Appendix 5.3 C - Long term planning for drinking water quality

Wessex Water

September 2018

Wessex Water
YTL GROUP

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Executive summary

Our 25 year vision statement includes a drinking water quality outcome: *Safe, wholesome and pleasant drinking water which complies with mandatory standards and supports the wellbeing of our customers and communities.* It also sets out the main actions we will take to ensure the highest quality of drinking water.

Given our track record of long term planning and innovation, we are well placed to meet the challenges of the future, through a combination of:

- source to tap risk assessment
- asset management and maintenance planning
- water resources and resilience planning
- addressing broader issues such as operational technology and people.

Our review of long term risk for drinking water has identified that the majority of known issues can be addressed through a continuation of our current mitigation strategies. In particular we expect to deal with:

- **Raw water deterioration.** For the last 13 years we have been working very closely with farmers in the areas around our reservoirs and boreholes and we propose to continue to maximise the opportunities for catchment management.
- **Water treatment.** We will continue a rolling programme of refurbishment of our largest water treatment works.
- **Distribution network.** Continuation of our mains replacement strategy with drinking water quality being one of the key prioritisation factors, although we anticipate that it will be necessary to gradually increase the rate of replacement.
- **Lead.** Our long term ambition is to have a lead free network by 2040.
- **People.** We have started a People programme to address the challenge of an ageing workforce and lack of STEM training.

Other threats and opportunities that may require additional exceptional investment are set out below. Joint work with regulators, industry bodies and research organisations will be required to ensure cost effective solutions are identified in a timely manner.

Revision of the EU drinking water directive, and micro plastics
Meeting a revised lead standard, reduced limit on turbidity at customers' taps and increased sampling regimes may require additional investment. Analytical techniques will need to developed for microplastics.

Operational technology
We see great opportunities in the adoption of more real time monitoring of water quality, data analytics, and decision making tools, which should enable us to deliver even higher standards and respond to events better.

Laboratory and analytical services
We benefit from having our own laboratory but expansion is constrained by a lack of space. Additional future monitoring requirements may drive the need to relocate the laboratory.

Contents

1. Introduction

This submission has been prepared in response to the information letter from the Drinking Water Inspectorate (DWI) dated 12 September 2017 (information letter 03/2017), requesting a statement about future risk mitigation measures that will be needed over the long term.

The purpose of the report is to provide a commentary of our long term drinking water plans and future investment strategy.

A draft version of the document was discussed with our DWI liaison inspector on 24 April and the feedback is included.

The submission includes:

- a summary of Wessex Water's 25 year vision statement
- a description of our overall approach to long term planning
- long term drinking water considerations, and
- a brief write up on some of the broader issues that we will need to address to ensure continued delivery of high quality drinking water.

2. 25 year vision

Our mission is *"to provide outstanding, sustainable water and environmental services"*. Providing resilient services and meeting future challenges in a sustainable way that is affordable for customers will require continued innovation and ambition.

In July 2017 we published Our strategic vision which sets out our key long-term future priorities and reaffirms our commitment to providing excellent quality drinking water. We developed the statement after wide and continuous engagement with customers, staff, young people and other stakeholders.

Our strategic direction sets out what we aim to deliver for customers, wider society and the environment. We have also set out the strategy by which we will deliver, focusing wherever possible on forming partnerships with others and harnessing market forces where they can help deliver more cost beneficially.

Our strategic direction informs and supports both our water resources plan and business plan proposals. Within the document is a specific section on our drinking water quality priorities (Figure 2-1), including continued use of catchment management and replacement of lead pipes. The outcome is *"Safe, wholesome and pleasant drinking water which complies with mandatory standard and supports the wellbeing of our customers and communities".*

Figure 2-1: Drinking water priorities included in our Strategic Direction Statement

Excellent quality drinking water

Action points:

We will proactively maintain our water treatment works and distribution system using the latest technology in order to maintain excellent quality drinking water.

We will use catchment management to protect sources of raw water from contamination wherever feasible.

In addition to ensuring high levels of compliance we will manage risks to water quality by using source-to-tap drinking water safety plans.

We will continue to work closely with WRAS, the water fittings agency, on customers' plumbing and promoting WaterSafe (the industry approved plumber scheme). The use of appropriate materials will be a key focus as a significant proportion of water quality failures can be attributed to domestic plumbing and service pipe issues such as lead pipes, copper plumbing and nickel in taps.

We will continue to replace lead pipes in combination with phosphate dosing, a process that safely coats the inside of lead pipes.

We will continue to reduce customers' concerns about the appearance, taste and odour of their water through a combination of targeted rehabilitation of water mains and improved availability of information for customers who experience problems.

Outcome:

Safe, wholesome and pleasant drinking water which complies with mandatory standards and supports the wellbeing of our customers and communities.

3. Our approach

Our overall approach to long term planning is to deliver the best overall service on the things that matter most to customers, such as drinking water quality, customer service, supply resilience and the environment.

Providing high quality drinking water is a fundamental and essential service for our customers and communities. For this reason drinking water is governed by strict European and UK water quality legislation, overseen by the Drinking Water Inspectorate.

We have invested in additional water treatment and improved water mains, supported by improved quality and risk management systems and day to day management and monitoring of water supplies.

Our annual compliance with quality standards has averaged 99.97% over the past five years and not fallen below 99.95% since 2005. In 2016 the DWI introduced a new measure of compliance, called the Compliance Risk Index, which provides a broader view of compliance than numeric performance against the prescribed concentrations or values in the regulations. The new measure encourages rapid and efficient resolution of problems and focusses on the parameters with the greatest public health impact. We are pleased that we are the leading water and sewerage company in the first year of comparative data for the new measure (2016).

