

4. Securing long-term resilience

4.1 Key messages



- **We have set the benchmark in terms of financial resilience:** Publicly listed; lowly geared at 65% with an average equity buffer of £4.5bn; robust credit ratings A3/A- both with stable outlook; prudent level of headroom and liquidity; a responsible approach to financial risk management and a UK leading approach to pension risk management
- **We have delivered a step change in operational resilience in AMP6, with £250m additional investment in AMP6:** This is informed by our learning from recent events, for example the Lancashire water quality incident and the Cumbria floods - both in 2015 - and evidenced by our response to the 2018 freeze-thaw
- **Innovative systems thinking¹ approach to managing our business, backed-up by our sector-leading corporate resilience:** Secures services for current and future customers
- **We have improved and thoroughly tested our recovery plans and a best practice integrated approach to managing risk:** Supported by a sector leading approach to asset health
- **We present a robust and high quality viability statement:** Board approved statement provided alongside our business plan, demonstrating our ability to absorb all 'severe but reasonable' scenarios and Ofwat's common scenarios in each year of the viability period to March 2025
- **Independent reviews conclude that we are leading the industry in our approach to risk, resilience and asset health in many areas:** Independent Resilience in the Round Review, Arup, July 2018; Review of United Utilities' Approach to Asset Health, Jacobs, June 2018
- **Reflecting customer views, we will ensure resilience in the round for the long term by intelligently prioritising base expenditure:** There is only one area where we need incremental expenditure, which is work to manage our biggest water supply risk for Manchester and the Pennines

4.2 Overview

We have used the best available evidence to objectively assess and prioritise the risks and consequences of disruptions to our systems and services and engaged effectively with customers on the risks and consequences. We take an organisation-wide, integrated approach to identifying and appraising all the diverse risks to the resilience of services and interdependencies across different areas. Delivering resilience is embedded throughout our business plan.

We have a comprehensive, integrated, forward-looking, objective and quantitative risk assessment process. It aligns to the International Risk Management Standard (ISO 31000), and links to our Wholesale Risk and Asset Planning approach which in turn aligns with the International Standard for Asset Management (ISO 55000). The identification of risks and issues, monitoring of strategic performance requirements and prioritisation of investment and operational

¹ Our approach was reviewed by Accenture who said "Accenture considers UUU to be leading the water sector in executing a system thinking approach. This strategy necessitates a level of strategic maturity, long term focus and investment in innovation that is amongst the most sophisticated in the sector" and "This wider systems view should enable UUU to build greater resilience across the network". For more details see chapter 6 and T5004 "Assurance of the systems thinking transformation journey benchmarking: Accenture".

management are aligned through these processes. Reviews by Arcadis and our corporate audit function, supported by PwC risk management experts, recognise that our risk management represents good practice.

Key risks identified from this process include high impact, low likelihood events like failure of major aqueducts, impounding reservoirs or terrorism, as well as more frequently occurring disruption such as sewer flooding. We have extensively and creatively engaged with customers to understand their evaluation of these issues and understand their needs better than in the past. They have repeatedly told us that they expect us to provide a service that is secure, safe and reliable so that supplies can be maintained, even in extreme conditions. Customers also continue to place a high priority on protection from flooding and storm overflows from wastewater treatment works and our sewerage network. Through our acceptability testing and specific research on Manchester and Pennines resilience, customers have shown their active support for the proposals.

Our assessment of financial resilience is that we set the benchmark as the frontier company in the sector, providing the highest levels of protection to stakeholders. We attribute our financial strength and resilience to two key factors: subjecting ourselves to the rigour and scrutiny that comes with being a publicly listed company and our responsible and long term approach to financial risk management. We will look to maintain and build further on this during AMP7.

As part of our business plan submission, the Board has provided a high quality viability statement out to 2025. It demonstrates how our strong liquidity and capital solvency position, supported by our responsible approach to financial risk management, is able to absorb all modelled risk scenarios (including Ofwat's common and combined scenarios applied to each year of the viability period) without the need to take mitigating actions. In Ofwat's most extreme scenario our credit rating could reduce to Baa2/BBB. As we consider this to provide insufficient headroom above investment grade, mitigating actions would be considered to restore the ratings to an appropriate level.

In the event that mitigating actions were required we have a number of options available which provide significant scope to improve liquidity and the capital position. For example, a 5% increase in gearing would raise over £500m in new funding whilst in the event of an urgent need for cash, dividends could be deferred to improve liquidity and our capital position.

We have objectively assessed the full range of mitigation options and chosen the interventions that represent best-value for money over the long term, and are supported by customers. In developing a resilient plan we have followed the seven resilience planning principles². Since resilience in the round is a broad and interconnected topic, our processes are outlined and a number of examples are given in this chapter with further examples provided in the supplementary reports referenced below. In the examples we show how we considered a breadth of intervention options (including resistance, reliability, redundancy and response & recovery) and selected a best value plan from the options. This includes innovative approaches to risk mitigation (technology, behaviour change, partnerships and co-creation), but our starting point is always to consider working smarter and making operational changes to improve resilience before resorting to investment.

Our resilience plan also complies with guidance relating to resilience in the WISER and DWI guidance for. Supplementary report S6005 – "AMP7 Statutory obligations summary" sets out all of the obligations and expectations that were identified, and how we believe they will be achieved.

Our resilience plan is embedded in our approach to managing our business (section 4.5), and our range of ODIs (see supplementary document S3001), for the benefit of customers and the environment. In AMP6 we have stretched ourselves to deliver a step change in resilience, with £250m additional investment in resilience projects. In AMP7 we will deliver resilience mostly through prioritising within existing budgets. The key exception is our resilience scheme for water services to populations in Manchester and the Pennines which is the subject of a cost adjustment claim due to the unique nature of that project. This scheme has been subject to extensive customer and stakeholder engagement.



We worked with a number of stakeholders across Greater Manchester to inform our approach to Manchester and Pennines resilience. This included use of internationally pioneering approaches with 100 Resilient Cities who said "this approach is commendable".

² The seven resilience planning principles as defined on pages 79 and 80 of Delivering Water 2020: Our final methodology for the 2019 price review, Ofwat, December 2017.

Our approach to resilience is reflected throughout the plan. In this chapter, we describe our leading approach to resilience: how we assess risks; the step change we have made in resilience in recent years; how customer engagement is shaping our plans to deliver resilient services; and summarise how our suite of ODIs protect the resilience of service for customers.

We cover all seven resilience planning principles:

1. Considering resilience in the round for the long term (Section 4.5.1)
2. A naturally resilient water sector (Section 4.6.4)
3. Customer engagement (Section 4.3 and Chapter 2)
4. Broad consideration of intervention options (Section 4.5.5)
5. Delivering best value solutions for customers (Section 4.5.5)
6. Outcomes and customer-focused approach (Section 4.8.1 and Chapters 5 and 7)
7. Board assurance and sign-off (Section 4.5.1 and Chapter 10)

Our approach is summarised in Figure 4.1.

Figure 4.1: Resilience in the round: highlights of our organisation-wide integrated approach to the interdependencies of resilience



We have provided representative examples of our resilience assessments in this chapter, but these represent a fraction of our overall evidence base, which we have provided in the following supplementary reports:

S4001 Asset Health: Our approach. Describes how we assess asset health, what our models are telling us about how asset health will change over AMP7 and beyond, and why this is sustainable.

- S4002 Resilience Track Record: Case studies of delivering resilience and learning from our experiences.** Includes corporate, financial and operational case studies of our track record for delivering resilience. It also describes the major events of AMP6, lessons learned and improvements delivered.
- S4003 Corporate resilience: Corporate risk management framework.** Describes how systems thinking is embedded in UU, our corporate risk framework, the WRAP process, smart resilience solutions, how customers' views are embedded in our risk assessments through valuations and how we manage interdependencies.
- S4004 Ecosystem resilience: Ecosystem resilience through catchment management, partnership and markets.** This includes our approach to the natural environment, recognising the long term benefits of a resilient environment, taking a systematic approach and adopting Natural Capital thinking.
- S4005 Operational resilience: Detailed risk assessments and resilience plans.** This covers our key risks and controls, a description of how we expect overall risk to change over AMP7, a description of our business continuity model. It also provides detail on how each risk is assessed, what the control options are and how best value solutions have been identified with support from customers.
- S4006 Financial resilience: Assessing and demonstrating financial resilience.** Sets out the Board's assessment of the financial resilience of UUW and supports the high quality viability statement provided as part of our AMP7 business plan submission.
- T9034 Resilience review: ARUP.** This is a third party produced maturity assessment of our approach to resilience.
- T9035 Approach to asset health: Jacobs report.** An assessment of how our approach to asset health compares to best practice (as outlined in CH2M's Targeted Review of Asset Health for Ofwat).

4.3 Customer expectations for resilience

We have undertaken an extensive programme of engagement with customers to understand their priorities and expectations for long term resilience of water and wastewater services. This reflects Resilience Principle 3: Customer engagement. Research topics include: recent incidents, supply interruptions, drought, Manchester and Pennines resilience, sewer flooding, natural experiments, service response, water efficiency, leakage and ecosystem resilience. For each area, we ensured that customers were presented with a broad spectrum of options.

Water dependent business, Manchester

"It's about reducing risk further, if they're not doing their job properly, I can't do mine"⁵

In aggregate this shows that customers have a varied tolerance to risk. We know that customers have some, albeit limited, tolerance to service disruption. In our supply interruption customer panel customers told us that they can accept an interruption to supply of just over two hours³. However in other situations, such as drought, customers show less acceptance of more severe events and a strong preference to avoid deterioration from current high levels of resilience⁴. Generally there is limited willingness to pay for improvements, but customers spontaneously raise concerns about flooding, coping with population growth, terrorism and cyber security⁵.

We have pioneered new approaches to customer engagement to gain a richer understanding of customer expectations. To ensure that customers have been fully engaged we have conducted innovative immersive research⁶, placing 100 customers in two interactive workshops to discuss the topics of long-term supply interruptions and ecosystem services. In each situation customers were presented with differing service options and associated costs and were able to make decisions based on their experiences of being immersed in the situation. Results from these immersive workshops were then triangulated with other research methods.

We have taken this principle further by actively seeking to co-create solutions with customers in specific communities. For example, in the River Petteiril catchment we organised workshops involving domestic customers, landowners and the

³ T1052 - Short-term interruptions to supply research

⁴ T1060 - Water resources management plan (WRMP) research: Stages 1 and 2

⁵ T1013 - Customer priorities quantitative research (2)

⁶ T1048, T1115, T1068 immersive research studies

farming community⁷. The aim was to understand views on the challenges and choices of conventional versus alternative smart catchment schemes.

We also explored issues of the timing of investment across generations and found that a majority (69%) would support a phased approach to investment, spreading the costs and benefits across the generations⁵. This aligns with our customer engagement on asset health, where the majority of customers support investment in assets to reduce the risk of equipment failing over time, and think investment should either be made now (46%) or spread across current and future generations (44%)⁸.

A useful insight into general resilience concerns is given by our customer priorities research⁵. Spontaneously, customers raised similar future challenges which touch their lives: wasted water, flooding and understanding cost are high priority. Figure 4.2 highlights how we have responded to these challenges in our plans.

Overall our engagement with customers indicates that they want high quality, sustainable and resilient water and wastewater services at a price they can afford. We recognise that customers place their faith in us to deliver a responsible approach to managing risk.

Innovative engagement on resilience



100 customers took part in two interactive workshops⁶

Working with a creative agency to design the workshops meant we got high quality engagement, and cognitively valid results

Figure 4.2: Future challenges raised spontaneously by customers⁵ and how we are addressing these in our plans



4.4 Learning lessons to enhance future resilience

This section sets out our recent record in delivering resilience, highlighting significant improvements we have made by learning from experience. In 2015 and 2016 we experienced three major water supply incidents and a major flooding incident. We very much regret the disruption these caused to our customers and have learnt from these experiences to significantly improve our resilience. As a result of our learning and action we believe that we are now providing industry-leading levels of resilience in many areas. We have also held events to share our learning from a water supply incident across the industry.

⁷ T1069 - River Petteril water catchment research

⁸ T1081 - Asset health research

In July 2015, 80,000 customers in Bolton were variously affected by loss of water supplies, having to boil water and seeing discoloured water for four to five days. The multi-agency debrief identified lessons and one quote sums up our response: *“UU acknowledged that they became too focused on resolving the technical issue rather than informing partners & seeking support.”* Based on feedback we immediately instigated major improvements in the way we work with others, which are explained below.

In August 2015, we'd already applied some lessons from Bolton when we experienced a prolonged cryptosporidium incident in Lancashire. The multiagency debrief included a comment welcoming... *“Early notification of the boil water advice. This was a precautionary notice and there were low incidents of people affected. The United Utilities mechanisms to deliver a high volume of letters in a tight timescale were great. The communication messages from United Utilities to members of the public worked well.”* As a result of the incident we were fined £300,000, with £150,000 in costs, on top of the £18.8m compensation we had already paid to customers. The judge criticised us for not undertaking the complete risk assessment process (our improved process is explained below.) However, it was accepted that we showed a very responsible attitude from the start of the incident and our response was described as “textbook”.

We learned a lot from these incidents and so we actively shared our knowledge with peers in the industry and in other sectors too. In particular, we hosted a series of seminars to disseminate lessons learned⁹. By sharing this knowledge we hope that we have contributed to future industry resilience by helping to avoid future incidents, assist with quick recovery and build confidence in the resilience of the public water supply.

December 2015 was the wettest month since records began in 1894. Storms Desmond and Eva caused a number of rivers in Cumbria, Lancashire and Greater Manchester to exceed the highest levels previously recorded by a significant margin, breaching flood defences. We adopted a major incident response structure and participated in multi-agency Strategic Coordinating Groups. Approximately 1,000 properties had temporary water supply issues, but the wastewater service had greater impacts: 113 treatment works and 138 pumping stations were flooded, along with sewage treatment works in Greater Manchester, Bury and Rochdale. A widespread power cut in the Lancaster area led to other assets losing power temporarily.

