Part B

Chapter B3

Maintaining Service and Serviceability

Our Strategy

This chapter sets out our strategic approach for asset management to maintain service to our customers. Our plans are consistent with the long-term strategy that was set out in our Strategic Direction Statement published in December 2007. We have adopted a forward-looking approach, forecasting future asset deterioration and the resulting impact on service. For the FBP evidence has been improved across the full range from condition and performance of assets to the likelihood and consequence of their failure.

Our Reporter has commented that in addition to the structured challenge of the Reporter, the content of the FBP has been subject to heavy internal challenge and this is particularly true of this area. We have actively taken into account Reporter challenges, Ofwat and other stakeholder feedback on our DBP and improved the quality and robustness of our plan by;

- improving our data. For example extending the time series of asset performance data used in our infrastructure and non-infrastructure investment models
- improving our models. For example we have revised the way in which we modelled the impact of the Active Leakage Control (ALC) intervention on the rate of rise in leakage
- improving the balance of risk. For example removing the DVA siphon renewal project where the cost outweighs the risk reduction and customer willingness to pay.
- Spreading the implementation of some schemes over multiple AMP periods to create a better balance between risk and bill impact.
- Improving the optioneering within projects. For example conducting further investigations, surveys and more detailed technical appraisals

In the ongoing development of our plan through to the FBP we have involved other stakeholders. Our customer's views have been assessed through research that fed into the DBP development in terms of their willingness to pay for improvements and also post DBP submission to assess their views of the DBP being good value for money. The results of the customer research on whether customers thought the DBP was good value for money supports our approach to the development of our submission. Our objective has been to create a plan which is cost beneficial that:

- maintains our assets in the condition needed to achieve stable service performance, and deliver stable serviceability as measured by the Ofwat indicators.
- improves upon current levels of service where they have fallen below the standards that customers can expect to receive where this is supported by customer's willingness to pay. We have applied cost-benefit analysis to determine where service improvements are justified.

We have developed and implemented a new asset management system (BRITE) which we have used to forecast asset deterioration and service impacts, and to support the development of the overall programme based on an assessment of costs compared to benefits. We have applied the UKWIR Asset Management Planning Assessment Process to

determine our current performance and identify areas for improvement. At the DBP we used an independent consultant (MWH) to score our AMPAP compliance. To ensure continuity we have used MWH to revisit this area given its evolution into the Asset Management Assessment (AMA) as we understand that this is to be used to assess our asset management capabilities and the approach taken to develop and finalise our FBP.

This is covered in the B3 Overview – Asset Management Assessment (AMA) section of this document. Our focus has not been to produce a revised score but on demonstrating improvements made and presenting Ofwat with robust evidence on which to assess the FBP.

The total level of capital expenditure (net, post efficiency) is £2.6bn (£1.2bn for water and £1.4bn for wastewater) which is £500m less than in the DBP (£3.1bn). This is £0.2bn less than in AMP4 and is similar to that expected in the SDS.

Our plan includes:

- substantial expenditure on water supply projects such as Frankley pumping station and Ambergate Reservoir, which are amongst the largest assets which we have, in order to ensure that we continue to provide reliable water supplies.
- increased expenditure on mains replacement in order to control interruptions to supply and leakage.

Proposed expenditure in AMP5 (gross, pre-efficiency, 07/08 prices)

Service	Sub Service	Capex (£m)	Opex (£m) 2014/15
Water	Infrastructure	402.5	0.7
	Non-infrastructure	450.8	1.7
Sewerage	Infrastructure	232.0	0.3
	Non-infrastructure	714.8	(0.8)
Total		1800.1	2.1

Contents

B3 Overview - Asset Management Assessment (AMA)

Introduction

This section sets out our current position and our plans for improving our asset management capability.

In the Ofwat Letter PR09/23 (of 28 January 2009) it was made clear that the Asset Management Planning Assessment Process (AMPAP) had evolved into the Asset Management Assessment (AMA) and that this would be used by Ofwat to assess the asset management capabilities and the approach taken to develop and finalise the PR09 Final Business Plan (FBP) submission for each company.

There are nine sections in this overview, in line with the AMA headings. Each section begins by setting out Ofwat's aspirational statement, followed by our response using the AMPAP tests.