Contacts about the acceptability of tap water in our area have fallen since 2009. We receive about 1,200 contacts each year, equivalent to 9 per 10,000 people.

We need to continue to deliver very high levels of compliance with drinking water standards. Customer research shows that the appearance of water is a priority issue and so we need to maintain a downward trend of customer contacts about the acceptability of the water they receive.

The EU drinking water directive is being revised and this could give rise to additional requirements, such a further reduction in the standard for lead and reduction in the limit for turbidity at customers' taps.

We continually engage with our regulators and national industry bodies and contribute to consultations regarding legislative changes. We are active members of UKWIR and are involved in their research programmes such as the big question on 100% compliance. In the event of policy changes and emerging issues we review our policies, programmes and procedures accordingly to ensure compliance is maintained.

Delivery of excellent drinking water quality is achieved by a combination of our staff, culture, processes and assets. We have raised the awareness of the need for the exemplary hygiene practice at our works through the Water Smart campaign. We were pioneers in catchment management to address rising nitrates, and we are looking to trial market tools to mitigate pesticide contamination.

For these reasons we will be happy to adopt the other new measure that the DWI are currently developing – the Event Risk Index. This measure is intended to reflect the behaviours of companies with respect to the mitigation and management of reportable events, both of which are a key focus for us anyway.

In addition to Drinking Water Safety Plans, drinking water quality is fully integrated into our investment planning process including:

- water resources planning
- asset management and maintenance and operational planning
- resilience planning.

3.1 Water resources planning

We published our draft Water Resources Management Plan (WRMP) earlier this year.

It sets out how we will meet demand for water whilst protecting the environment over the next 25 years. We prepare a plan every five years that is reviewed by our regulators, the Environment Agency, Ofwat and Defra. We also actively encourage other stakeholders to tell us what they think of our proposals.

If the system is forecast to be in surplus through the planning period then no further action is required. Nonetheless we can choose to take forward new schemes to meet wider objectives related to government policy, customer preferences, operational efficiency, system resilience and/or environmental benefits.

The WRMP is not produced in isolation. The Plan is fully integrated with our drinking water quality programme to ensure that our statutory drinking water quality obligations are taken into account in the long-term planning of water resources. And it is consistent with our asset maintenance programme, for which one of the key planning objectives is maintaining capacity.

3.1.1 Our draft Water Resources Management Plan

Given the investments we have already made, we have access to enough water resources to meet the needs of our customers for at least the next 40 years without the need to develop new sources of water. However, we are taking forward ambitious proposals to work with our customers and local communities so that together, we can reduce the water we take from the environment, improve the resilience of our services and potentially support areas of the country where water scarcity is a growing problem. We will also continue to work with partners at a catchment level to help safeguard the resilience of the ecosystems that provide us with our raw water supplies.

The Wessex Water region continues to face:

- above-average population growth
- raw water quality pressures
- the potential need to reduce water abstraction licences to protect river ecology
- changing weather patterns driven by climate change.

The investments that we have made in network infrastructure, source protection and promoting efficient water use has created a very resilient water supply system. Households and businesses in the Wessex Water region have enjoyed supplies without restriction for over 40 years.

Our services are resilient to a repeat of any of the drought events experienced in the last 100 years without the need to require customers to restrict their use. Therefore, we would not expect to impose temporary use restrictions (hosepipe bans) on average more than once every 100 years or to impose non-essential use bans for commercial customers more than once in every 150 years on average. This level of drought resilience is amongst the highest for all water companies in the UK.

We have historical records to estimate the magnitude of more severe droughts that might happen only once in 200 years. Our modelling shows that we would not need to implement rota cuts during this type of drought event.

We will continue to manage water supply by continuing to reduce leakage and supporting customers to manage household demand by promoting metering and water efficiency through behavioural engagement.

Our surplus and resilient water resources position mean that we are not anticipating the need to develop any new sources. The requirement for new boreholes is more likely to be driven by water quality rather than sufficiency reasons.

3.1.2 Consultation on our WRMP

The draft WRMP was issued for public consultation on 9 March 2018. The draft plan is available to download here: https://www.wessexwater.co.uk/waterplan/

Consultees have until 1 June 2018 to submit their comments to Defra. We committed to prepare a statement of response to the comments received and make necessary revisions to the WRMP within 14 weeks of the close of the public consultation.

Following permission to do so from Defra we will publish the final WRMP. We expect this to be early 2019.

3.2 Asset management and maintenance planning

Our asset management strategy for water covers all water supply assets across raw water, water treatment and distribution. It is reviewed annually with major updates every five years. We are accredited to ISO 55001, the international standard for asset management.

Our asset management strategy sets out how we will deliver commitments and objectives in our strategic direction statement and business plans. It is risk based, targeting the assets and asset groups that will provide the most benefit to our business, our customers and our stakeholders, whilst taking into account cost, benefit, time and quality. The asset management framework, which includes asset strategies and asset management plans, provides a business-as-usual asset management process aimed at ensuring our strategic objectives are achieved.

We aim to strike the optimal balance between maximising performance, long-term asset stewardship and managing risk, subject to affordability constraints. We therefore use a combination of asset renewal and refurbishment strategies depending upon the asset type and criticality of the asset. The findings from bottom up assessments and life cycle analysis are used to formulate a long-term investment programme for our key sites. These are refurbished or renewed as part of a long-term proactive strategic programme.

For some assets such as boreholes, dams and service reservoirs we undertake proactive cyclical maintenance inspections which lead to asset maintenance and refurbishment programmes. For other assets we use a run to fail model resulting in a set of reactive capital maintenance tasks. The result is the delivery of a resilient supply service to customers in a cost-efficient manner whilst maintaining an appropriate level of risk.