We undertook customer research following the incidents above¹⁰. Customers had mixed views about how much the incident had impacted them. Some customers mitigated worries about the effectiveness or inconvenience of boiling by purchasing bottled water. We used this to derive valuations for future investment planning to avoid a water quality incident. There was also important feedback about expectations for communications and prioritising vulnerable customers that we have taken into account.

The Board wanted to ensure that the important lessons learnt from these incidents were embedded and as a result significant progress has been made in enhancing our resilience. We improved our governance processes by establishing a Wholesale Risk & Resilience Board, reporting into the Group Audit and Risk Board. We have thoroughly improved our incident management procedures, introducing new roles and training. We have also developed more detailed water network contingency plans (see section 4.6.2) and enhanced our Priority Services offering¹¹, to improve our response to vulnerable customers during emergencies. We also established an incident review reporting process, led by a senior leader so lessons learnt and trend analysis has become an integral part of our integrated business management.

Recognising there were improvements to be made, we commissioned a comprehensive review of our risk management framework by Arcadis. Whilst it found the framework itself was robust, it highlighted inconsistent approaches and

Feedback from water industry attendees at post-Lancashire water quality incident seminars

“Excellent post incident review and interesting to see significant shift in company attitude post the incident”

“I think UU were incredibly open”
“A great example of sharing learning across the industry”

“Your team all seem to have learnt a lot from the event so ... you seem to be in a very good place for the next AMP”

100% of attendees said it will help them look at making improvements in their own organisations

⁹ The lessons learned handout from these seminars is included as Supplementary Report S4007.

¹⁰ T1043, T1044 - Lancashire water quality incident research; T1046 - Tameside water quality incident research; T1045 - Lancashire water quality incident: Post court case

¹¹ For a video explaining our Priority Services offering see <https://youtu.be/fYRjGGEW174>

application across the business which needed to be addressed. Arcadis suggested improvements to the framework for risk escalation, aggregation and consistency across the business. In response, we fundamentally reinforced and enhanced our methodology for identifying risks and assessing the vulnerability of services. As a result our improved overarching Business Risk Framework adopts all aspects of the Arcadis work (see section 4.5.4). We have also completed engineer lead full end to end Hazard Reviews (HAZREV) of our Water Treatment Works (WTW) processes at our highest risk sites, with all WTWs on track for completion by the end of 2019.

Our approach to communications with partners and affected customers has progressively improved as we learned from our experiences. A key lesson is that using multiple networks to communicate in incidents is by far the most effective way of getting messages out to impacted populations. Different groups are also affected in varying ways, with their own issues and needs, for example, regarding alternative supplies. Recognising this we have completely redesigned our approach to engaging with sensitive customers. Through collaboration with charities we have made new connections with older people and people suffering chronic conditions so they are registered with us for priority water supply provision during incidents. We have established a memorandum of understanding with the British Red Cross to support us in incidents: helping deliver water, providing psychosocial support and conducting welfare checks among those affected.

Learning from the water quality incidents, to improve operational resilience, we invested £117 million in a programme of work to install automatic shutdown and ‘start-up to waste’¹² at all our water treatment works. We will be the first water company in England and Wales to have this in place at all of our water treatment sites. We also developed a more robust approach to testing our service reservoirs which is now considered industry best practice. By the end of AMP6 we’ll have UV treatment at 24 high risk water treatment works and pipework to enable emergency deployment at a further 14. The investments are coupled with a reviewed risk management processes at water treatment sites and improved automation and telemetry controls at strategic sites.

We have invested in our fleet of ‘Water on wheels’¹³ tankers to pump treated drinking water into the local network in the event of a water outage. By the end of AMP6 we will have 44 large tankers and 5 smaller tankers on standby at all times, capable of reducing the customer impact of large water supply interruptions.

Following the floods we improved resilience when reinstating damaged assets by, for example, increasing culvert capacity. We also developed a catchment resilience strategy, putting natural flood management at the heart of our sustainable catchment management programme for AMP7 (see section 4.6.4).

A key lesson from these floods was that historic flood levels can be significantly exceeded, so there is a limit to which barriers can provide cost-effective resistance to extreme events. Response and recovery plans are a cost effective way to protect service provision and effective flood warnings give opportunity to implement temporary control measures. We have built a standard set of immediate preparations on receipt of amber “be prepared” flood warnings. We have also improved asset standards to locate critical functions on the upper floors of buildings. We have also worked with third parties such as Electricity North West to ensure our resilience plans are interdependent between services.



After purchasing 12 new tankers in 2017 we have the greatest volume of deployable water in the UK industry, and have a further 20 on order in 2018

¹² This protects the quality of water provided to customers by ensuring the output of the water treatment does not go into supply when treatment processes are being restarted.

¹³ For a video explaining our Water on wheels response <https://youtu.be/mfghljAH11g>

Table 4.1: How our approach to resilience differentiates us from traditional approaches to resilience

Traditional approach to resilience	Our approach	Examples of our approach
Overly focused on “building out” risk	Focus on managing risk, only “building” when there is clear value	Our wholesale risk and asset planning process with generic high-level solutions – a genuine totex approach (see section 4.5.5) New integrated control centre: situational awareness, monitoring trends, proactive response (see section 2.5 of S4002 - Our resilience track record: Case studies of delivering resilience and learning from our experiences)
Overly focused on the most recent incident (e.g. solving last year’s flood)	Predict future risk (based on asset health, legacy performance and future predicted changes) Prioritise action based on predicted risk, using totex approach to identify best value approach	UV deployment across multiple water service sites based on risk assessments (see earlier in this section) Stochastic modelling as scenario analysis in water resources management plan (see case study on page 87) Integrated drainage area strategy supported by wastewater network modelling (see case study on page 89) Blended approach to drainage risks, including green infrastructure solutions and customer awareness programmes (see section 7.2 of S4005 Operational resilience: Detailed risk assessments and resilience plans)
Solving part of the problem (one hazard at a time – flood, fire, raw water quality)	Integrated solutions (assess solutions against multiple hazards through comprehensive risk assessments)	Enhancements to mitigate multiple hazards at Sweetloves WTW. By providing flexible configurations to the existing contact tanks at Sweetloves, we have enabled full rezoning for demand normally met by Sweetloves WTW. This enables us to meet this demand with water from Lostock or Wayoh WTWs in a cost effective way providing resilience to multiple hazards that could potentially affect Sweetloves WTW
Focused on assets	Focused on customer impact – protect service not assets	Industry leading priority services offering, providing extra support to customers where it’s needed (see section 4.6.2) Use of rezoning or tankers to maintain water supplies before repairing assets (see earlier in this section)
Traditional “low risk” solutions	Leveraging new technologies	Use of NERADA technology for biological phosphorous removal (see section 4.3.1 of S4003 - Corporate resilience: Corporate risk management framework)
Delivering concrete	Delivering operability (e.g. contingency plans, live risk management)	Exercise Triton – multi-agency testing of contingency plans (see Section 4.6.2)
Overly focused on current operational “issues”	Focused on the high consequence risks	Manchester and Pennines resilience (see case study on page 88) Targeted remedial works programme for high impact low likelihood service reservoir water quality risks (see earlier in this section) Impounding reservoir resilience programme developed through portfolio risk assessment (see section 4.6.7) Critical sewers inspection and rehabilitation. Ensuring that we proactively understand the condition of our most important sewers, inspecting and intervening prior to catastrophic failure, wherever possible.
Focused on short term financial payback	Natural capital included as part of the value assessment	Integrated catchment strategy (see section 4.6.4)

A well as the incidents above we have also performed well in a number of areas, for example the Environment Agency has rated our environmental performance as industry leading four stars for the past three years. Through the rest of this AMP, and into the next, we will continue to learn and develop our resilience, addressing risks where appropriate. In

the wake of the Lancashire water quality incident the Board sanctioned the executive to spend an additional £250m on reducing risk and enhancing resilience across the business, which will deliver significant resilience benefits.

£250m additional investment

“We believe that it is appropriate to share our success with customers by re-investing in resilience measures, thereby improving service and reducing future bills.”

Steve Mogford, CEO, investor presentation, 31 March 2018

The £250m additional investment is transforming resilience across the business. It includes the aforementioned water quality improvements, targeted improvements in the water network on connectivity, burst risk and more flexible pumping arrangements. It includes risk and optioneering for Manchester and Pennines resilience and replacement work on the highest risk section of the Haweswater Aqueduct. On the wastewater service it includes works to improve the resilience of the inlet at Fleetwood WwTW (a critical asset for North West bathing waters), generators to reduce the risk of pollution at Carlisle WwTW and further investment in reducing sewer flooding. It also includes improvements to our wastewater

network models to underpin future resilience improvements from our drainage strategy (see case study in section 4.6.9). For bioresources we are investing to improve throughput capability to reduce the risk issues arising from sludge backlogs. This level of investment in projects, which go beyond our PR14 plans, means that we go into AMP7 with an improved resilience position. Our approach to resilience is also bolstered by our systems thinking approach. Systems thinking recognises that making a small change in one element of the system can have a big impact elsewhere, and makes use of patterns of change rather than static snapshots. Table 4.1 shows how our approach is different to traditional approaches to resilience and there are many examples in this chapter of how we are looking to progress this in AMP7. Systems thinking is explained further in chapter 6.

4.5 Corporate resilience: Our risk management framework

4.5.1 Resilience in our corporate structure and governance

Corporate resilience is the ability of an organisation’s governance, accountability and assurance processes to help avoid, cope with and recover from disruption and to anticipate trends and variability in all aspects of risk to delivery of services. Being a listed company brings higher corporate governance requirements and heightened public profile, increasing the degree of scrutiny and accountability of the company.

As a listed company, United Utilities Group PLC complies with the UK Corporate Governance Code, including the provisions on the Board being responsible for determining the nature and extent of the principal risks it is willing to take in achieving its strategic objectives and also maintaining sound risk management and internal control systems. Composition of the Board of the regulated entity, United Utilities Water Limited (UW), mirrors that of the listed entity. UW also reports annually on its compliance with the Code and Ofwat’s Principles on Board Leadership, Transparency and Governance¹⁴. Additional evidence on compliance with the principles is provided in supplementary report S4003 – “Corporate resilience: Corporate risk management framework”.

Board effectiveness

“External evaluation provides valuable insight for Board members and helps prevent complacency and examine whether, as a Board, we are doing the right things, with the right people and making the right decisions to promote the long-term success of the company”

John McAdam, Chairman, in our 2018 annual report

Our directors are fully aware of their statutory duties as directors, the need to act in a way most likely to promote the success of the company for the benefit of its members as a whole and the evolving application of their duties under s172 of the Companies Act 2006. The company and Board maintain a long term outlook and is engaged, for example, in considering the 2019 Water Resource Management Plan which looks beyond a 25 year planning horizon, review and approval of projects relating to long-term resilience such as the Thirlmere transfer and Haweswater Aqueduct outage. The Board was instrumental in ensuring that lessons learned from the Lancashire water quality incident were embedded into the organisation and a Board review of the incident was led by the Senior Independent Non-Executive Director.

¹⁴ See for example the 2018 code on the company website. https://www.unitedutilities.com/globalassets/z_corporate-site/corporate-governance/code-on-board-leadership-transparency-and-governance-26-june-2018.pdf

The Board is engaged in the oversight of the company's PR19 business planning and the Board Corporate Responsibility Committee has noted the significance of resilience and climate change to PR19 planning. Regular engagement between the Board and the Chair of YourVoice has ensured that the board has been kept fully apprised of customer engagement on resilience priorities. The Board has also been regularly updated on the improvements made in the Priority Services package. There are regular reviews and debates on the risk profile of the group and the principal risks facing the company.

The principal board committees are the audit committee, remuneration committee, nomination committee, corporate responsibility committee and treasury committee. The Chairman chairs the nomination committee; all other principal board committees are chaired by independent non-executive directors who have particular skills or interests in the activities of those committees. They are supported by a number of management committees such as the Group Audit and Risk Board and the Security Governance Board. The latter committee has a key role to play in overseeing business continuity planning and its impact on resilience.

Each year the Board reviews and approves a risk and compliance statement¹⁵, confirming that the company has applied its processes and internal systems of control in a manner that has enabled it to satisfy itself, to the extent that it is able to do so from the facts and matters available to it, including that the company has appropriate systems and processes in place to identify, manage and review its risks. The Board also approves an annual certificate stating that the company will, for at least the next 12 months, have available to it the management resources which are sufficient to enable it to carry out its regulated activities. Our people plan is discussed in the following section and, together with board succession planning, it provides evidence on our long term plans to maintain capable management.

The company's remuneration arrangements are designed to promote the long-term success of the company. The company does not pay more than is necessary for this purpose and a significant proportion of senior executives' pay being performance-related. More information on the company's approach to performance pay is covered in chapter 9.

The board itself has a key role to play in strengthening resilience and care is taken to ensure that the composition of the board reflects perspectives and expertise from a variety of backgrounds and industries¹⁶ to the company to improve resilience. In 2017/18 a board effectiveness evaluation was conducted by Lintstock Consultants. Lintstock found that the composition of the board was considered to be a diverse group of high-quality non-executive and executive directors. All members of the nominations committee are independent, exceeding code requirements, and board succession planning uses a skills matrix to maintain the breadth of experience and application of a diversity policy.