This overview should be read in conjunction with the detailed C8 commentary which sets out extensive additional detail on all key AMA high level areas. We have included relevant cross references to the C8 commentary, but believe that C8 must be fully considered to obtain a full picture of our asset management capability and the improvements to our plan following the DBP. Extensive consultation across several teams in Severn Trent Water (SVT) has again been carried out to produce this overview. A full AMPAP assessment was undertaken in April 2008. This overview document evidences the current status of our Asset Management Planning Processes, how the approaches have improved over the last year and how this will be continued into AMP5. This overview also evidences how our Final Business Plan will have improved relative to the Draft Business Plan submission. It is important to note that this AMA section does not duplicate all the evidence required to score the AMA but seeks to summarise the key points and direct the reader to those parts of the FBP where detailed evidence is provided.

Background

During the preparation of the Draft Business Plan (DBP) SVT commissioned MWH, an independent external consultancy, to complete the AMPAP assessment using the approved methodology to gain a balanced view of asset management planning within SVT.

This work involved substantial management input and facilitation to develop a full picture of the state of our approach to asset management. Since this time significant improvements have been made within the business as the result of:

- Wider application of Cost Benefit Analysis to identify viable projects/schemes.
- Significantly improved data quality following the creation of a dedicated data control team.
- Completion of a range of Business Improvement Projects.
- Ongoing planned development of the models and processes that had been trialled during the DBP Preparation and Submission.

- Feedback from the Reporter on issues within the DBP submission and Ofwat feedback on the DBP submission.

In assembling this document as evidence for Ofwat of our Asset Management capability, a degree of interpretation has had to be used to map AMPAP components onto the AMA high level areas using the Aspirational Statements and key AMA component headings provided in PR09/23 (dated 28/01/09) and in other communications. For example, two AMPAP High Level Areas (Management and People) have been combined and rationalised from a total of four components to just one within Ofwat's AMA. Additionally, a new High Level Area, 'Balance', has been created in the AMA. Only an Aspirational Statement and Component titles have been shared by OFWAT for this new area and this indicates that it we need to reflect the 'balance' across the business plan to meet the various planning objectives, whilst considering phasing and deliverability. Where AMPAP provided test statements that map to the AMA Components, these have been used as a guide to add clarity around the type of evidence required to score the AMA Component.

Following the pre-FBP meeting held with Ofwat on 13 January 2009, discussions were held with Ofwat (led by a member of the Severn Trent Executive Committee) on 4 February 2009 to build a better understanding of the Ofwat AMA approach and how we could best evidence the improvements that had been made such that our AMA score would reflect the improvements that Severn Trent Water have made for the FBP.

This overview follows the AMA structure to provide Ofwat with a report that is correctly focussed and contains information, evidence and cross references to the Business Plan commentaries to illustrate our asset management capability. As AMPAP has now evolved into the AMA, a revised AMPAP score has not been produced. Our focus has been on demonstrating improvements made and presenting Ofwat with robust evidence with which to score the FBP. MWH have assisted in pulling this overview together to continue with the independent review carried out at DBP to ensure consistency of our approach with that used for the DBP.

1 Stakeholder Engagement

OFWAT'S AMA ASPIRATIONAL STATEMENT: The company has implemented an asset planning approach that delivers a business plan that addresses the conflicting interests of its stakeholders and statutory objectives, and seeks to deliver the best value for customers now and in the long term. This is achieved through economic assessments and optimisation of investment needs, including robust valuation of benefits to the company, customers and the environment as appropriate. Where conflicts are not clearly resolved through economic tests, the company's position and justification for its chosen plan are clear.

SEVERN TRENT WATER'S RESPONSE

1.1 Engagement with Customers and other stakeholders

AMPAP Test: Stakeholders views have been actively sought and taken into account in the planning process.

We have carried out extensive customer and stakeholder engagement in producing the Final Business Plan to ensure it reflects the views of customers and other stakeholders.

Commentary on how we have engaged with customers and stakeholders is laid out in **Chapter C1** of the Final Business Plan. This includes detail of quadripartite meetings held with key stakeholders (including Ofwat, The Environment Agency, Drinking Water Inspectorate (DWI), the Consumer Council for Water (CCWater) and Natural England) to help inform and balance the different priorities of these groups. Stakeholder involvement is enabled through a Stakeholder Engagement Plan (SEP), where issues are tracked and managed in detail via relationship management with each key stakeholder. Our Regulatory Affairs Manager within the Regulation and Competition Directorate is responsible for coordinating stakeholder engagement across SVT through the SEP and supports the agreed owners of each relationship in progressing issues with them.