3.3 Risk management

The management of risk is of fundamental importance to Wessex Water. Customers, regulators and the media have increasing expectations and are less willing than ever to accept failure. Our policy on risk identification and management is subject to annual review by the Board and the status of the principal risks is reviewed by the Board twice a year.

The risk environment changes through time as some risks become less likely or less damaging while new ones emerge. Our processes are designed to respond flexibly to these changes and to ensure that the necessary controls and mitigation measures are put in place.

In considering the annual programme of internal audits, the Audit Committee includes internal audits which review the status of the principal risks and the mitigation measures in place.

3.3.1 Risk Process

The identification and management of risk is delivered through a tiered system of groups drawn from operational staff, senior management, Executive Directors and the Board. The Board reviews and holds ultimate responsibility for the risk process and for the identification and mitigation of risks.

Asset and operational risks are reviewed, assessed and recorded monthly by operational staff as part of our Drinking Water Safety Plan (DWSP) programme. Risks are scored using a best practice process which assesses probability and impact on a five by five matrix. Risk mitigation plans are recorded and implemented where appropriate and pre and post mitigation scores are recorded.

The risks identified act as a foundation for a separate corporate risk register (to which our DWSP process feeds into) which is maintained by a Risk Group comprising senior managers from throughout the business. The Risk Group reviews all business risks, including emerging and strategic risks. All risks are assessed by experts responsible for the relevant part of the business. Where a high scoring risk is identified the Risk Group considers additional measures to reduce its impact to an acceptable level.

The Risk Group meets through the year and submits the current corporate risk register and summary report to our Risk Management Advisory Group comprising the Executive Directors and key senior managers, twice a year. Any significant new risks are reported to the Advisory Group as they arise.

The Risk Management Advisory Group scrutinises and challenges the risks included within the register and requires additional work where necessary to better classify the risk or explore alternative mitigation methods.

The Managing Director submits an annual risk review paper to the Board for its consideration and approval. This paper sets out the risk review process and identifies the current principal risks to the business and the mitigation measures in place.

3.4 Resilience planning

3.4.1 How do we define resilience?

Resilience is the ability to:

- maintain high-quality and reliable services for our customers
- protect the natural environment in the face of disruptive events
- ensure the long-term viability of those services against a backdrop of strategic pressures and a changing external environment.

Our resilience depends on natural resources, how we maintain our assets and systems, and fundamentally on our people, their skills and their expertise.

3.4.2 Our history of resilience

Resilience is not a new concept for Wessex Water. We have consistently taken a long-term view to improve the resilience of our service in line with customer preferences and expectations, and as shown by the Integrated Grid project.

Our assets, systems and people are already very resilient, as demonstrated by the high levels of service we provide to our customers every year, and our performance during recent disruptive events such as:

- the flooding of the Somerset levels in 2014 – the largest flood event ever known in the area since records began in the 1600s
- the foot and mouth outbreak in 2001 when access to land for sludge disposal was restricted
- the Beast from the East in 2018 when we were able to keep all our customers in supply despite extreme cold weather.
- It is over 40 years since we imposed a hosepipe ban and our essential supplies are resilient to a 1 in 200 year drought.

3.4.3 Considering resilience in the round

We aim to maintain high-quality and reliable services and to protect the natural environment at all times and during disruptive events.

At PR14, resilient services was one of our key outcomes in our Strategic Direction Statement. Resilience remains a key priority for Wessex Water as we look forward to 2020-2025 and beyond.

Our approach is fully in line with Ofwat's seven principles of resilience planning:

1. considering resilience in the round for the long term
2. a naturally resilient water sector
3. customer engagement
4. broad consideration of intervention options
5. delivering best value solutions for customers
6. outcomes and customer-focused approach
7. board assurance and sign-off.

We have also embraced new ways of working such as market tools and catchment partnerships.

We put customers at the heart of our resilience thinking, as shown in this diagram and the summary of our proposals that follows.

Wessex Water: our approach to resilience

3.4.4 A summary of our proposals for 2020-25 and beyond

Customer research on resilience and future proofing, carried out in 2017, concluded that:

- in general customers have a low appreciation for future risks and the need to build resilience in to the water and waste infrastructure; they expect water companies to be planning for the future as a matter of course
- customers are willing to assist to mitigate risk but need help on how to achieve this

- customers see more value in strategies that have a clear logic, are preventative, resonate emotionally and are low cost
- the majority of customers are prepared to pay a little more to future-proof water services for future generations. They are willing to pay more to mitigate resilience risks that relate to risks that are not part of a company's business-as-usual and where there is a wider societal dimension such as for environmental damage.

In response we have developed ambitious commitments to deliver resilient services for our customers and to the environment for the period 2020 to 2025 and beyond, as highlighted in the table below.

The customer and environmental benefits of our resilience plans

	Water resources and Water network plus
Customer service	• Maintaining very high levels of compliance as assessed by CRI • Responding to events • Supply interruptions – 75% reduction to industry upper quartile • Restrictions on water use – industry leading levels of service • No hosepipe bans
Asset health	• Mains bursts – stable over the long term • Unplanned outage – stable over the long term
Long term planning	• Drought resilience – 0% of our customers at risk of restrictions in a severe (1 in 200 year) drought
Catchment partnerships and catchment management	• Catchment management to mitigate deteriorating raw water
Community engagement	• Greater help to encourage efficient use of water

The four components of resilience – corporate, financial, operational and environmental – are summarised below.