4.5.2 Resilience in our organisational capability: our people plan

The company also recognises the key role that employees at all levels have in ensuring resilience. The board's Nomination and Remuneration Committees ensure that the highest calibre individuals are recruited, retained and motivated at the most senior levels within the company. In early 2015 we carried out an Organisation Capability Review (OCR) and as part of this we identified a number of risks to our organisation and included mitigating actions in our people plan. OCR key themes are assessed and reported to the board annually with a full review carried out at least every five years.

Our people plan centres on a needs driven talent strategy. It incorporates improving our ability to identify and harness potential internally, understanding the skills and capabilities we need for the future, developing a strong brand in the market to enable us to attract from the broadest and most diverse pool, creating space to bring in new capabilities and allowing those with potential to develop and grow. We have put in place targeted programmes for senior leaders and senior

Developing talent



Through OCR we have identified that 40% of our people may retire in the next decade. Our graduate and apprentice programmes mitigate this risk, and we take time to celebrate the success and achievements of our apprentices, graduates and other learning communities

¹⁵ Part of the Annual Performance Report, see for example the 2018 report on the company website, <https://www.unitedutilities.com/corporate/about-us/performance/annual-performance-reports-2015-2020/>

¹⁶ Board biographies are available on pages 60 – 63 of the 2018 annual report, https://www.unitedutilities.com/globalassets/z_corporate-site/investor-pdfs/annual-reports/united-utilities-ar2018-web-ready.pdf

managers and an 'aspiring manager' programme to identify our emerging talent at the middle management level with the aim of creating a talent pipeline.

The changing external market, increased automation and fast paced change all mean that we need effective leaders to help steer the organisation through change both in terms of setting the strategic direction and supporting employees. We have assessed current leadership strength, identified high potential employees at all levels of the organisation and built their development into our plans.

4.5.3 Resilience in our supply chain

Our approach to corporate resilience extends into supply chain activity. We use category management which takes a long term holistic view of our demand, specifications and the supplier market to deliver the appropriate contract strategy. Our third party spend is around £1 billion per annum and consolidated into a number of categories which reflect similar commercial considerations and supply markets. Each category has a dedicated category delivery manager. Throughout this process we are encouraging commercial awareness from market to company and encouraging competition wherever necessary.

The biggest resilience risks from the supply chain are security of supply, that is that a risk that the supply of critical goods or services is interrupted resulting in service impacts to customers or the environment, or capital programme delivery partner failure resulting in delays to service improvement or quality failures. The risks are mitigated with a number of controls: supplier relationship management, contract assurance, strong governance, business continuity plans, alternative suppliers, market monitoring, benchmarking and price hedging. Our resilience plan for these risks is provided in supplementary report S4005 – "Operational resilience: Detailed risk assessments and resilience plans".

Case studies of how we use markets to provide resilience and efficiency are given in Chapter 6 (section 6.4).

4.5.4 Our best-practice integrated risk assessment process

Our business risk management framework follows an enterprise-wide approach. It covers all risk types (e.g. Strategic, Operational, Financial, Compliance and Hazard) across the entire company and considers internal and external factors. The key principle of the framework is the achievement of objectives and associated targets that underpin our company vision to be "the best UK water and wastewater company, providing great service to our customers". This section provides a summary, and full details are provided in supplementary report S4003 which demonstrates the organisation-wide integrated nature of our framework.

The risk management process for objectively assessing and prioritising risk forms part of the overall framework. This process has been adopted from, and aligns to the International Risk Management Standard ISO 31000.

Identification focuses on inherent risk events. Each potential event is analysed for the likelihood of occurrence based on causal factors and the potential impact (financial and reputational) of each consequence should the event occur. This analysis is undertaken using various tools to identify key attributes and sources of evidence including risk breakdown structures, consideration of proactive and reactive activity and risk consequence (Figure 4.3).

The process enables risk to be evaluated and prioritised and reported. It also supports evaluation and prioritisation of risk which fall outside of the highest ranking risks, but are nevertheless important for the delivery of our objectives and meeting our obligations. A mature governance and reporting structure exists, providing challenge over the objectivity and prioritisation of risk. Governance of our risk management strategy is overseen by the Audit Committee which reviews the effectiveness of the risk management and internal control systems regularly on behalf of the board. The board also provide governance over the objectivity and prioritisation of the risk twice a year in line with the full and half year reporting cycle.

Wholesale Risk and Asset Planning (WRAP) is our integrated business planning process to align the identification of risks and issues, identify and monitor strategic performance requirements, and prioritise these for investment or operational management. It aligns with the International Standard for Asset Management (ISO 55000) embodying the principles of

the asset management system it defines¹⁷. Good asset management is an essential part of planning resilient services for customers. WRAP is illustrated in Figure 4.4.

Figure 4.3: Diagrammatic representation of "Interruptions to water supply" risk

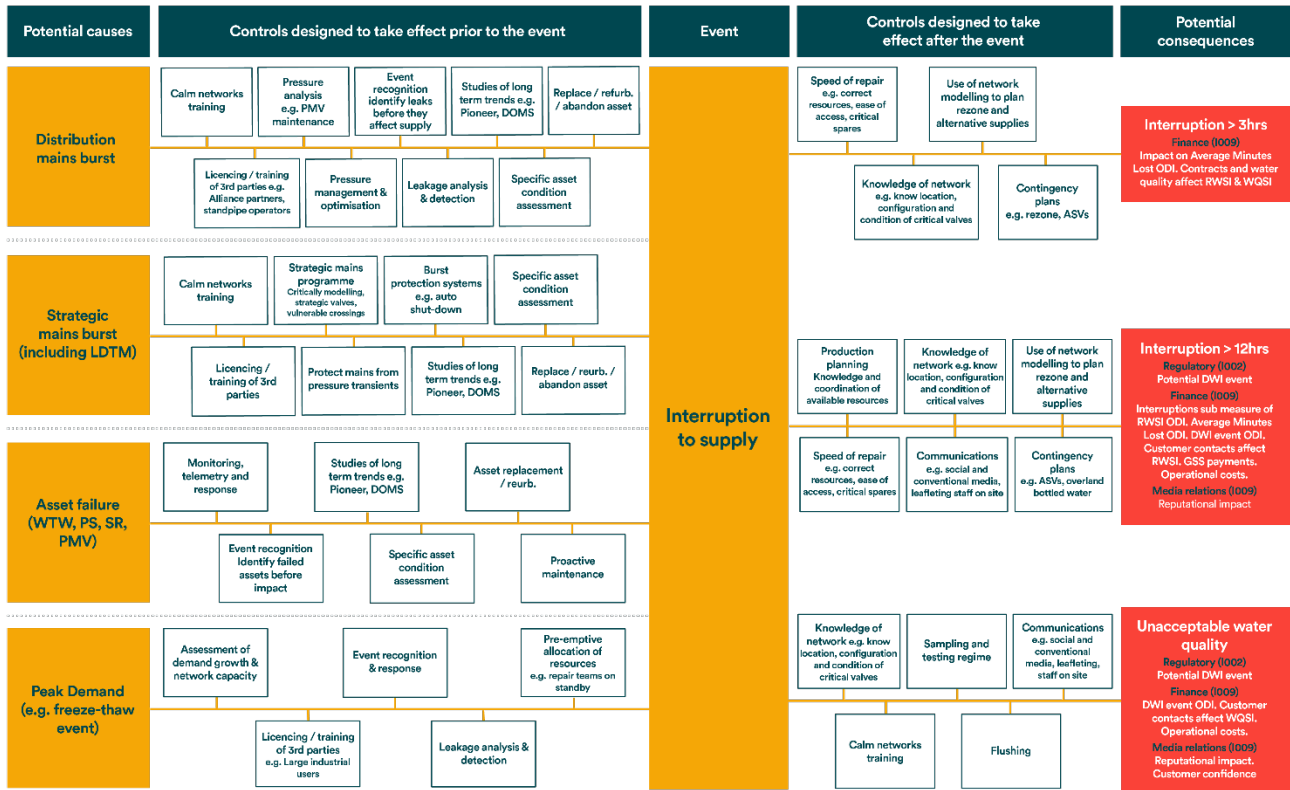


Figure 4.4: Our process for embedding resilience within our wholesale operation



¹⁷ Asset Management: An Anatomy. Institute of Asset Management, 2015

WRAP facilitates the identification of risks “bottom-up” from operational teams and “top down” through our strategies and methodologies. Strategies address and balance customer priorities, statutory requirements and stakeholder expectations. Methodologies provide a consistent approach to assessing risks to those strategic objectives. In a “tier” process bottom-up risks identified by operational teams are aligned with top strategic risks, prioritised and mitigated. This allows us to assess our systems in a structured way to identify asset resilience risks through a range of hazards (see Figure 4.2 for an example). Assessments of asset health support this process because maintaining assets properly for the benefit of current and future generations is a key area of service resilience. Supplementary report S4001 demonstrates that we have the data, tools and capability to assess asset health and to make risk balanced decisions that impact the health of our assets in a controlled way and supplementary report T9035 – “Approach to asset health: Jacobs report” provides a third-party review of our approach to asset health.

Asset health

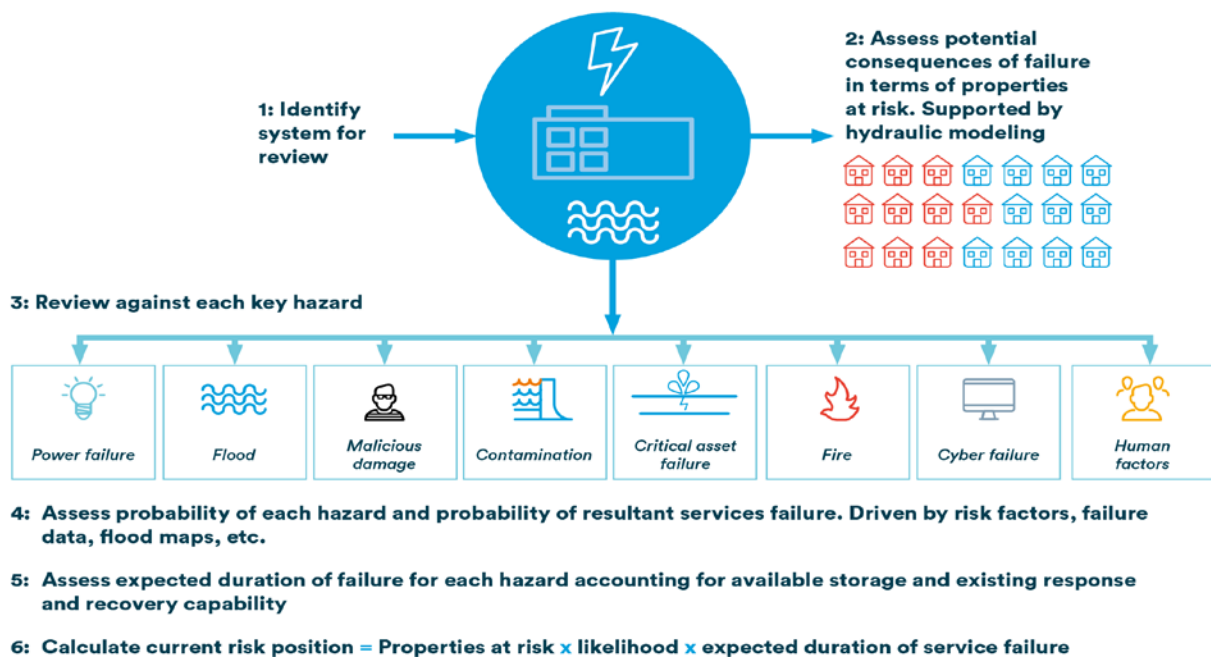
Over 90% of customers surveyed thought our proposed asset health measures were easy to understand.

Jacobs (formerly CH2M) reviewed our approach, comparing with their *Targeted Review of Asset Health* for Ofwat, and concluding that we were **best in class or leading** in four aspects and “performing” in the remaining three.

Supporting evidence in supplementary reports S4001 and T9035.

All risks are captured in our investment prioritisation system where risks are weighted based on relative customer valuations and options are considered (see section 4.5.5).

Figure 4.5: Multi-hazard approach to resilience risk assessment using the water service as an example (this methodology informs the development of risk assessment in Figure 4.3)



Following incidents in 2015 we asked Arcadis to carry out a comprehensive review of our risk management framework. Their report concluded that a well-structured corporate risk management framework was established. It noted “a robust process and Governance approach which reflects best practice”, “good application of quantification of risk with clear target levels of exposure” and “active senior management, executive and board level engagement and commitment to risk management”.

Our corporate audit team, supported by PwC subject matter experts for risk management, undertook a risk management audit in 2017 that concluded the following:

UU’s risk management framework represents good practice, although further work is required to fully define and embed risk appetite. Good progress has been made ... to ... enhance the existing risk management framework and embed it within the business. In particular, there is an increased linkage between the operational risks and corporate risk reporting.

