in identifying a central estimate of customer value:

- There should be a rising rate per day, reflecting the immersive, customer contact and panel results of rising inconvenience over time;
- Greatest weight should be put on the immersive research, as this provided the most information on experience of interruption and therefore is the most informed choice; and
- The value for short-term interruptions should be within the range of results from the research.

Our overall results are shown in Table 18 below.

Table 18 Overall customer valuation results of supply interruptions

	6 hours	1 day	3 days	14 days
Customer value/day	£199	£227	£289	£293

An overall figure for an interruption of between three and 14 days, we propose to use a figure of £290 per day.

For the purposes of assessing resilience risk, we propose to use a benchmark of risk of a 12-hour interruption. This was the point at which a clear majority of customers regarded an interruption as being unacceptable.

4.1.3 Water supply resilience research outcomes

4.1.3.1 How do attitudes change in short, medium and long service failures?

Our customers have a complex reaction to a long duration water service failure. Most of the data that we have analysed directly relates to water supply interruptions rather than water quality failures, although the major water quality incidents during the 2015-2020 investment period have provided a clear insight into our customers' responses to these types of incidents. We have identified four discrete stages of customer response to water service failures:

Table 19 Customer attitudes to service failures

Time	Classification
0-6hrs	Notification – during this phase customers are generally tolerant of the service failure and are focussed on ensuring that we are aware of the issue and are actively working to return the service to them. Expectation management is key at this stage as if water quality failure is

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	anticipated, there will be a minimum duration to the service failure related to the water quality sample turnaround time.
6-12hrs	Frustration – during this phase the inconvenience that customers experience from not having a normal water service is likely to start to affect their daily routines. The expectation of the service being restored is growing and when it isn't frustration grows; this may be evidenced by calling us to get an update on the expected return to service.
12-24hrs	Annoyance/Anger – during this phase customers are starting to have to change their routines significantly. There are now more repeat calls and trust in service restoration is reducing. As in previous stages our response and recovery actions can have a positive impact, if we are visible and clearly helping to reduce the inconvenience.
>24hrs	Unacceptable (resignation) – during this phase, customers have largely become adjusted to the new normal of living with the service failure. This is widely considered to be an unacceptable service failure and company plans should aim to avoid this level except on very rare occasions.

4.1.3.2 How much worse are different service failures from each other?

There are generally accepted “least unwelcome” service failures. One of the most significant issues our customers is associated with the worry that the water is unsafe to drink or use. The research that we have carried out indicates the sequence and relative values stated in Table 20.

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Table 20 Summary of service failure relative valuations

Service failure	Relative Value
No water	1.0
Boiled water notice	0.35
Do not drink notice	0.8
Do not use notice	1.0
Discoloured/Taste or Odour	0.6

4.1.3.3 How infrequently is acceptable for a service failure?

Customer research regarding the acceptable occurrence of long duration service failures is extremely difficult because fortunately most customers haven't experienced a major service failure. Our immersive research into long duration failures has indicated that a service level similar to the likelihood of a drought leading to severe water use restrictions would be an acceptable planning target. However, it should be noted that likelihood estimates for very infrequent events are notoriously difficult to evaluate accurately.

4.1.3.4 How much are you willing to pay for maintaining or reducing the risk of service failure?

Customer valuations for a change in risk of service failure have been assessed through a number of different mechanisms. The overall customer valuation including domestic and retail customers for reducing the risk of a multiday service interruption is approximately £290 per day.

4.1.3.5 What is an acceptable level of service: how long an interruption to a high quality, reliable supply can you tolerate?

There is very clearly a transition for many customers where a water service failure becomes a major inconvenience, this most typically seems to occur between six and 18 hours into an incident, as indicated in the historic operational data. Further research is being carried out to confirm this conclusion. This has helped to inform the service level target for planning purposes of a return to service in 12 hours. Clearly in the case of water quality the service level target would be further extended due to the water quality sampling and analysis period.

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5. Conclusions

In summary:

- Compared with the water resources management plan 2015 we have conducted a much broader and more varied volume of research and engagement. This approach means we have delved deeper into customer's views and opinions in order to tailor this plan towards them in every way possible;
- Alongside carrying out extensive customer research we have ensured to engage stakeholders and regulators throughout the WRMP process. This has involved formal actions such as pre-consultation alongside additional activities such as liaison meetings and working groups;
- We have strived to move away from the reliance on willingness to pay surveys and instead have concentrated our efforts creating new innovative techniques to get customers involved in the WRMP process. This has been particularly important as we explore risk and resilience to a greater extent with customers. This has included releasing an interactive 'game' to our customer panel and carrying out immersive research with customers to try and simulate 'real life' scenarios; and
- We have also ensured that we look at 'business as usual' data to see what customers are saying all the time and not merely at specific events and surveys that we hold.