Resilience component	**Proposals**
Corporate resilience	Regular review of governance, accountability and assurance processes. Further develop well established processes for the identification and management of risk. Progress the People Programme to address the long-term risk around people and shortfall in STEM skills.
Financial resilience	Annual stress-testing for our long-term financial viability statement, with assurance by the Board and an independent third party. Maintain investment-grade credit rating. Ensure group structure complies with Ofwat's requirements for Board leadership, transparency and governance.
Operational resilience	Continuous improvement of our processes and policies, based on a maturity assessment against the six guidelines in BS65000, the British standard for organisational resilience. Based on assessment of the full range of potential hazards, cost beneficial investments to address residual risks to service: • resilience improvements at our largest water treatment works • improvements to the robustness of our operational technology and communications systems. Industry leading service levels for hosepipe bans and drought restrictions, and sewer flooding.
Environmental resilience	Catchment management to tackle water quality at source, including: • nitrates in catchments to our drinking water sources. Community engagement to encourage efficient use of water.

4. Long term drinking water quality considerations

4.1 Overview

An overview of our future long-term investment strategy up to 2045 is shown in the figure below.

Figure 4.1: Our long-term investment strategy

Long term plan	AMP7	AMP8	AMP9	AMP10	AMP11
	2020	2025	2030	2035	2040 2045
Raw water & Treatment works					
Major works reconstruction - surface water	Durleigh	Fulwood	Maundown	Ashford	Sutton Bingham
Major refurbishment - groundwater works	3 works	7 works	Continuation of rolling refurbishment programme		
Pesticides	Continued catchment management (incl for Metaldehyde). Entrade trial				
Nitrates	Continued catchment management, but increasing need for treatment at some sites				
Integrated Grid	Optimisation of blending and source utilisation for water quality and security				
Cryptosporidium		Replacement of membrane plants			
Disinfection	Increased use of UV / reducing chlorine residuals where possible to improve acceptability				
Drinking water safety plans	Risk assessment developed further and reflected in regulatory measures. Rolling programme of risk based capital maintenance				
Network					
Iron	Integrated network management to deal with water quality, bursts, leakage etc.				Off Grid water, Smart networks
Acceptability					
Customer					
Lead	Increase in proactive lead pipe replacement activity - partnerships with customers			Potential to reduce phosphate dosing in some zones	

4.2 Raw Water

4.2.1 Catchment Management

We commenced the first catchment management scheme in 2005 and now extensively use the approach to protect sources of raw water from contamination and deterioration. Catchment management is both cost effective and sustainable in helping to negate the need for additional water treatment processes, reducing the quantity of chemicals used, and improving overall environmental quality of our water sources.

We are committed to continuing to use catchment management as the starting point to manage nitrate, pesticide and Cryptosporidium risk as well as to maintain, if not improve, the quality of our raw water sources.

Recently we have developed EnTrade, an online trading platform that allows us to engage with farmers on a wider scale and which reduces the cost of mitigation measures through its reverse auction capability. Initially developed for nitrate, we will be developing pesticide auctions to augment and enhance our ongoing catchment delivery work.

Continued cooperation with land users in the future is essential for protecting drinking water sources that are vulnerable to a combination of farm inputs (e.g. nitrates and pesticides) and heavy rain. For catchment management to be exploited to its maximum, there will be a continued need for collaborative partnership working; we envisage this may require further regulatory or legislative means to encourage all sectors, including agriculture, to work together.

Oil spills and pollution incidents will remain a risk to the raw water quality of our sources into the future.

4.2.2 Pesticides

Historic and ongoing water quality sampling shows that pesticides are primarily a risk at our surface water sites. However, we do have a number of groundwater sites that are also vulnerable due to their hydrogeological setting. Our initial response to managing rising pesticide levels is catchment management ahead of treatment solutions and this will continue into the future.

Granular Activated Carbon (GAC) plants are installed at all our surface water sites and a number of groundwater sites for removal of pesticides. This successfully controls our current pesticide risks. However, Metaldehyde (from slug pellets) remains a specific threat, as our existing treatment processes cannot achieve significant concentration reductions.

At ✂, a groundwater source that was particularly vulnerable to pesticide contamination following heavy rainfall, we have entered into a formal agreement with the main catchment farmer that restricts pesticide usage. Long-term measures have been implemented on other farms to reduce runoff from steep fields.

Modern pesticides are often much less polluting than older ones, but they can still present a risk to future water quality, if not treatable by our current treatment processes. We mitigate this risk through annual review of pesticide usage in the South West England, analysis of historic data and local knowledge of our in-house pesticide specialist. On the basis of this, we actively review our sampling programme, periodically assess our strategy, participate in industry studies and developments and target our catchment management measures.

Data shows that pesticides, including Metaldehyde, have been effectively managed at a number of our reservoirs through our catchment management programme which includes financial inducements for product substitution. This intervention will continue until such times as Metaldehyde usage is restricted, or the agricultural industry voluntarily makes the substitution.

At the small number of other groundwater sites where sporadic or elevated pesticides are observed, for example Fonthill Bishop, ongoing catchment investigation continues to try to identify and mitigate existing pollution sources and identify emerging sources.

The risk of pesticide contamination on bulk imports will continue to be monitored very carefully both through sample results and our ongoing liaison agreements.

4.2.3 Nitrates

Nitrate concentrations in groundwater from historical and recent agricultural activity continue to present a significant water quality risk.

Catchment management forms a fundamental part of our source to tap approach to managing nitrate in water supplies. Much progress has been made by the catchment delivery team since work started at four sites in 2005 and to date no new nitrate treatment plants have been constructed on sites subject to catchment management. When carrying out future planning we prioritise catchment management with treatment solutions only considered as a last resort once catchment management solutions have been thoroughly trialled and proven to be ineffective.