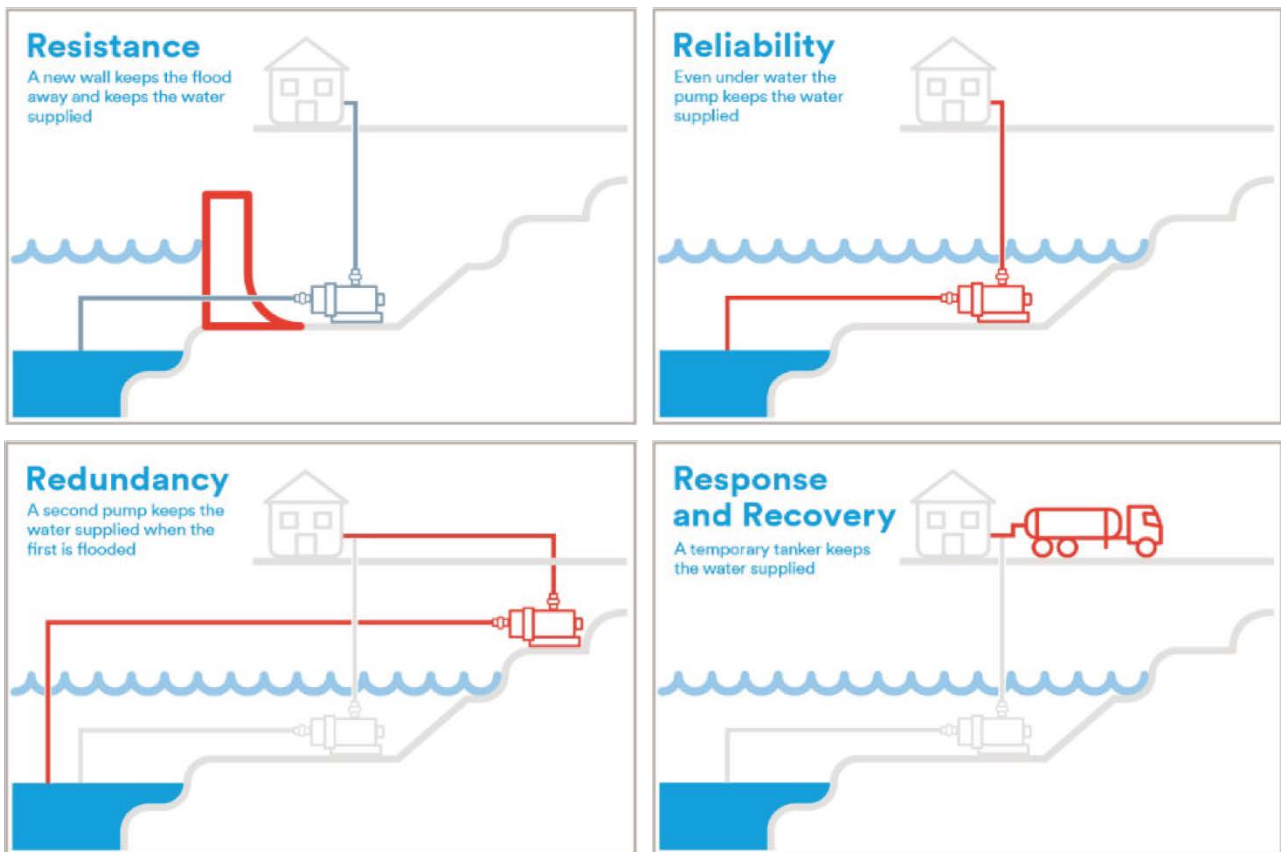
Resilience is about how effectively risks are mitigated, and the following sections explore our resilience in terms of risk assessment and mitigation plans.

4.5.5 Our best-practice assessment and selection of options

Embedded in our business process is an objective, best practice assessment of the full range of mitigation options. This relates to Resilience Principle 4: “broad consideration of intervention options”. Our process categorises control and mitigation options into four different types: directive, preventative, detective and responsive. This categorisation lets us understand the focus of existing controls, both individually and in combination, and objectively target risk improvement.

These four control/mitigation types incorporate the four Rs (Resistance, Reliability, Redundancy and Response & recovery) from Cabinet Office guidance¹⁸ which sets out how resilience can be delivered (see Figure 4.3 as an example). Each control is assessed for its design and operational effectiveness to target specific improvement actions that represent best-value for money over the long term.

Figure 4.6: Explanation of the 4 Rs of resilience using different ways to provide resilience of water supplies to flooding as an example



Once the current risk position (net of existing control effectiveness) has been evaluated, a target risk position is selected. Selection of the target position is based on various mitigating options to align with risk appetite, objectives and obligations. Specific mitigating actions relative to the control types are then selected relative to the selected option. Progress is then monitored on an ongoing basis.

All risks are captured in our investment prioritisation system where risks are weighted based on relative customer valuations. Once the most cost effective way of mitigating that risk has been assessed, investment is prioritised based on cost-benefit and lower price solutions delivering large risk reductions in areas that customers value are therefore

¹⁸ Keeping the Country running 2011

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/61342/natural-hazards-infrastructure.pdf

prioritised. This relates to Resilience Principle 5: “delivering best value solutions for customers”. If a risk does not have a solution that is prioritised for investment, this decision is fed back through the tier process to ensure that all risks continue to be effectively monitored and mitigated until a better solution can be found. The overall level of risk is reported through our governance structure to inform the setting of business plans and budgets.

Table 4.2: Generic solutions in our Wholesale Risk and Asset Planning, to support objective assessment of the full range of mitigation options

Generic High Level Solutions			Resilience 4 R's
1	Monitor and Respond	Accept the risk, monitor it and plan to respond in an agreed way if the risk arises. Document this in a contingency plan.	Response and Recovery
2	Operational Intervention	Return assets to their original performance capability through one-off intervention activity, coupled with an agreed contingency plan.	Reliability
3	Optimisation	Improve asset performance capability by changing operational and maintenance regimes, possibly coupled with one-off investment to increase the capability of the existing assets.	Reliability
4	Refurbishment	Major refurbishment of existing assets to prolong asset life and restore performance capability to original design.	Reliability
5	Replacement	Replace assets on a like for like basis, restoring the original performance capability.	Resistance, Reliability
6	New Asset	Capital investment on new or additional assets to meet new performance standards, enhanced reliability or a more cost beneficial solution.	Resistance, Reliability, Redundancy
7	Partnership solution	Collaborative investment shared or wholly provided through a third party with costs and benefits shared across all parties.	Any of 4 Rs

4.5.6 Summary of corporate resilience

By making sure the right people, leadership, infrastructure, systems and processes are all in place and working effectively in this way it allows assessment and management of resilience in the round for the long term. This links to Resilience Principle 1. Further supporting evidence on our corporate resilience is available in supplementary report S4003, which demonstrates the ability of our governance, accountability and assurance processes to help avoid, cope with and recover from, disruption, and to anticipate trends and variability in all aspects of risk to services.

4.6 Operational resilience: Our key risks and resilience plan

This section gives an overview of our operational resilience by price control. For each area it identifies our key risks and summarises our long term resilience plan. Short case studies give examples to provide further evidence for the IAP tests on resilience. We start with an overview of our risks, followed by an explanation of our operational response and recovery plans. One risk relating to the resilience of water supplies to Manchester and the Pennines is significantly larger than all other risks. While this risk is discussed in context below, full evidence relating to Manchester and Pennines resilience is provided in the cost adjustment claim submission U UW_WN1_M. In addition, supplementary report S4005 – “Operational resilience: Detailed risk assessments and resilience plans” provides numerous examples from across our organisation, demonstrating a clear understanding and objective assessment of risks, together with objective assessments of a full range of options to evidence long term best-value mitigation plans.

4.6.1 Our current and future risks

The process explained in section 4.5.4 has identified that our business risk profile consists of 93 all-encompassing risks from across the business (as at April 2018). Each individual risk within the profile is allocated to one of ten principal risk areas providing an overview of how the risk exposure is distributed and the extent of the exposure for each area. A principal risk is: “a risk or combination of risks that can seriously affect the performance, future prospects or reputation of the entity. These should include those risks that would threaten its business model, future performance, solvency or liquidity.”¹⁹ Figure 4.7 illustrates the aggregated risk exposure (current state) of for each principal risk (excluding political and regulatory risks) relative to the probability of occurrence and full life financial impact for each risk underpinning it. Reputational exposure is also noted.

¹⁹ FRC Guidance of the Strategic Report June 2014

Figure 4.7: Full life risk exposure (product of likelihood and impact) for each principal risk area (ranked by financial exposure). Shading shows the contribution the Manchester and Pennines water supply risk makes to the water principal risk

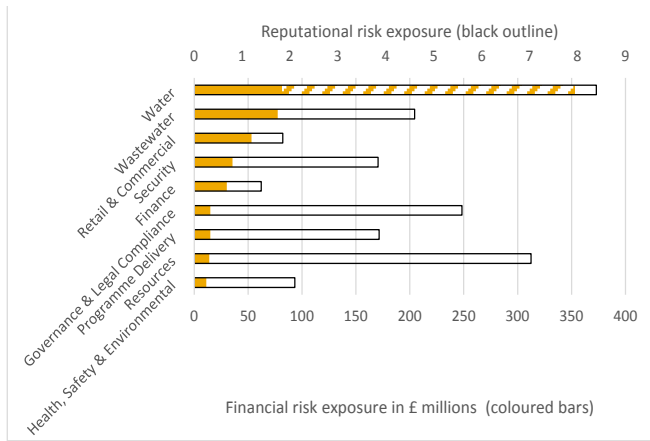
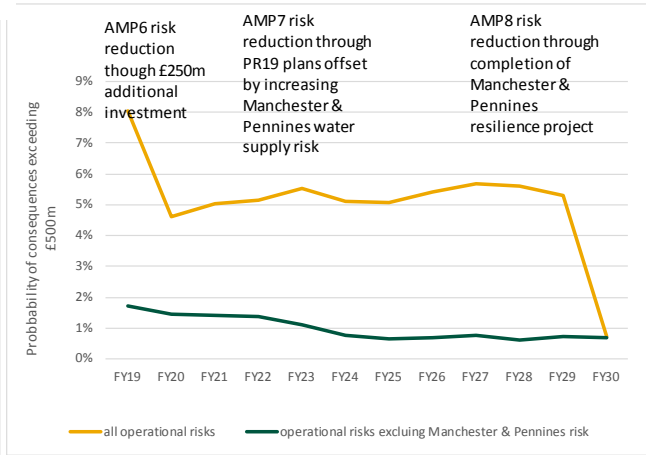


Figure 4.8: Overall risk profile for AMP6 to AMP8



As would be expected, Figure 4.7 shows that operational risks (including water, wastewater and retail & commercial principal risks) are relatively higher than the other principal risk areas. These assessments are in the current state, assessed with existing controls in place. The water service principal risk is significantly higher than all the other principal risks mainly due to the scale of risk from failure of the main aqueduct supplying Manchester and Pennine areas (see case study in section 4.6.8). The water principal risk also includes high impact, low likelihood risks such as the uncontrolled release of water from statutory open reservoirs.

A summary of the top operational risks is shown in

Table 4.3 and the changing risk profile as a result of our AMP7 plan is shown in Figure 4.8. A number of case studies are then given in the following sections. These are not necessarily the highest risks, but have been selected to show a range of different types of risk.

Although other risks are lower, our process makes sure that they are given appropriate management. Of the 93 risks which underpin this analysis many have a relatively low likelihood, for instance 35 risks events are less than 5% likely to occur in any one year. Nevertheless, such lower risks are identified, assessed and prioritised through our processes.

Table 4.3: [X]

[X]



[<]

4.6.2 Our plans to recover from disruption

We have tried, tested and improved plans to recover from disruption to maintain services for customers and protect the environment, involving partnership working and innovative customer engagement. As noted in section 4.4, we have substantially improved incident management policy and procedures. This ensures a properly resourced response, organised to meet the specific demands of the incident and led by a manager of appropriate seniority.

Cabinet Office best practice guidance is fully incorporated into our procedures ensuring a common approach across our organisation and aligning us with police, fire, and local authority and ambulance responders when working together in major incidents such as flooding. We also take best practice from these other agencies into our business. We believe we are in the vanguard of the utility sector in adopting these principles into internal procedures²⁰.

Our Priority Services²¹ scheme provides customers in vulnerable circumstances access to a specially trained team of call handlers, and a range of support services, including additional support during a water supply issue. Separate contractual arrangements are in place to provide these customers with alternative supplies. More than 35,000 customers have been signed up to the scheme in the past two years.

At the core of our response and recovery approach is our Integrated Control Centre. It's the part of United Utilities which provides a single and informed view of how the water, wastewater and bioprocessing business streams are performing, in real time. The centre is a key part of our Systems Thinking approach and includes the following activities:

²⁰ For example, in 2018 the Cabinet Office are to issue a set of resilience standards, we plan to take full account of these in a review of our procedures.

²¹ For a video explaining our Priority Services offering see <https://youtu.be/fYRjGGEW174>

- 24/7 company duty manager, responsible for horizon scanning, leading the response to breaking incidents and applying our incident management methodology to relatively minor events to prevent escalation into incidents
- Remote monitoring and control of our operations
- Customer service function providing 24/7 response to customers
- Work management function providing direction and monitoring of our field based teams for reactive and planned work to repair and maintain our networks and facilities
- Operational technology, emergency planning, business continuity and data management teams

This enables a uniform and coordinated approach to response and recovery and where events impact more than one business stream, enables effective prioritisation of resources to minimise impact on customers, wider society and the environment.

Figure 4.9: Our Integrated Control Centre with the latest operational status on display



We have a comprehensive set of business continuity and contingency plans. We align our continuity plans to ISO 22301 guidelines. We have an in-house recovery work area immediately available for critical teams and also contract with an independent work area recovery provider. We have suites of contingency plans to address disruption to operational assets. There is a hierarchy from incident management policy and procedure through tactical plans, generic asset level plans and site specific plans. Tactical plans include, as an example, plans for dealing with severe weather. Site specific plans cover many aspects of our operation, for example individual plans for incidents at our c.180 open reservoirs.

Training and exercising is vital to assure ourselves of our effectiveness and to ensure staff remain familiar with contingency plans. Over 200 senior and front line managers have been trained by the Emergency Planning College, with eLearning for other staff to improve their delivery of incident response. We use full deployment exercising where responder staff act on the ground not just around a table. In 2016 we held or participated in ten exercises of contingency plans. For example we were a lead player in a multi-agency exercise, Triton II²², which was shortlisted for an award in the 2017 British Construction Industry awards.