The conclusions of this research are as follows:

- Reliable supplies are typically ranked a top priority by customers, and having sufficient supply to meet demand ranks highly within that category;
- Leakage is a big issue for all parties and there is some willingness to pay in this area. There is strong support and preference for demand management options;
- Acceptability is generally high for levels of service, and willingness to pay valuations show a stronger desire to avoid deterioration than preference to improve service. There is marginally more distinction between service levels for drought permits over water use restrictions;
- There is some support for water trading, however, concern has been raised both stakeholders and customers that any trading should not affect customers and the environment in the North West;
- There is little distinction between different levels of drought severity for planning; and
- Customers place high valuations on avoiding supply interruptions including to hazards other than drought.

Following the publication of this Draft Water Resources Management Plan 2019, we will conduct further work to inform the revised Draft Water Resources Management Plan 2019 with both stakeholders and customers, both to support the proposals in the plan, but also to further engage on plan delivery. Key planned areas of future work include:

- Continuing dialogue with regulators and stakeholders through consultation on our plan;
- Further customer specific engagement on the potential for future water trading;
- Further research on our programme to reduce leakage, specifically with regards our programme / pace of delivery in the early part of the planning horizon; and
- Further customer and stakeholder engagement on alternative solutions to increase resilience to water supplies to the Manchester and the Pennines.

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6. References

Department for Environment, Food and Rural Affairs, 2016. Guiding principles for water resources planning.

Environment Agency and Natural Resources Wales, 2017. Water Resources Planning Guideline: Interim update. April.

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Appendix A. Full list of all responses received for Pre-consultation

The following organisations were contacted for the pre-consultation:

ORGANISATION
Friends of the Lake District
Lancashire Constabulary
Individual Member of the Public
NWIFCA (North Western Inshore Fisheries and Conservation Authority)
West Cumbria Rivers Trust
Windermere Town Council
Consumer Council for Water
Holker Group
Lake District National Park Partnership
Windermere Lake Users Forum
South Lakeland District Council
Environment Agency
REDFA (River Eden & District Fisheries Association)
Windermere Lake Cruises Ltd
Natural Resources Wales
Natural England
Ofwat

Appendix B. Full list of all councils and local authorities contacted

The following councils/local authorities were contacted and met with:

NAME OF COUNCIL/LOCAL AUTHORITY	
Copeland	Tameside
Lancaster	Wirral
South Ribble	Carlisle
Allerdale	West Lancashire
Knowsley	Blackburn and Darwen
Wigan	Warrington
Salford	Eden
Sefton	Fylde
Burnley	Lancaster
Blackpool	Trafford
Bolton	St Helens
Pendle	

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Appendix C. Programme Choice experiment

Screenshots from the initial screens in the Programme Choice experiment.