Detailed nitrate trending across Wessex Water sources was undertaken in 2013 using a bespoke model to assess the requirements for managing water quality up to 2030. We intend to update the model with observed nitrate data for the period 2013-2017 to refine future projections.

Ongoing trending work and observed sample data will be used to inform the need for enhanced catchment management or for capital schemes such as blending or nitrate removal. Our current DWSP nitrate risk matrix incorporates likelihood of breaches to the year 2035. As time proceeds, this will be extended further into the future.

There are three sources where catchment delivery has failed to stabilise rising nitrates and where adequate blending is not available to mitigate winter peaks. At these sites asset solutions will be built in AMP7 to ensure that adequate blending capacity is available and compliance maintained. Additional treatment is not considered necessary.

4.2.4 Radioactivity

After completing risk assessments for each of our treatment works there has been no need to introduce additional control measures for radiation and the future likelihood of a public health risk or a breach of the prescribed concentration value (PCV) is assessed to be very low.

Our sampling programme supports the ongoing risk assessment process, demonstrating consistent and continued low levels of radiation. We therefore do not deem long-term investment in radioactivity control to be necessary.

Operational monitoring and knowledge sharing from across the industry and relevant authorities will continue to be used to review our position.

4.2.5 Cryptosporidium

We have substantially reduced the Cryptosporidium health risk across our supply area over the past 19 years. Continued collaboration between operational and catchment management teams is fundamental for assessing and reducing risks within catchments in the future.

For sites with *Cryptosporidium* treatment in place, catchment management will remain an important control measure for preventing deterioration of the raw water quality. Replacement of existing membrane plants is anticipated to be required within the next 10-15 years, with a large proportion in AMP 8 (see table 3-4).

We will continue to review risk and treatment requirements on a site-by-site basis through our DWSP process.

A future challenge regarding the management of *Cryptosporidium* risk is the diminishing appetite for risk in the regulations along with public perception. Changes in tolerance for *Cryptosporidium*, even at low levels, may result in an increased requirement for additional control rules, monitoring and treatment.

4.2.6 Emerging risks

Chromium

We follow the Inspectorate's guidance regarding Chromium, and keep up to date with research regarding Chromium VI. We continue to monitor the risk and review data for chromium through our programme of compliance sampling and will continue to do so in the future. Our assessment indicates that Chromium is not a risk to our water supply.

Pharmaceuticals and endocrine disruptors

We predict a low future risk of pharmaceutical contamination to our supply as a large proportion (72%) of our water is from groundwater sources and our largest surface water sources (✂) are upland reservoirs.

Whilst still low, we assess the risk of pharmaceuticals would be highest at surface water sites with upstream river inputs, or borehole sites subject to surface water influence. Should pharmaceuticals become a regulated parameter then we may need to install additional treatment processes, for example advanced oxidation, at some sites.

We will continue to monitor risk through actively reviewing our sample programme, maintaining resilience to isolate high risk sources from supply, and keeping up to date with industry research and developments. More detailed site risk assessments will take place as information becomes available.

Micro plastics and nano plastics

As with pharmaceutical risk, since much of our water is from groundwater and upland river sources we currently consider the risk of micro-plastics being present in our sources to be low.

Whilst our sources are likely to be free from microplastics the risks from treatment processes such as membranes, our network of plastic pipes and customer fittings remains unknown.

There is currently no established method for examining drinking water supplies for microplastics so the interpretation of any results we could obtain would be difficult without a proven method of analysis and significance values.

We welcome the proposed UKWIR and World Health Organisation (WHO) studies investigating the dangers of plastic in drinking water; and we will continue to keep up to date with industry research, innovation and legislation. More detailed risk assessments will take place once the research is complete and further information is available.

Coliphages

We do not currently have internal capabilities to analyse for Coliphages, however we are able to send samples to the National Laboratory Service through a framework contract. Should monitoring for coliphages become a regulatory requirement as proposed in the revised Drinking Water Directive then there may be a need for increased internal or external analysis capabilities.

We have not undertaken a risk assessment of our sources regarding Coliphages and they are not currently included in our disinfection policy.

We will continue to review legislation surrounding Coliphages, the effectiveness of existing disinfection process and requirements for developing an internal analytical facility in the future.

Legionella

We do not currently test for Legionella in our drinking water samples. However, we have internal capability to take samples and analyse for Legionella in our laboratory.

The addition of Legionella as a regulatory parameter as proposed in the latest Drinking Water Directive consultation is unlikely to impact on sampling programmes, however increased capacity in the laboratory would be required.

We will continue to liaise with Local Authorities where Legionella risk assessment becomes an obligation.

Disinfection by-products

We are working to reduce levels of disinfection by-products in our treated water and will continue to do so in combination with increased regulation.

We proactively monitor levels of disinfection by-products in our network. The most commonly encountered disinfection by-products arise from the reaction of free chlorine. We have recently added the use of ultraviolet irradiation as a primary disinfectant to our disinfection policy. Lower levels of chlorine may reduce by-product formation at some sites.

We have been involved in an UKWIR project investigating treatment conditions which minimise the formation of disinfection by-products and will continue to participate in research in the future.

Turbidity standards

Tightening of turbidity standards both at treatment works and in distribution has been proposed as part of changes to the EU Drinking Water Quality Directive. The majority of our treatment work sites have turbidity shutdown levels <0.5 NTU, which is lower than current legislative requirements. We will continue with work to reduce turbidity levels at the point of disinfection and in distribution.

The proposed change to a 0.5NTU standard for 15 minutes at water treatment works will drive the need for accreditation of on-line instruments including final water turbidity.