In 2017 we undertook the first of what will be an annual crisis level incident exercise: simulating a cyber-attack on our IT systems and operations assets. Sixty employees took part, from front line operational staff to members of the Executive team. The objective was to validate our computer security incident response team, incident management and crisis management plans. It explored linkages between parallel IT and operational incidents and the resulting command and control challenges. The opportunity was taken to explore and refine arrangements with crisis leadership through our new executive crisis management team. The experts we engaged to run the exercise²³ recognised strengths in our plans and capability including stakeholder communications but made some recommendations which we have built into an improvement plan.

²² For a video explaining exercise Triton II see <https://youtu.be/eZdHj-41DWM>

²³ Operational Command Training Organisation Ltd, Europe's foremost authority on the leadership and management of crisis and emergency situations.

We actively participate in the North West utilities forum where infrastructure providers come together to align response plans, train and exercise. In 2016 and 2017 this group ran a North West level exercise workshop followed by a series of exercise workshops across Greater Manchester local authorities. These exercises were built around a widespread prolonged electricity outage, the interconnectivity of utilities and our fundamental reliance on electricity. Another exercise will be run with other North West local authorities in 2018 and in addition we are planning a programme of exercises for 2018/19.

Drawing together partnership working and contingency planning, we have joined up interagency plans with our Local Resilience Forum partners for dealing with loss of water services. The plans have proved their value in major incidents, but the engagement also mitigates risk proactively. We work closely with both electricity distribution network operators in our region. For example, we coordinated maintenance work to minimise overall risk to services during work on the Haweswater Aqueduct in 2013 and 2015. We have also run joint exercises with these organisations to identify interrelationships and vulnerabilities across utility services.

The benefits of our preparedness are evidenced, for example, in our response to the freeze-thaw event in February and March 2018. Following its' cross-company review of the event, Ofwat concluded that "our overall analysis of United Utilities' performance is that it performed well and largely met its customers' expectations"²⁴.

4.6.3 Security risk and resilience

There are a range of security risks which could affect service to customers. These include physical and cyber risks, including risks of loss or breach of data including customer data. We have a comprehensive range of controls to protect our systems, services and customer data.

We have a dedicated security manager responsible for the physical security governance throughout UU, including guidance, support, direction and advice on all aspects of physical security, personnel security, criminal investigations, internal and external security events and international business travel. Our security manager is a specialist in counter terrorism who monitors and identifies security threats to the business and acts as the single point of contact to Government Security Advisors, the security services and the intelligence and various law enforcement agencies.

We take a proactive approach to industry and sector engagement. UU employees currently hold the chair of the Water Security Information Exchange, the Telecoms Association of the Water industry and sit on the Water Sector Protective Security group. We also attend regular industry security briefings held by the National Cyber Security Centre, the Centre for the Protection of National Infrastructure and Defra. We are committed to the Cyber Security Information Sharing Partnership platform and continue to work closely to encourage the sharing of information across UK PLC to help reduce risks.

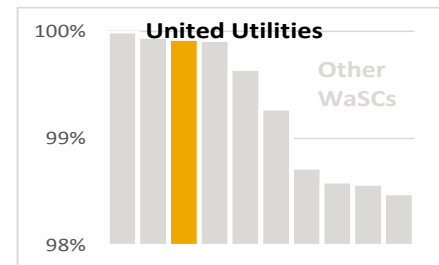
Employees across the entire business have received security related briefings, presentations and mandatory eLearning programmes to enhance their awareness on all aspects of security with an emphasis on reporting criminality, security risks, suspicious activity and other incidents. Employees are encouraged to report such occurrences via our official reporting system, and as a result 118 occurrences of 'suspicious activity' were acted upon in 2017. The most significant cyber risks for any large business can be quickly separated into three key categories: data breach, service unavailability due to cyber-attack and loss of data integrity. As a critical national infrastructure provider, we also

Freeze-thaw 2018



Our **systems thinking** approach proved very successful with no service reservoirs running empty and water treatment works production being maintained throughout.

More detail in supplementary report S4002



Percentage of customers unaffected by interruptions of four hours or more²⁴

²⁴ Letter from John Russell to Steve Mogford, 19 June 2018 and "Out in the cold: water companies response to the 'Beast from the East'", Ofwat, June 2018.

consider the management and control of operational resources that could be compromised remotely due to malicious actors. Consequences for customers range from interruptions to their services to fraudulent activity.

We recognised some years ago that addressing the myriad of cyber threats in today's digital environment needed a more mature approach to understanding and addressing risk than was in general use at the time. To provide best-value cyber risk management, we understood that the threat landscape must be viewed in a holistic manner with a strategic plan. To achieve this, security governance was restructured and we built a sector-leading, company-wide security governance board through which security strategy, compliance and governance could be applied across the whole business.



Case study: Our layered cyber security model

Supporting evidence on cyber risks and development of the cyber security plan in supplementary report S4005

To protect customer services and customer data from cyber risks, we use a highly evolved, layered security model which has the following elements:

A strong security infrastructure investment plan. By considering innovations such as cloud services, internet of things, virtual reality and hyper-virtualisation, we can remain at the cutting edge of IT advancements to provide the most reliable improvements to customers and retain appropriate levels of security.

A ground-breaking **cyber assurance** process. Our dedicated information security governance and assurance team, is the largest in the sector, and ensures that for each IT solution created, best practice security and data principles are built in from initial concept to final delivery into business-as-usual processes.

Continuous management, monitoring and reporting of the IT estate for any unexpected security events provided by a global IT security company. We can patch, upgrade and build defences in the most cost efficient manner to meet the threats as they evolve.

Staff education, awareness and training because employees play a critical part in security.

Strongest possible security for Operational Technology to protect our water and wastewater operational sites. Many of our controls are industry leading and will not be found in many parts of the industry where cyber security tends to have a very slow adoption rate.

A **cyber incident response plan** which follows NCSC best practice guidance, and is tested repeatedly.

Data integrity controls including encryption of sensitive data and supplemented with resilient architectures and backup and secondary data repositories.

4.6.4 Delivering resilience through natural capital

Resilience of services for customers is interdependent with resilience in the external environment which underpins our activities. This includes the natural environment: catchments, soils, ecosystems and biodiversity. Our services rely on services from the natural environment and the environment depends on our services. We are the largest corporate land owner in the UK with around 56,000 hectares of land. We have a long history of managing this land for multiple benefits, such as water quality, recreation, biodiversity and carbon sequestration. Applying systems thinking we are now moving further forwards with an integrated catchment strategy.

The Natural Capital Committee defines natural capital as “those elements of the natural environment which provide valuable goods and services to people, such as the stock of forests, water, land, minerals and oceans”. We rely on natural capital to provide the clean water that we then treat and supply to customers. Our wastewater system helps to protect and enhance the natural capital of the North West, recycling wastewater to the natural environment. We know that customers also benefit by experiencing the natural capital that we own through access and recreation on our sites. Our investment plans support the natural environment and we're exploring how natural capital approaches can help us

to make better decisions about the management of our land, assets and business and make them all more resilient. This aligns to Resilience Principle 2: “A naturally resilient water sector”.

The principles behind our integrated catchment strategy enable effective and efficient delivery of outcomes within a catchment. This brings together our analysis of water quality, water resources and flood management, together with learning from our earlier sustainable catchment management plans (SCaMP) and taking a holistic approach to planning and service delivery. We are working across the price controls, promoting integrated ways of working through synergies, but ensuring there is a robust evidence base to support investment and challenge uncertainties that our interventions will deliver tangible benefit to customers. Water catchments, water efficiency and leakage reductions, our turning tides partnership and sustainable drainage are all examples of enhancing natural capital. Additional supporting evidence is in supplementary report S4004, which demonstrates how we are ensuring the resilience of the natural environment and ecosystems on which our operations depend.

We have piloted a number of natural capital approaches across our business over the last year (see case study below). These pilots will enable us, and stakeholders, to see how to make the most of natural capital approaches in the future. Our approach to natural capital has been developed through our Corporate Responsibility Panel, Wholesale board, the Executive and board level Corporate Responsibility Committee. It will allow us to apply Natural Capital solutions on a larger scale in AMP7 and adopt Natural Capital solutions as a standard part of our approach in AMP8. Consideration of Natural Capital will be a standard part of our investment appraisal methodology by PR24.



Case studies: Natural Capital Strategy

In-depth explanation of these examples is provided as supporting evidence in supplementary report S4004

It is our strategy to develop a full natural capital account for PR24 underpinned by natural capital tools and appraisal models.

Corporate Natural Capital Account. To enable us to assess and track the value of the Natural Capital that we own we are building a Corporate Natural Capital Account, based on the Natural Capital Committee’s framework, to help inform decisions over the future management of our land holding to ensure the resilience of the ecosystem service we rely on as a company. This project also includes training for our strategic land management and finance teams to enable further accounts to be completed by our own teams.

Natural infrastructure. In partnership with the National Trust and Green Alliance we’ve been exploring how a ‘natural infrastructure scheme’ might work, paying upstream landowners for downstream benefits such as “slow clean water”. We are looking at how this might result in catchment management outcomes being delivered in a more efficient manner securing natural capital and its benefits through alternative market mechanisms.

Petteril catchment integrated thinking. As part of our integrated catchment thinking, we have undertaken a project in the Petteril catchment that has created an innovative ‘Natural Capital Integrated Catchment Optimisation Tool’ which will generate a Natural Capital account for the catchment and enables different catchment interventions to be modelled to assess the best way to achieve catchment outcomes. We have undertaken two behavioural research sessions in the catchment to gauge customer and stakeholder views on integrated catchment management options. The results inform the tool and assess the Natural Capital benefits of the options and where these occurred.

Natural Course. We are partners in Natural Course, an EU funded project to build capacity to protect and improve our North West water environment, now and for the future. A key element of this is using Natural Capital solutions to bring multiple benefits. Further detail is provided in the case study on partnership working in chapter 6 section 6.4.2.

Auctions for environmental benefit. We recently trialled the use of ‘EnTrade’, an online auction platform for improving the environment. Further detail is provided in the case study on our Natural Capital trading strategy in chapter 6, section 6.4.2.

4.6.5 Helping customers to support resilience

We also consider the resilience of the communities with which we interact. There are many aspects which make up a community. This can include environmental, economic and social factors, which includes financial systems, infrastructure, political systems, networks and connectivity, people, culture, identify and natural assets. The areas of strength and vulnerability (issues) across these themes (and how they interrelate) will ultimately determine a community's ability to thrive while being sustainable and resilient. Segmenting communities in this way also enables more effective engagement on water issues as 'one size fits all' fails to chime with specific interests.

We have a community investment framework, endorsed by our Corporate Responsibility Committee. This provides a coherent link from our business principles²⁵ to measures and targets, mapped to agreed focus areas. We're targeting activity and resources with the purpose 'to work with communities to benefit the North West' and retain the key focus areas of debt and deprivation, environment and education and skills. Examples of community resilience include:

- our multi award winning Town Action Planning and our industry leading priority services, targeting support for those who find themselves in the most vulnerable circumstances (see Chapter 3)
- promoting water efficiency, including a long-running campaign with communities in West Cumbria: reducing water consumption in a particularly environmentally sensitive area and reducing bills (including energy bills through less hot water use) for customers in relatively deprived areas around Workington and Whitehaven
- renting a shop in Keswick²⁶ to engage local people of the West Cumbria water supplies project
- partnering with other companies, local authorities and regulators on catchment restoration schemes such as Moors for the Future²⁷ and Natural Course²⁸
- demonstrating and engaging with the gardening community through the Royal Horticultural Society with the award winning 'slow the flow garden'²⁹ at the Tatton Garden Show
- working in partnership with City of Trees³⁰ and others to plant street trees in Salford and Prestwich. The trees will slow the amount of surface water going into the sewer and reduce the risk of surface water flooding as well as creating a quality environment, benefitting local business and attracting further investment.
- Organising a vlog star competition³¹ to address wet wipe disposal with North West Schools.

We also prioritise some of our economic activity to support local communities. For example, for our West Cumbria water supply project we are targeting activity within the local area. West Cumbria has a number of communities with relatively high deprivation. This includes a community investment fund to support local third sector organisations, specifying a proportion of local work in contracts with the supply chain, and a scheme to develop local young people not in employment, education or training (NEETs). As a result 8 NEETs were employed with United Utilities or its supply chain. In total we estimate that the project will boot the Cumbrian economy by £52m. Over the long term this will contribute to improving debt and deprivation and skills to the benefit of future generations of customers.

In AMP7 we are establishing CommUnity Share which will provide a substantial package of company funded measures to support vulnerable

Community Resilience

It's the capacity of communities to survive, adapt and grow no matter what kinds of chronic stresses and acute shocks they experience.

Definition adapted from 100 Resilient Cities

Nicci Russell, managing director of Waterwise, on water company plans to reduce consumption:

"United Utilities is the most ambitious, although it does not have a serious water resource problem coming in the immediate future, but it is doing it for affordability. There are multiple benefits from water efficiency"

Evidence to Inquiry into Regulation of the water industry, Environment, Food and Rural Affairs Committee, 20th June 2018

²⁵ <https://www.youtube.com/watch?v=fLkztG7JubA&feature=youtu.be>

²⁶ <https://www.unitedutilities.com/cumbria/our-plans/keswick/>

²⁷ <http://www.moorsforthefuture.org.uk/>

²⁸ <http://naturalcourse.co.uk/>

²⁹ <https://youtu.be/GFwCidSDxfg>

³⁰ <http://www.cityoftrees.org.uk/>

³¹ <https://www.unitedutilities.com/services/wastewater-services/uu-vlogstars-2017-competition/>

customers and an upfront guarantee that if we pay dividends over a certain threshold or in the unlikely event we become highly geared we will ensure that customers gain benefit through bill discounts or other investments in enhancing the resilience of the North West. We will consult widely with customers and stakeholders about where such spending will be best targeted. The CommUnity Share is an additional level of commitment which goes beyond any reinvestment and benefit sharing that might be undertaken during AMP7 through normal regulatory mechanisms and on the same voluntary basis as was observed in AMP5 and AMP6.