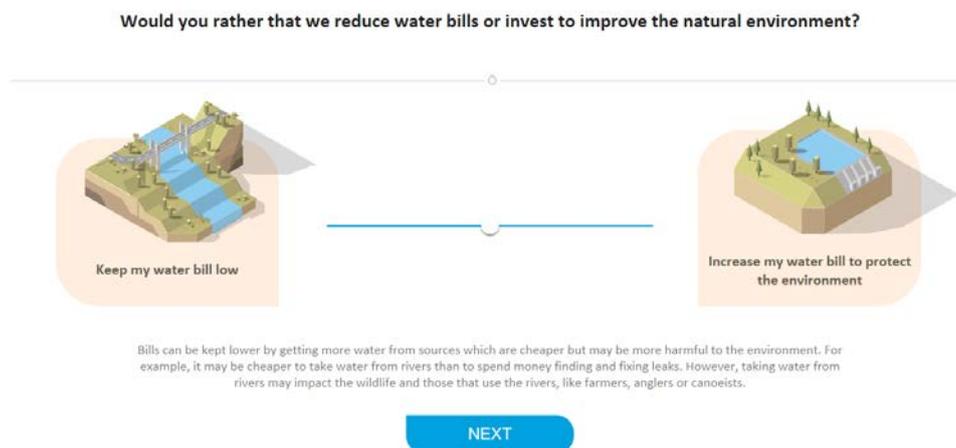


Figure 15 First screen from Programme Choice experiment

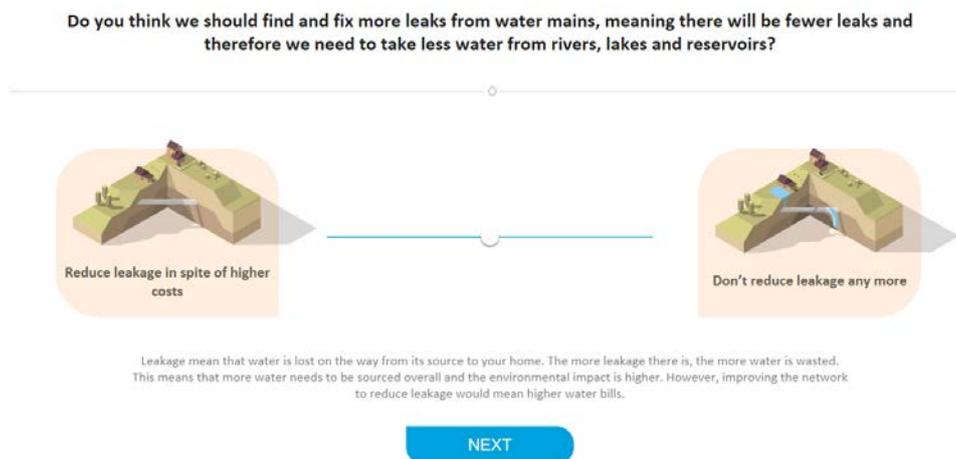


Figure 16 Second screen from Programme Choice experiment

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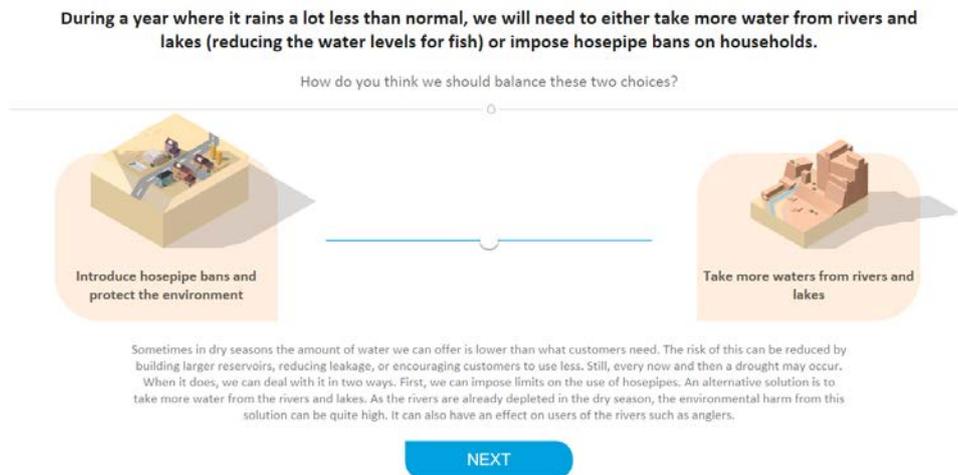


Figure 17 Third screen from Programme Choice experiment

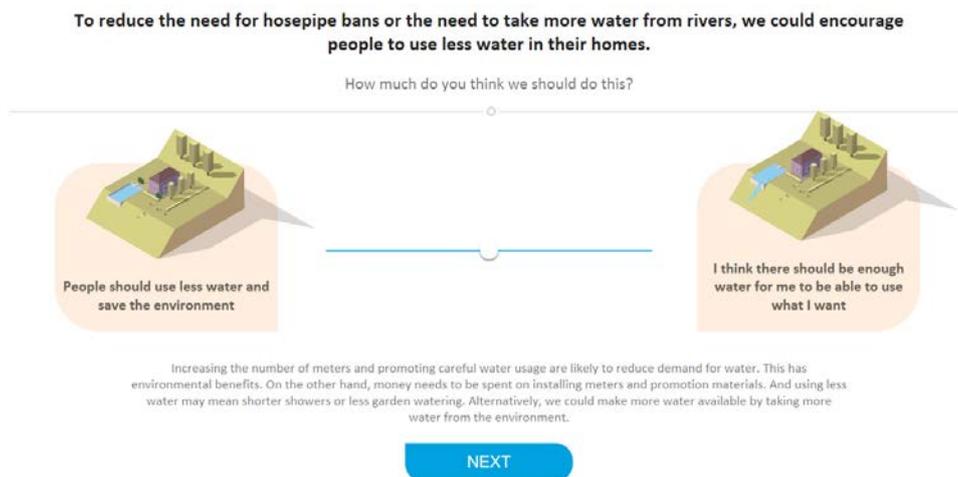


Figure 18 Fourth screen from Programme Choice experiment