The greatest risk for non-compliance with future turbidity legislation changes is within the distribution network. We envisage that this will be managed primarily through flushing, real time turbidity monitoring and 'calm' network training and operation. There may be a need for increased mains replacement and relining.

4.3 Water Treatment

We will continue to proactively maintain our water treatment works using the latest technology and innovation where appropriate to maintain excellent quality drinking water into the future.

The raw water category of our sites is frequently reviewed using sample data to ensure appropriate treatment is in place. The requirement to do this regularly is integrated into our disinfection policy.

Planning for refurbishment and renewal of our sites is managed through our long-term strategic programmes. Our strategic maintenance plans are proactive and informed by risks recorded in our Drinking Water Safety Plan (DWSP) system. Our business as usual asset management framework and the findings from bottom up assessments and life cycle analysis have been used to formulate an investment programme for our key sites up to the end of AMP 8. Examples of our investment programmes for groundwater and surface water sites are shown in the diagrams below.

Substantial investment has recently been undertaken as part of the integrated water supply grid project including site rebuilds and upgrades. This partially accounts for the reduced amount of strategic maintenance spending in AMP7 but there is flexibility in the programme to address new risks or deterioration.

We will continue to review, update and extend these programmes into the future.

Figure 4.2: Surface water works strategic maintenance plan (of strategic/largest sites)

Figure 4.3: Groundwater works strategic maintenance plan (of strategic/largest sites)

Our surface water treatment works have dissolved air flotation (DAF) and granular activated carbon (GAC) processes installed which help manage Geosmin and 2-Methyl isoborneol

(MIB) levels in treated water. Our ongoing programme of investment and maintenance will enable us to continue to manage this risk into the future.

We will continue with ongoing work to reduce undesirable chlorine concentrations and disinfection by-products in treated water through optimisation of treatment works and booster stations. In the future we will use both chlorine and ultra-violet radiation as a primary disinfectant for water treatment.

Future spend requirements will include replacement or upgrade of phosphate dosing facilities (as an interim measure), replacement of balance, chemical and contact tanks, continued replacement of membranes and increased use of ultra-violet irradiation as a disinfectant.

4.4 Networks and Distribution

4.4.1 The Grid

Now completed, our integrated water supply 'grid' network will enable better use of resources across our region (Figure 4.4); facilitating the optimisation of blending and source utilisation for water quality and security of supply.

Figure 4.4: Wessex Water Integrated Supply Grid

Part of our network is remotely controlled through an optimiser system, which manages the network semi-autonomously by interpreting a series of inputs and constraints to ensure consistency and quality of supply whilst minimising costs and maximising energy savings. The optimiser automatically recalculates the best way to operate the network to mitigate an

outage, improving the resilient operation of our water supply system whilst maintaining compliance.

Following the success and efficiency of the system we plan to extend the optimiser across more of our network in the future. Sweetening and conditioning of the main will take place routinely and automatically to ensure the network remains 'supply ready'. Central remote control will increase the speed that problems are resolved.

Greater automation and more proactive approaches to network control will continue to be developed in the long-term. This will minimise call outs and site visits out of hours with subsequent cost and efficiency savings.

4.4.2 Mains Replacement and bursts

Our long-term plan for water distribution is to maintain stable asset health. We have 12,000km of water mains in our network and currently replace between 40km and 50 km of mains per year. Prioritisation of mains replacement is based on known burst history, customer contacts, leakage and water quality issues. Work is prioritised on an annual basis and then reprioritised as and when new issues come to light. Our ongoing mains rehabilitation programme reduces the risk of bursts as well as corrosion of mains.

Our mains deterioration model indicates that we will need to increase the number of mains replacements to maintain a stable burst rate in the longer term (Figure 4.5).

Both bottom up and deterioration modelling approaches confirm that current renewal and maintenance expenditure will need to increase above the typical historical levels to prevent a capital maintenance backlog, keep pace with asset deterioration and prevent service deterioration. Our mains replacement strategy will continue into the future.

Increased connectivity within our network along with pressure reducing valve (PRV) technology will continue to be developed to provide alternative transport routes for water in the event of a burst.

4.4.3 Mains flushing

We have a regular mains flushing programme and flush around 600 km per year (approximately 25% of trunk mains). Mains are flushed primarily in areas at risk of discolouration or high levels of iron where flushing is known to be an effective strategy. Should the prescribed concentration value (PCV) for turbidity be lowered in the future then these activities become increasingly important for sustaining future compliance. Increased real time data will also be required.

In addition to flushing, we also condition trunk mains by exercising mains flows up to their hydraulic capacity to prevent discoloured water issues.

4.4.4 Polycyclic Aromatic Hydrocarbons (PAH)

Polycyclic Aromatic Hydrocarbons (PAH) have been detected in the peripheries of our supply network. The source of PAHs is understood to be a combination of deterioration and low turnover associated with coal tar lined cast iron mains at the end of the network.

Future risk will be managed through prioritisation within the main replacement programme, planned flushing and highlighting high-risk district metered areas (DMA's) in the DWSP system. Risks will continue to be assessed in the event of any future changes to regulatory limits. Should the risk or rate of detection increase, then addressing PAHs has the potential to prove very costly if increased rates of mains replacement are needed.

4.4.5 Customer Acceptability

Our long-term plan is to improve water quality and reduce unwanted customer contacts to the lowest possible level whilst keeping bills affordable. Subject to our customer's willingness to pay, achieving this has three main aspects:

- Asset management – we are committed to maintaining our water distribution assets to deliver excellent quality drinking water
- Operational performance – we are always looking to improve the way we operate our network to improve water quality delivered to the customer and overall acceptability
- Customer Relationship Management (CRM) – to provide information and outbound communication to minimise the need for customers to contact us.