4.6.6 Retail service resilience

The resilience risks relating to our residential retail service include risks to continuity of services for customers, maintenance of customer service performance and bad debt levels. The first two of those are summarised here. Supporting evidence is provided in supplementary document S4005, which demonstrates a clear understanding and objective assessment of risks, together with assessments of a full range of options for long term best-value mitigation plans.

There is a risk that residential retail services may become unavailable due the loss of site or a core IT system. Events such as a security or health and safety issue or infrastructure failure could result in a temporary loss of service for customers. Customer contact channels could become unavailable or unserviceable, resulting in an inability of customers to contact us in relation to billing or wholesale service issues.

Ensuring customers are able to contact us, particularly in the event of a water or wastewater service issue is an important part of overall event mitigation and wider service resilience. This means that mitigating the impact of events which may interrupt customer contact channels is important. A range of options exist to ensure contact channel continuity, including:

- Maintaining multiple contact centre locations
- Having arrangement for emergency alternative sites in place
- Maintaining multiple contact channels

We have chosen to put in place elements of all the above options to help ensure that customers are able to contact us even under extreme circumstances. Both of our two main call centres are capable of delivering a full service offering for a finite period should the other site become unavailable. However both sites are secured and well maintained and the assessed risk of loss of one or both of the sites is small. In the event that a core shared system were to become unavailable (e.g. telephony) we maintain arrangements to access emergency back-up sites as part of our business continuity plan. These plans are tested regularly and their suitability assessed. These sites have access to independently serviced telephony and IT systems ensuring that basic customer contacts could be restored after a short period, even in the event of a major service interruption.

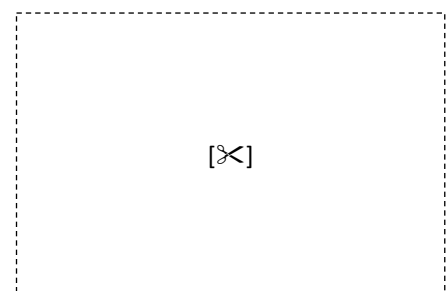
4.6.7 Water resources

Our water resources business manages our water catchments and raw water assets, including our fleet of reservoirs.

In developing our plans we have identified that the key risks that the Water Resources service must be resilient to are:

Figure 4.10: [X]

- **Impounding reservoir failure** – we have had a proactive regime of reservoir risk management for 15 years, and will continue our multi-AMP approach by reducing risks at 6 dams in AMP7 (Figure 4.10)
- **Deteriorating water quality** – in AMP7 we will continue with our Sustainable Catchment Management Programme (ScaMP), increasing the area covered at a lower unit cost by integrating with other investments in catchments and focussing on resilient catchments to protect habitats



- **Environmental damage due to abstraction** – our AMP7 plan includes a range of interventions as set out in the WINEP
- **Interruption of supply into network** – our AMP7 plan includes refurbishment of three strategically significant pumping stations to ensure we can reliably supply water under a range of challenging circumstances

Pioneering catchment approach

“United Utilities’ SCaMP was the first large-scale water company intervention in land management”

Blueprint for PR14, Blueprint for Water coalition, September 2012



Case study: Drought risk

Full analysis is provided in our WRMP, which is fully integrated into this business plan and included as supplementary report S5003

Droughts bring environmental consequences through the introduction of drought permits which allow more water to be taken from the environment to mitigate the potential for loss of supply. In extreme droughts customer supplies could be interrupted through emergency drought orders to introduce standpipes, rota cuts or other emergency responses. Widespread loss of supply would bring significant social and economic consequences, disrupting daily life in homes and businesses.

For our 2019 Water Resources Management Plan (WRMP) we adopted a number of innovative methods, including stochastic modelling, robust decision making and system simulation. We examined the in-combination effects of a range of future uncertainties including: extreme drought (over 17,000 years of synthetic hydrological records); climate change (100 UKCP09 scenarios); and demand (encompassing population growth, economic trends and patterns of water use). We assessed risks over the 2020-2045 planning period and took a very long-term view at the 2080s.

This work showed that our risk of extreme drought is relatively low, especially once drought permits are included in the assessment (Table 4.4), which gives us industry leading performance on the common performance commitment. Following customer and stakeholder feedback, our plan is to reduce leakage by over 40% by 2045. This will allow us to reduce the frequency of drought permits from 1:20 years to 1:40 years.

Table 4.4: Resilience to extreme drought

	2019/20	2024/25	2029/30	2034/35	2039/40	2044/45
Risk of rota cuts/ standpipes	1:1000 years (0.1%)	<1:1000 years (0.1%)	1:1000 years (0.1%)	<1:1000 years (0.1%)	1:1000 years (0.1%)	1:1000 years (0.1%)

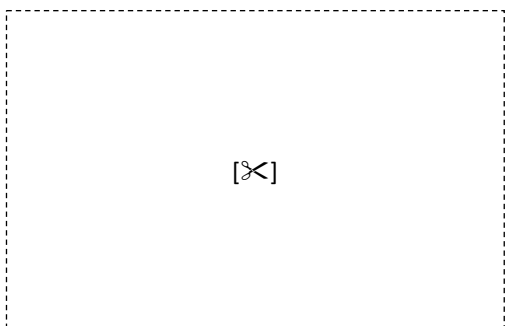
4.6.8 Water network plus

Our overarching approach to providing a reliable water supply is to ensure that we have a resilient, flexible, and dynamic system to allow us to adapt the network performance to deal with extreme droughts, loss of a critical asset, and future demand for water which may include water trading. We want to ensure that our customers are provided with most reliable and high quality service, providing the best possible service and being prepared for extreme events.

In developing our plans we have identified that the key risks that the Water Network Plus service must be resilient to are:

- **Manchester and Pennines** water quality incident or loss of supply. Planned investment will bring significant risk reduction once work in completed in AMP8 – see case study below and Figure 4.11

Figure 4.11: [X]



- **Loss of supply from water network failure** – in AMP7 we will continue with mitigation using the 4R’s, including using more intelligent pumping and pressure control to reduce operational strain on the network
- **Leakage** – since leakage can contribute to supply interruptions and pressure issues, as well as contributing to drought resilience, in AMP7 we will reduce leakage by 15% by tackling the most problematic areas of our network using satellite images and noise logging technology. We will also trial new innovations put forwards by third-parties to enable a long term reduction of over 40% by 2045
- **Supplying unwholesome water** – In AMP7 we are installing UV treatment at our remaining highest risk sites which are WTWs fed by river abstractions

Good practice

“The United Utilities Water plan demonstrates good practice in a number of areas, including the approach to wider resilience, third party engagement and customer participation.”

Ofwat response to United Utilities’ WRMP consultation, May 2018



Case study: Manchester and Pennines resilience

Further details in UUW_WN1_M

Our largest resilience risk is failure of our largest potable water aqueduct, which supplies water to 2.5 million people in Greater Manchester and Pennine areas. Following a multi-AMP strategy we undertook a major outage investigation in 2016. Findings from the outage indicate that there are a number of risks that could result in a widespread water quality incident or loss of supply to many thousands of properties for an extended period.

We have undertaken work to mitigate risks as far as possible before recourse is made to further significant investment, but our extensive risk analysis shows the risk increasing as the asset deteriorates over the coming years. In an extensive process to consider a full range of options to mitigate this risk for customers, we identified and assessed 405 options across the 4 R’s.

We worked with YourVoice and independent academics to engage effectively with customers so we could determine a preferred solution. We also engaged with range of stakeholders, including working with the 100 Resilient Cities organisation. Customers preferred solution is to construct new sections of tunnel parallel to the existing aqueduct. Environmental and economic appraisals favoured this solution, and analysis showed it also the most robust option. Details of our delivery plan for this solution are given in Chapter 8.

Braulio Eduardo Morera

Director, Strategy Delivery, 100 Resilient Cities

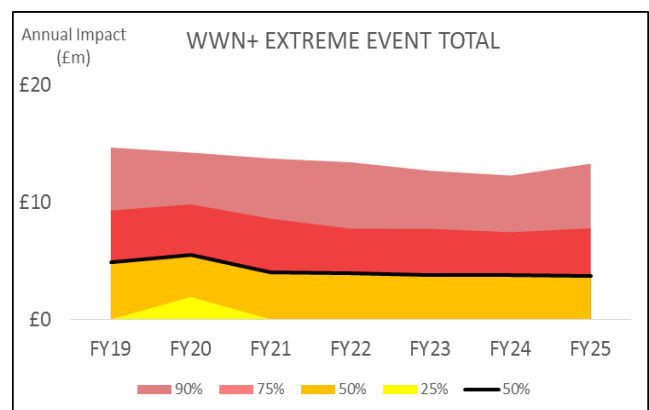
“100RC is delighted to contribute to UU’s exploratory work. According to our experience internationally, it is unusual for utility providers to expand beyond their technical analysis and incorporate research and exploratory work to truly address the complexity of the challenge at hand. This approach is commendable”

4.6.9 Wastewater network plus

Our wastewater service collects and recycles the 3.2 billion litres of foul and surface water we collect from customers each day, returning it to the environment without causing harm or disruption.

We have made significant improvements to performance in recent years, recognised by our frontier position as a four star company in the Environment Agency environmental performance report for three years running. Going forwards we want to maintain high service quality for customers. As such, we are using our systems thinking approach to ensure resilience and customers’ service expectations are managed in a cost-effective way. Our plan is that customers and the environment will continue to experience an improvement in service performance in AMP7. However we expect risk to remain largely stable (see Figure 4.12) as the benefits of our operating strategy are balanced against stronger targets, tighter discharge permits and ageing assets. We also recognise

Figure 4.12: Wastewater network plus risk profile to 2025



the vulnerability of wastewater services to the long term trends of population growth, urban creep and climate change and our resilience plan aims to mitigate those impacts.

In developing our plans we have identified that the key risks that the Wastewater Network Plus service must be resilient to are:

- **Serious pollution** – In AMP7 we will seek to maintain our industry leading position through additional real-time monitoring, de-silting of sewers and engaging customers to prevent sewer misuse. We also remain committed to our Turning Tides partnership to reduce the risk of pollution to surface and shellfish waters
- **Sewer flooding** – The mitigation for flooding is similar to pollution but in AMP7 we will also proliferate surface water separation and the use of sustainable urban drainage systems (SuDS) to manage long term risk from climate change alongside delivering specific enhancement to sewer capacity where appropriate
- **Exceedance of permits** – In AMP7 our discharge permit limits are again becoming more challenging, to meet the requirements of the Water Framework Directive. We will seek to use catchment solutions where feasible and use new technologies such as Nereda to protect the environment and keep costs low

3 years running



Leading company in the
Environment Agency
environmental
performance assessment



Case study example: Managing sewer flooding and pollution risks in an integrated way

Detailed assessment of this risk and our plan to mitigate is provided as supporting evidence in supplementary document S4005.

The North West is one of the wettest places in England and Wales with five out of the top seven wettest urban areas. As such there are high levels of surface water run-off. Climate change, development and urban creep are increasing pressure on our wastewater network which could increase the risk of sewer flooding and pollution. We have therefore developed a unique approach to managing the long term resilience of our network. It's an **enhancement of the drainage strategy framework, called Integrated Drainage Area Study (IDAS)**, and builds on understanding built through our active involvement in the 21st Century Drainage Programme.

IDAS gathers evidence on all the areas which drain to a treatment works and then uses a collaborative approach to define the plan. Local development plans are fed into our network models to understand the impact the development poses to our flooding risk. Using this approach we build up an in depth understanding of a drainage catchment and collate a detailed list of risks.

exceptional model coverage

99.7%

of our wastewater
network is covered
by verified hydraulic
models

So far, we have applied this approach to 18 drainage catchments, containing over 800,000 properties. This learning and experience from IDAS will underpin the framework we are developing as part of the **Drainage and Wastewater Management Plans (DWMP)**. In AMP7 we will review all our 568 drainage catchments, develop DWMPs on a risk prioritised basis and aggregate them into 14 river basin plans and one company level plan.

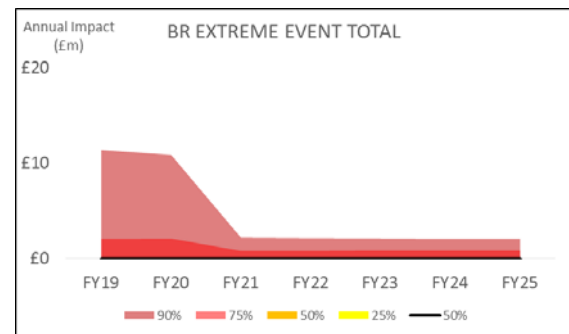
4.6.10 Bioresources

We currently produce approximately 190,000 tonnes dry solid of sewage sludge each year as a result of the wastewater treatment process and this must be disposed of safely. Our plan for bioresources services is focused on delivering the most efficient cost and we expect risk to remain largely stable (see Figure 4.13).

In developing our plans we have identified that the key risks that the bioresources service must be resilient to are:

- **Process safety** – Since bioresources involves gas in high pressure systems, in 2016 we established a unified process safety programme, taking best practice from the oil and gas sectors. In AMP7 we will evolve and further embed a process safety culture within our layers of protection, ensuring that process safety is living and breathing in all that we do. We will focus on assets that are identified as high risk to manage them appropriately, including enhancing our capabilities to operate and maintain them.
- **Satisfactory sludge disposal** – In AMP7 we will expand our biosolids to agriculture operation to secure more agricultural hectares at greater distance from our sludge treatment centres, to allow us to move towards 100% recycling of biosolids to agriculture. This is facilitated by an improvement in landbank availability, improved product quality and co-delivery of the service with farmers. We will retain incineration capability as this enables us to efficiently manage the risk of significant periods of insufficient agricultural land availability.
- **Mersey valley sludge pipeline** – this 85km pressurised pipeline was built before privatisation and bursts could cause pollution and higher operational costs. Analysis shows there currently no known hot spots for significant investment, so we continue our operational plan to manage the risks through a combination of preventative and reactive management

Figure 4.13: Bioresources risk profile to 2025. Risk reduces at the end of AMP6 through our process safety programme and remains stable thereafter.