We will continue to work to reduce our customers' concerns about the appearance, taste and odour of their water through a combination of targeted flushing and rehabilitation of water mains alongside improved availability of information for customers.

To help achieve this we will look to expand the use of real time data. Further detail about strategic technology opportunities are detailed in section 5.2.

Our asset management plans are live documents. Every five years we carry out a major review of our asset management plans as part of the business planning process. As part of this process, we adjust our policies and amend rates of replacement as required to remain below the target number of mains bursts per year. A similar process also applies to customer acceptability contacts.

4.4.6 Reservoirs

We undertake proactive cyclical maintenance inspections of our service reservoirs, which subsequently informs asset maintenance and refurbishment programmes. We have a long-standing reservoir maintenance policy, which has resulted in detailed knowledge about the condition of our assets.

We will maintain a stable risk profile for our dams and impounding reservoirs, principally to ensure on-going compliance with the Reservoirs Act 1975. Sedimentation in reservoirs can eventually affect raw water quality as can changes in flows or operating levels that can mobilise sediment into the water column.

4.4.7 Water conditioning

Aggressive treated water affects the network and can result in an increased number of water quality complaints. Modelling indicates that our groundwater supplies are non-aggressive when entering the distribution system whereas surface water sites exhibit corrosive properties to varying degrees. We will continue to monitor water chemistry alongside customer contacts. When evaluating future conditioning schemes, the cost of installing the new plant and ongoing operational costs will be compared with the cost of mains rehabilitation and replacement.

4.4.8 Summary

Opportunities and pressures for networks and distribution are summarised in table 4.3 below.

Table 4-3: Future opportunities and cost pressures

Pressures	Opportunities
• Increase in infrastructure renewal required to match long term deterioration • Increase in leakage expenditure to meet customer expectations for further reduction	• Reduced demand allowing the option of some network rationalisation • Innovation and new technology including real time monitoring and data analytics should enable o improved operational responses to asset failures o asset maintenance expenditure to be optimised o improved Customer Relationship Management to improve the service delivered to customers

4.5 Lead

Lead is a significant compliance issue. We have an exemplary lead pipe replacement strategy and will continue to be ambitious over the next 25 years and beyond.

Our long-term ambition is to replace (or reline) all lead pipes (communication and supply pipes) by 2040. This will be achieved through:

- a strategic planned approach, which will be more cost effective and enable targeted pipe replacement
- annual review of District Metered Areas (DMAs) to identify suitable locations for proactive wholesale replacement of services
- where practicable we will remove all lead at least up to point of entry into the property. Regulatory changes involving adoption of customer supply pipes would assist in meeting this objective
- maximising synergies with metering and leakage programmes as part of a customer focused campaign on plumbing issues.

Our internal investigation trigger currently exceeds the requirements outlined by the Inspectorate, providing a buffer and resilience to ensure compliance and efficiency is maintained.

Should the prescribed concentration value for lead be reduced to 5 µg/l through changes to the EU Drinking Water Quality Directive or be subject to any further changes then we will re-evaluate our investigatory trigger level and overall strategy.

The increased rate of pipe replacement will form part of a holistic strategy where we will promote co-operative partnership working for the benefit of our consumers. Lead pipe replacement will ultimately result in a reduced need for phosphate dosing and the ability to cease dosing completely in some zones. In the meantime, a twin track approach of lead pipe replacement in conjunction with phosphate dosing will continue.

As an initial milestone, by 2025 we will work to ensure that all educational establishments within our region have a lead-free supply.

5. Broader considerations

We are well aware that delivery of excellent drinking water quality is achieved by a combination of long term investment and efficient and effective operation. In addition there are some broader considerations that potentially affect drinking water:

- operational technology
- laboratory and analytical services
- security of chemical supplies
- staff
- bottled water
- climate change.

5.1 Operational technology

We will continue to invest in and upgrade our technology, including providing more open networks, protecting sensitive data and low-cost monitoring.

The Internet of Things (IoT) will become increasingly relevant through smart technology and greater use of tools such as cloud based solutions and telemetry. Technology will become more accessible on mobile devices, for example geographical information systems (GIS) and operational telemetry. This will enable more problems to be solved remotely, increase staff mobility and enable more proactive rather than reactive behaviour. Great potential exists for customer interaction with the IoT, e.g. future devices on customer taps or stop taps, Smart Meters and temperature and flow measurement.

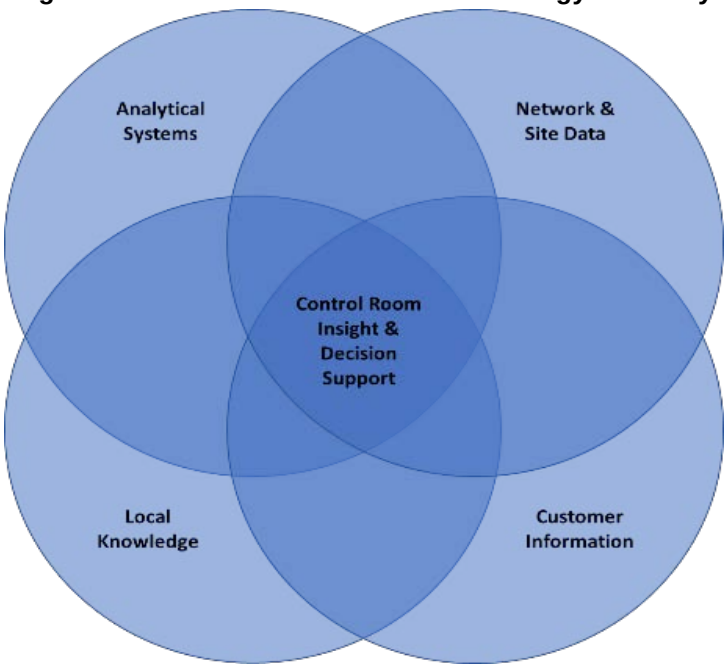
Digital resilience and cyber security remains a continued priority both now and into the future alongside compliance with The Network and Information Systems (NIS) regulations.