4.7 Financial resilience: Assessing and demonstrating financial resilience

4.7.1 A frontier company leading the way on financial resilience

We welcome Ofwat's challenge to the industry to improve levels of financial resilience and to ensure companies maintain responsible levels of gearing. Our assessment is that we are the benchmark frontier company in terms of financial resilience.

Our financial strength is driven by two key factors: subjecting ourselves to the scrutiny and rigour associated with being a publicly listed company and our long-term and responsible approach to financial risk management. We are looking to maintain and build upon this into AMP7. In addition, recognising and taking accountability for the scrutiny the industry is under, we have been working with other water companies to encourage and support the necessary improvements required across the sector.

We have a duty to stakeholders to ensure financial resilience over the long-term. Financial resilience means we have access to sufficient financial resources so we can act to protect customers from the occurrence of unusual or extreme events³². It also ensures that we can continue to attract the finance required to fund our customer-focused long-term investment programme at the lowest possible cost.

³² Extreme events are those assessed as being low likelihood but high impact scenarios or a plausible combination of multiple events occurring in an AMP, which have a collectively high impact.

4.7.2 Financial resilience underpinned by strong foundations

Being a publicly listed company

Publicly listed companies must adhere to the highest levels of governance and accountability, carefully balancing the interests of all stakeholders and working in their long-term interests. Publicly listed equity finance provides the broadest degree of shareholder ownership³³ and a viable source for further equity investment. Furthermore, our liquid share price provides a ‘real-time’ investor confidence measure of our resilience and long-term success as an organisation.



It also provides the highest degree of transparency for customers to understand our simple ownership and financial structure. In summary, we consider that it provides the best framework within which to operate and maximise benefits for customers.

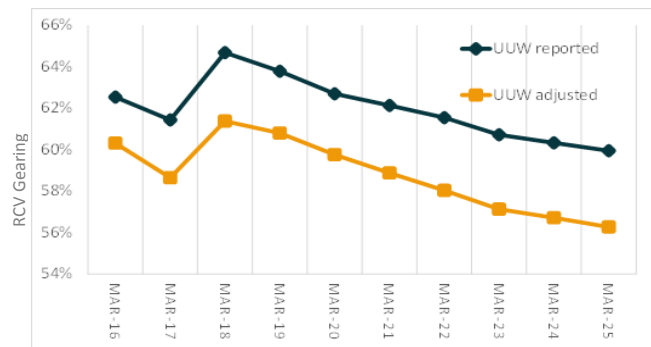
As our regulated activities comprise substantially all (98%³⁴) of our UUG group, the financial resources and interests of the regulated business are robustly ring-fenced and protected, with negligible risks from our non-regulated activities. The gearing of UUG group is c4% lower than the company, which provides a further degree of resilience as additional liquidity within the group could be made available to the company.

Maintaining an appropriate level of gearing

At 31 March 2018, UUG reported a gearing of 65% in its APR, reducing to 61% when adjusted for pensions and a loan to our retail JV, Water Plus. This level of gearing represents one of the lowest in the sector³⁵. To provide a comparable measure of gearing across the sector we consider it appropriate to adjust for the IAS19 pension surplus/deficit³⁶ and the short-term loan to Water Plus.

We have consistently operated with broadly this level gearing for well over a decade and our AMP7 business plan is consistent with achieving gearing of c60% (as reported) by 2025, which is well aligned with Ofwat’s notional company gearing assumption for AMP7.

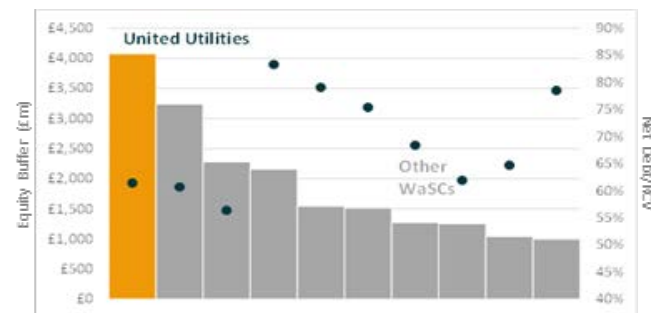
Figure 4.14: UUG reported RCV gearing managed within 55%-65% target range and lower gearing when adjusted for IAS19 pension scheme surplus.



Our objective when managing capital is to maintain efficient access to the debt capital markets throughout the economic cycle. To help meet this objective, the Board strategy is to maintain gearing by reference to the RCV, within a target range of 55% to 65%. This gearing range aligns well with Ofwat’s notional company gearing assumption.

Figure 4.15: UUG highest equity buffer and joint second lowest level net debt/RCV gearing compared to other WaSCs at 31 March 2017.

Maintaining a significant equity buffer (equity portion of RCV) of over £4.5bn on average during AMP7 (the largest in the sector) provides considerable protection and assurance for customers both in terms of insulating them from future financial impacts and due to the increased financial interest shareholders have in the long-term success of the company and the service it delivers. Our strong capital structure enables us to raise new funds through both debt and equity finance and has enabled us to provide a robust viability statement in our Annual report and financial statements.



³³ At 31 March 2018, we had over 79,000 equity investors, the largest of which held a c9% stake.

³⁴ Based on regulated revenue as a percentage of UUG group revenue on an IFRS basis at 31 March 2018.

³⁵ Joint second lowest on a reported basis per Ofwat’s latest Monitoring financial resilience report, dated November 2017.

³⁶ For rationale see ‘UK leading approach to pension scheme risk management’ section below.

Robust credit rating and low cost of financing

Our current credit ratings are A3 Stable/A- Stable with Moody's and S&P respectively. Following Moody's recent water sector review³⁷, we are now the highest rated shareholder owned water company and one of the few companies not to have had their credit ratings put on negative outlook during the PR19 price review process. This again evidences the relative strength of our financial resilience.

A3 Stable Moody's

A- Stable S&P

Our business plan submission looks to maintain robust investment grade credit ratings of at least A3/BBB+ for U UW (actual company), from Moody's and S&P respectively, which provides a degree of headroom above the threshold for investment grade. We consider this level of credit rating enables us to meet our objective of maintaining efficient access to the debt capital markets throughout the economic cycle³⁸.

We have achieved one of the lowest costs of debt in the industry, underpinned by our credit ratings and efficient treasury management. U UW reported an average nominal cost of debt of 3.6% and 4.0%³⁹ for the years ending 2018 and 2017 respectively. As the joint second lowest cost of debt across the industry in 2017, we have helped set the benchmark for efficient financing costs whilst having a capital structure that is unencumbered by securitised debt or overly restrictive covenants. This low cost of debt has fed into a lower industry average cost of debt reducing bills for all customers in England and Wales.

A prudent level of headroom and liquidity

Headroom and liquidity is about having enough cash or readily available cash to meet the funding requirements of the business into the future. We have a longstanding board policy of maintaining between 15 and 24 months of financial headroom on a rolling basis, which provides a substantial level of liquidity to meet any short-term cash flow impacts that may arise. At 31 March 2018, the company had over £1.0bn⁴⁰ of available liquidity at its disposal, comprising £500m of cash and short-term deposits and over £500m of undrawn committed loan facilities. In addition, we manage our debt maturity profile to avoid any undue refinancing risks. At March 2018, our debt portfolio had an average term to maturity of just under 20 years.

At March 2018

£1.0bn of available liquidity

£550m+ of liquidity for 10 months

21 months of liquidity

A responsible approach to financial risk management

We take a responsible approach to financial risk management including the use of hedging in a cost effective manner against interest rates, inflation, foreign currency and electricity prices in line with clearly articulated treasury policies. By not speculating on these costs, we help protect financial resilience and investor confidence by mitigating the impact of these risks.

To help protect stakeholders further from the impact of certain extreme events occurring, we have a carefully constructed portfolio of insurance in place to cover many catastrophic scenarios. This insurance cover provides a significant degree of additional financial resilience by mitigating the financial impact of certain extreme events occurring where these cannot be prevented or managed in other ways.

An example of this was the December 2015 storms which resulted in considerable damage to a number of our sites and infrastructure assets and some c£37m of repair costs. Much of this was eventually recovered through insurers rather than impacting financially on customers and investors through totex overspends. In addition, due to the availability of liquid resources we had the headroom available to respond immediately to the situation ahead of any insurance claim, minimising the impact on customers.

³⁷ Moody's Regulated Water Utilities –UK, Sector in-depth report dated 22 May 2018.

³⁸ See T7003 – "Board letter on financing: Goldman Sachs".

³⁹ Per Ofwat's latest Monitoring financial resilience report, dated November 2017.

⁴⁰ United Utilities Water Limited, Annual report and financial statements for the year ended 31 March 2018 (page123).

UK leading approach to pension scheme risk management

We have the most robust and resilient funding position in respect of our defined benefit pension schemes in the industry and one of the strongest in the UK⁴¹, resulting from our responsible approach to risk management and a collaborative approach with the schemes’ trustees in formulating effective asset-liability matching strategies.

Whilst unfortunately many companies with significant defined benefit schemes are struggling with pension scheme deficits stretching into the £billions⁴², we were the only WASC to report an IAS19 surplus at 31 March 2017. Other WASCs reported a combined deficit of £1.6bn, up by £1.25bn on the prior year⁴³.

We support the Ofwat position of protecting customers from the costs of any existing or future pension scheme deficits beyond the commitments set out in PR09. As deficits can significantly impair financial resilience, as is illustrated by some of the high profile corporate failures in recent times, company gearing assessments should recognise pension scheme deficits as a form of debt. This is consistent with rating agencies’ assessments of gearing and the Employer Debt Regulations 2005 which legally establishes deficits as debt. Normalising the calculation of pension scheme liabilities under IAS19 would provide an even more robust assessment. If gearing estimates do not include pension deficits then there is less incentive for companies to pay down pension deficits, in favour of reducing other forms of debt. Indeed, the incentive would be for companies to allow pension deficits to increase by diverting funds to reduce the reported gearing position.

Effective hedging of the liability exposures within the scheme underpins our robust pension scheme. This includes our asset-liability matching policy that aims to reduce the volatility of the funding level of the pension plan by investing in assets such as fixed income gilts, corporate bonds and swaps, which perform in line with the liabilities, hedging against changes in swap and gilt yields.

In 2010, we introduced our innovative Inflation Funding Mechanism (IFM) that facilitated a reduction in growth risk assets by accepting increased inflation risk, which was fully correlated with the company contributions. In spring 2018, we extended the successful asset-liability matching approach, to fully hedge exposure to inflation in the external market (with removal of the IFM), interest rates and eliminating any exposure to growth risk assets.

With interest rates, inflation and growth asset risk all effectively hedged, we have significantly reduced the financial volatility experienced by the pension scheme and further enhanced our resilience position for the future. As a result, the main exposure in the future will be to changes in the typically less volatile assumption on mortality. The risk around

Figure 4.16: UUU only WaSC with an IAS19 pension scheme surplus at 31 March 2017

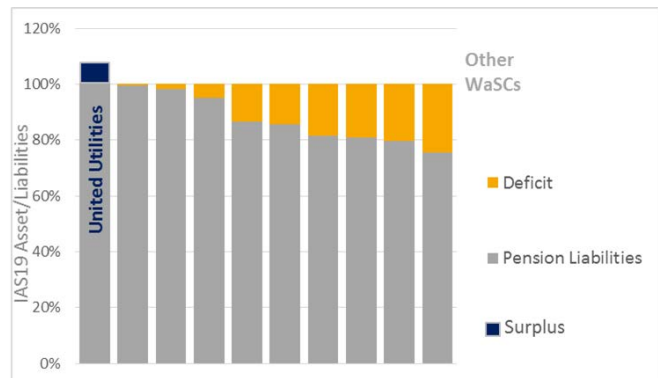
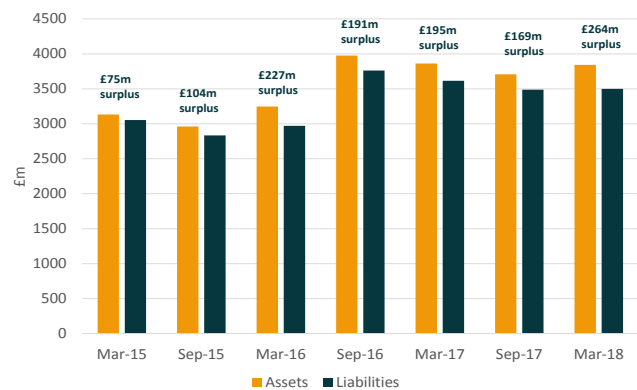


Figure 4.17: Robust IAS19 pension surplus over time, demonstrating a well funded and asset-liability hedged scheme.



⁴¹ Over 70% of FTSE 100, pension schemes are in deficit on an IAS19 measurement basis (Source: The FTSE 100 and their pension disclosures March 2018, JLT).

⁴² Total deficit of FTSE 100 pension schemes estimated to be £46bn at 30 June 2017 (Source: The FTSE 100 and their pension disclosures March 2018, JLT).

⁴³ Source: Ofwat’s latest Monitoring financial resilience report, dated November 2017.

mortality, the rate of improvement in which continues to decline, will be managed through AMP7 with the aim of exiting the AMP with the scheme in self-sufficiency and no longer having a dependency on the company covenant.