More real-time data will be facilitated by developing standards, improving policies and procedures, improving devices, low cost mass deployment and more analytics across systems.

Evergreen technology solutions (technology that keeps evolving) and a move to web based software platforms will increase resilience through continuous security patches.

Greater decision-making functionality within programmes will save money and increase efficiency, for example regarding alarms and monitoring. The ability to build criticality around alarms will facilitate alarm handling and help our control room prioritise jobs. More intelligent systems such as ‘Situational Awareness’ for visualisation of data e.g. advanced alarm management, flow rates, customer contacts and smart leak/burst alarm systems, will assist with prioritisation of work, resulting in shorter outages and quicker responses (Figure 5.1).

Figure 5.1: Situational awareness technology summary



5.2 Laboratory and analytical Services

Maintaining our own internal sampling and analytical services (including our laboratory) provides resilience and greater stability in terms of future analytical costs.

We will continue to review opportunities to purchase improved equipment with more sensitive levels of detection for our laboratory, taking into account the need for training, obtaining validation and accreditation.

We have a framework in place with other laboratories to outsource certain services. However, this is dependent on the capacity of the recipient laboratory and demand from other water companies.

It is forecast that on site and online monitoring will increase into the future, particularly regarding flow cytometry for bacteria and spectrometry for organic substances. Site based online data is not currently considered acceptable by the DWI for compliance purposes in lieu of sampling data. There are also repair, maintenance and calibration requirements to consider.

5.3 Chemical supplies

We use chemicals the meet applicable regulatory standards and aim to maintain more than one supplier for each bulk chemical that we use. Our suppliers provide us with business continuity plans and mapping for reassurance of security of supply.

Phosphoric acid is an important chemical used for plumbosolvency control. Globally, phosphoric acid is utilised as a fertiliser so therefore experiences volatile price fluctuations. Should chemical costs rise in the future then this would increase the cost of delivering our strategy.

Vulnerability exists with regard to iron based coagulants, for example ferric sulphate. Prices are increasing due to supply and demand. To increase resilience, we aim to have the ability to use alternative coagulants.

Increase in the cost of chemicals is a future risk. The future cost of chemicals will be affected by global influences such as supply and demand, Brexit and price fluctuations associated with the pound and the dollar. Chemical expenditure is very likely to rise in the future, increasing the importance of chemical optimisation and reductions in use where possible.

5.4 People

In the future we face the challenge of an ageing workforce alongside a reduced pool of young people studying science, technology, engineering and maths subjects. Furthermore, there is the challenge of greater staff mobility within the business which although is beneficial for broadening knowledge and skills results in fewer senior specialist staff.

In 2017 our ‘people programme’ was established. The people programme is a structured five-year programme with the conscious intention of spanning two asset management periods. The purpose is to make a positive difference to the working life of staff and build a sustainable workforce for the future. The people programme is linked to our sustainability vision and once the five-year period is complete will form part of our long-term HR strategy.

The people programme incorporates a graduate programme, apprenticeship programme, talent pipeline and e-learning facility.

Into the future remote and flexible working is anticipated to increase, along with continued focus on mental health, wellbeing and diversity.

5.5 Bottled water

We hold bottled water stocks within designated regional stores. ✂ We have a contract with a local company who produces bottle water to maintain these stocks and supply bottled water in emergencies.

Micro plastic detections in bottled water has recently hit the headlines and will become a topic of further research. Plastic use as a whole is an emotive public topic. Public opinion is likely to be an important influencer with regard to bottled water in the future. Recycling opportunities for bottles, investigations into biodegradable bottles and wastewater will therefore need to be explored further.

Future tariffs and levies on plastic bottles will also have an impact on production and distribution.

5.6 Climate Change

A resilient water company is one that can cope with gradual changes to the climate and also extremes of weather. In 2015 we published our second report to Defra under the climate change reporting power. This report is publicly accessible on our website and sets out how we plan to adapt to climate change. The report covers the climate-related hazards that could affect us, the level of risk that each poses for our business and the adaptation options that we have in place or propose.

The impact of heavy rain dominates our risk assessments more than warm or dry conditions.

Regarding water quantity, our risk assessment reflects detailed work undertaken as part of our Water Resources Management Plan. Our initial assessment showed that overall our region is of low vulnerability to climate change, with only the west of our supply region (where the majority of our surface water reservoirs are located) having a medium risk. Elsewhere, sources tend to be constrained by infrastructure or their abstraction license, rather than by hydrology.

Water resource quality is more likely to be compromised by climate change in the short to medium to long term, than water quantity. Warmer summers are likely to bring reductions in quality due to biological activity that is triggered also by warm weather. Warmer weather can also increase discolouration and taste issues, potentially increasing the number of complaints and likelihood of a compliance failure. Furthermore, heavy rainfall – both in prolonged episodes or short, sharp spells – can result in contaminants being washed into reservoirs or groundwater sources.

As climate change adaptation is part of our overall sustainability strategy we will continue to communicate with our stakeholders as knowledge improves, new risks emerge, investment is completed and our strategy develops.