In addition, following on from the closure of our defined benefit schemes to new members over a decade ago, in AMP6 we made significant amendments for existing members (see chapter 9, section 9.4.4 for further details.) These put the schemes on a more sustainable cost basis for the future and further reduce our exposure to future scheme deficits⁴⁴.

4.7.3 Demonstrating our financial resilience

High quality 7 year viability statement

As part of our business plan submission the Board has provided a viability statement out to March 2025 having satisfied itself that our plan will support the financial resilience of the company over at least this period (provided in supplementary report S4006). To provide further trust and confidence with stakeholders, Deloitte provided assurance to the Board that the financial resilience assessment was a fair and reasonable basis upon which to make the viability statement.

As a result of our relatively strong financial resilience, as demonstrated in section 0, our financial resilience assessment (in supplementary document S4006) supports that we would be able to absorb the potential impact of the principal risks facing the business in severe but reasonable scenarios. These company specific scenarios come from our best-practice integrated risk assessment process covered in section 4.5.4, which provides a comprehensive and robust assessment of all risks facing the company.

As part of our assessment⁴⁵ we have also performed stress testing using the extreme common scenarios proposed by Ofwat⁴⁶ and again have been able to demonstrate our ability to absorb these. In all but the most extreme common scenarios the company would reasonably expect, on a standalone basis, to be able to maintain credit ratings of A3, BBB+ without having to consider mitigating actions. In the most extreme scenarios the credit rating could reduce further to Baa2, BBB without any mitigating actions, which we consider inappropriate given the lack of headroom this provides and as such, mitigating actions would be considered to restore the ratings to a more comfortable level.

Given our strong capital base and prudent levels of liquidity, we are relatively well positioned to manage through such extreme scenarios. Our significant equity base means that the base case plan has equity dividends of c16% of RCV paid out across the viability period, providing financial flexibility twice that of the extreme combined scenario.

Additionally, we have assessed the potential impact of financing the Manchester & Pennines Resilience programme through the traditional in house funding approach in the event that a direct procurement for customers cannot be secured. Adding the expected impact to Ofwat's most extreme scenario still indicates that the company would be able to sustain a Baa2, BBB credit rating assuming that there was a firm commitment to reflect this expenditure in the RCV from AMP8 on a NPV neutral basis. (See supplementary S5007 and S5007a for further details of this project.)

With regard to the viability statement, the key assumptions that underpin our business plan are that we target to maintain minimum credit ratings of A3/BBB+ for UJW with Moody's and S&P respectively, and that through the allowed cost of equity and RoRE range we are able to provide a sufficient return for equity investors. The target credit ratings underpin our financeability assessment in that we believe such ratings provide efficient access to debt capital markets regardless of where we are in the economic cycle.

During the 2008 global financial crisis (the "Credit Crunch"), considered by many economists to have been the worst financial crisis since the Great Depression⁴⁷, we demonstrated our ability to raise new finance, raising over £1.8bn in

Viability statement



⁴⁴ In the last 12 months, the total disclosed pension liabilities of the FTSE 100 companies have risen from £586 billion to £710 billion (Source: The FTSE 100 and their pension disclosures March 2018, JLT).

⁴⁵ Please see Financial resilience assessment supplementary report S4006 for full analysis.

⁴⁶ Putting the sector in balance - position statement on PR19 business plans (July 2018).

⁴⁷ "Three top economists agree 2009 worst financial crisis since great depression", source: Reuters, <https://web.archive.org/web/20100212214538/https://www.reuters.com/article/pressRelease/idUS193520%2B27-Feb-2009%2BBW20090227>

debt finance, comprising £900m of debt market bonds, £400m loans and £500m in committed facilities⁴⁸. Providing a sufficient return for equity investors underpins our financeability assessment in that it serves to maintain an effective equity base supporting both equity and debt investor confidence which in turn serves to attract future finance at an economic cost. With regard to both of these assumptions, our financeability testing ensures that our business plan does not impair the future viability or financial resilience of U UW.

Financeability

Through our PR19 financeability assessment, we have fully tested our business plan to ensure we can maintain efficient access to debt and equity markets whose on-going trust and confidence we rely on in order to retain or attract capital on the most economic terms, an important consideration given we will need to raise over £2bn of funding in AMP7 to fund new investment and replace maturing debt. We are confident in our ability to raise this level of finance at an efficient cost, given factors such as our responsible level of gearing, our expectation of investment grade credit ratings, our responsible and clearly articulated financial risk management policies and our proven track-record of raising debt at competitive rates of interest.



See chapter 9, section 9.6 for more details on the financeability testing we have undertaken as part of our PR19 business plan.

Key management mitigations available in extreme circumstances

As evidenced in section 4.7.2, we consider that we are the leading company in relation to financial resilience and as such are in a robust position to effectively absorb and respond to extreme events if they were to arise. In the event that adverse factors result in an impact on the business beyond what can be naturally absorbed, there are a number of mitigating actions available to management to ensure the ongoing viability of the company.

The following actions enable the company to improve its capital structure and liquidity position:

- **Deferral of dividends** - if extreme circumstances merited it then the company could restrict dividend payments in order to conserve cash and maintain gearing at an appropriate level. This could increase the availability of cash to enhance the liquidity and capital position of the company.
- **Ability to raise new equity** - as a public listed company we could also enhance our capital solvency through the raising of new equity in the market.

The following actions enable the company to improve its liquidity position only:

- **Ability to raise new debt** - our existing solid investment grade credit ratings of A3/A- and modest level of debt gearing (65% March 2018) provide scope for us to raise new debt finance even if there was a downgrade to our ratings. Increasing our gearing by 5% for example would raise over £500m of cash.
- **Close out of derivative asset positions** - we have an extensive portfolio of derivative instruments, which potentially could be closed-out resulting in over £394m of cash (at 31 May 2018).
- **Capital programme deferral** - we plan to invest around £500m per annum in the first three years of AMP7, of which we could temporarily defer in times of financial stress c£100m per annum to years four and five of the AMP with modest risk to the business.

⁴⁸ See appendix 2, "Financial resilience: Assessing and demonstrating financial resilience" S4006.

4.8 Customers are protected

4.8.1 Customers are protected by our performance commitments

We have set ourselves performance commitments, with appropriate ODI's carrying out performance and underperformance payments to ensure that we will deliver resilient services for customers.

Table 4.5: Relationship between our ODIs and resilience showing how customers are protected

Type	Price control (Key: Common measures (14), Compulsory measure (1), Ofwat long list ODIs (4), UU bespoke ODIs (25))				
	Water resources	Water network plus	Wastewater network plus	Bioresources	Retail and cross-functional
Risk based leading measure of resilience 6 ODIs		<ul style="list-style-type: none"> Water service resilience 	<ul style="list-style-type: none"> Hydraulic internal flood risk resilience Hydraulic external flood risk resilience Raising customer awareness to reduce the risk of flooding 		<ul style="list-style-type: none"> Systems thinking
Long term resilience: management of system stresses 5 ODIs		<ul style="list-style-type: none"> Leakage Per capita consumption Manchester and Pennine resilience Successful delivery of direct procurement of Manchester and Pennine resilience Reducing discolouration from the Vyrnwy treated water aqueduct 	<ul style="list-style-type: none"> Risk of sewer flooding in a storm 		<ul style="list-style-type: none"> Household occupancy verification Non-household vacancy incentive scheme Gap sites (wholesale) Gap sites (retail) Improving street works performance
Asset health 8 ODIs		<ul style="list-style-type: none"> Mains repairs Reducing areas of low water pressure Reducing contacts for taste and smell 	<ul style="list-style-type: none"> Sewer collapses Sewer blockages External sewer flooding incidents 		<ul style="list-style-type: none"> Treatment works compliance
Lagging resilience measure: service performance 7 ODIs		<ul style="list-style-type: none"> Interruptions to supply 	<ul style="list-style-type: none"> Pollution incidents Internal flooding incidents 		<ul style="list-style-type: none"> CMeX DMeX
Societal and community resilience 8 ODIs	<ul style="list-style-type: none"> Keeping reservoirs resilient 	<ul style="list-style-type: none"> Reducing the number of properties at risk from lead Helping customers look after water in their home 		<ul style="list-style-type: none"> Improving air quality Recycling biosolids 	<ul style="list-style-type: none"> Number of customers lifted out of water poverty Priority services for customers in vulnerable circumstances
Ecosystem resilience 6 ODIs	<ul style="list-style-type: none"> Abstraction incentive mechanism Improving the water environment 		<ul style="list-style-type: none"> Improving river water quality Protecting the environment from growth and new development 		<ul style="list-style-type: none"> Enhancing natural capital value for customers Cost adjustment mechanism

While our overall approach to outcomes and ODIs is explained in chapter 7, a large number of our ODIs relate to resilience. This includes both leading (risk based) and lagging (performance based) measures as shown in Table 4.5. Asset health measures are also included as an important contributor to resilience

These ODIs have been developed based on our resilience plans and customer preferences in accordance with Resilience Principle 6: “Outcomes and customer-focused approach”. More details on how we have developed these and long term targets for the measures (to 2035) are given in chapter 7.

For the water service we have developed a resilience measure that will help customers understand the level they currently experience so that we can have a more informed conversation about how much they value resilience of service compared to other risks. This is based on a multi-hazard approach and is an evolution of approach we set out in a contribution to the marketplace for ideas⁴⁹.

4.8.2 Delivering resilience improvements in AMP7

As demonstrated through this chapter, resilience is embedded as business as usual in the way we manage our business. Significant improvements in our resilience have been made in AMP6 through prioritising base expenditure and making additional investment. This approach is set to continue in AMP7. In particular it is important to note that this business plan does not seek to recover costs from customers to address any shortcomings of the past.

In the current AMP we have completed a thorough risk review of our services and have invested in a number of areas to improve our overall risk position. This investment has been targeted at providing the greatest resilience benefit for our customers, and provides service benefits over and above normal maintenance activities. These interventions are due to be completed within the AMP and do not form part of any cost recovery requirements in our business plan.

In our business plan we have not specifically identified any further schemes of this type (this is outside of Manchester Resilience), and have developed a Totex plan which is based on efficient delivery of ongoing base maintenance activities. If circumstances arise that require us to invest in specific historic resilience interventions this will be prioritised within this maintenance programme.

Our overall approach to assessing and prioritising maintenance is based on providing the best benefit to customers for the level of investment made over the life of the assets. As such we plan to manage our overall maintenance expenditure to an efficient level whilst providing improved service levels and resolving resilience issues should they arise.

Due to the unique nature of the risk and scale of investment, which cannot be predicted by cost models, we require a cost adjustment claim of £73m for Manchester and Pennines resilience. Details are given in document UUW_WN1_M – Manchester and Pennine resilience May 2018.

Should new risks or events arise within AMP7 that require expenditure beyond that which can be accommodated by prioritising existing budgets, we have the financial and corporate resilience to accommodate this. In section 4.7 we demonstrate the relative strength of our financial resilience in being able to absorb all ‘severe but reasonable’ scenarios and Ofwat’s common scenarios, whilst maintaining an investment grade credit rating and before taking any mitigating actions in response to these events. Our corporate governance allows us identify risks and seek board sanction for additional expenditure, as we have demonstrated during AMP6 (see section 4.4).

As noted in section 4.6.5, we are establishing CommUnity Share which will ensure that if the company makes returns significantly in excess of the amounts reflected in the price determination, a share of the benefits will be reinvested on further enhancing the resilience of the North West.

In addition, our water service resilience and systems thinking performance commitments provide outperformance payments to specifically fund improved capability.

⁴⁹ https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/looking-to-the-future/measuring-resilience-in-the-water-industry_final.pdf

4.9 Conclusion: resilience in the round

We will ensure resilience in the round (corporate, financial and operational resilience) by the way we have learnt from experience and embedded best practice in our business, recognising interdependencies.

Our best practice processes for risk management align the identification of risks and issues, identify and monitor strategic performance requirements, and prioritise these for investment or operational management. The process embeds assessment of a breadth of solutions to ensure that resilience is delivered in the best value way for customers. It is supported by our range of stretching performance commitments which align to resilience. We have a balance between preventative and preparative resilience because even the most reliable of systems can fail under extreme circumstances. This is backed-up by our sector-leading financial resilience to ensure that funds are always available to protect customers. What is most important is minimising the impact on service delivery for customers.

We commissioned an independent assessment of our resilience in the round by Arup (included as supplementary report T9034). They benchmarked us based on their experience of working across the sector. Their assessment of our plans is shown in figure 4.15 and shows that we are focused on proactive actions to prevent issues before they arise. In conclusion they said that “in many areas, **United Utilities is leading the industry** in their approach to risk and resilience”.

Our resilience plan reflects customer preferences made clear to us through our extensive engagement. It is embedded in our systems thinking approach to managing our business and our range of ODIs. It seeks to secure services for current and future customers, and ensure the outstanding natural environment of our region is afforded the level of protection it demands. In AMP6 we have stretched ourselves to deliver a step change in resilience and within AMP7, we will deliver resilience through (mostly) prioritising within existing budgets. The sole exception of Manchester and Pennines resilience which requires a special adjustment to the cost baseline due to the scale of risk and expenditure required to mitigate it. This aligns to customers’ views on affordability and relative priorities and allows us to deliver what customers want: high quality, sustainable and resilient water and wastewater services, at a price they can afford.

The strong evidence we have presented shows the robust, ambitious and innovative approaches we have used to assess and mitigate risks to long-term resilience in the round. In chapter 10 we explain how the Board provide assurance that this business plan has been informed by a robust and systematic assessment of resilience, customer views on resilience and a comprehensive and objective assessment of interventions. This links to Resilience Principle 7: board assurance and sign-off.

Figure 4.18: Arup resilience in the round assessment of our plans shows that we are leading in many areas