Extensive stakeholder consultation was undertaken to establish customer's views on the Strategic Direction Statement published in December 2007. We consulted with key stakeholders (CCWater, the EA, DWI and Natural England) via the Quadripartite process in addition to publishing the draft for wider consultation on our website and company intranet. Local Authorities, interest groups and MPs were contacted by email to ask for their views. We received over 50 individual responses by email, as well as receiving detailed feedback from our key stakeholders. More detailed information around stakeholder engagement for the business plan can be found in **Sections 1.2 & 5.2 of Chapter B3**, for Water and Sewerage services respectively where we detail the support given by stakeholders for the proposed investments.

We have carried out dedicated market research to understand how much customers are prepared to pay for service change and improvements (Willingness to Pay) and the results from this have been shared with CCWater and other stakeholders through the quadripartite meetings. Our first WTP study was carried out in 2007 by the market research company Accent and economic consultancy RAND. A follow up survey with focus groups was undertaken in 2008 to refresh elements of the data. (Refer to **Chapter C8** commentary and **Section 2.1 of Appendix 4** for detailed information on the Customer and Stakeholder consultation and WTP surveys and results).

We have various means for receiving direct feedback from customers which includes:

- Customer Event Surveys, which since 2003 have been sent to all customers following their contact with work teams to obtain feedback on performance.

- Business Direct (trade customers) are given specific contact numbers for issues with Trade Effluent to ensure they are dealt with appropriately, with all contact going through a designated Commercial Waste Advisor.

- A customer satisfaction survey is carried out on a quarterly basis by Ofwat that assesses how well we are perceived as a company by our customers in relation to service delivery. This measure feeds into the Company's OPA score with feedback received shortly after each quarter's survey is carried out.

- Through reviewing and monitoring the level and content of written complaints, which is one of the most effective quality assessment tools that we have at our disposal. Thorough root cause analysis is undertaken into the types of complaints that are being received to highlight any emerging or underlying issues.

Reporter Involvement

We have a designated PR09 team responsible for wider business interaction with the Reporter. An agreed process is being followed, with clear ownership of issues and relationships and the processing and progressing of Reporter observations as a result of audit activity.

Following feedback from the Reporter during 2008 and the submission of the DBP, a joint lessons-learnt exercise was carried out with input from the Severn Trent Chief Executive, with key improvements identified and implemented within the programme in preparation for the FBP.

There are regular fortnightly meetings with the Reporter (now weekly) led by the Business Planning Director to proactively discuss issues and to ensure that audits are proceeding to plan. Inputs are constructive and well managed.

The audit plan has been developed and agreed through interaction between business subject matter experts and the Reporter teams (Atkins). The audit plan has been coordinated and maintained centrally by our 'Reporter Logistics' team given the numbers of audits required and the range of subject matter experts across the company. Atkins and our business experts are responsible for keeping Reporter Logistics informed of changes to the plan. Designated Severn Trent owners are responsible for managing technical responses to challenges raised by the Reporter. Any actions from audits or key Reporter feedback is managed through Summary of Audit Findings (SAFs) which set out the response from the audit. Responses to these are then made until the issues are concluded. Any notable concerns are escalated through regular internal meetings between the Reporter and senior members of the business planning team.

1.2 Choice of planning objective

AMPAP Test: The selection of the planning objective has been appropriately made.

As outlined in detail in **Section 2 of this overview**, an extensive process has been followed to develop and agree the company strategy and policy, which has been developed into detailed and agreed planning objectives. The Water and Wastewater teams have established detailed planning objectives for each sub-service level and these are explained in **Sections 1.1 & 5.1 of Chapter B3**.

The key stages in the strategy and planning process were:

- Key Strategic Intentions, more detailed Key Performance Indicators and ultimately the associated impacts on the business plan for all asset types (with a clear linkage to the SDS), were agreed at Board Level.
- Publication of the Strategic Direction Statement in December 2007
- Agreement of Control Totals (internal baseline positions for Opex and Capex at key points in the process to drive efficiencies and budgeting) for the Business Planning Process.
- Draft Business Plan key outcomes were presented to the Board and agreed.
- A Business Plan was developed to deliver the required outputs for each of the Key Strategic Intentions, within the Control Totals set.

This detailed rolling 5 year business planning process and how this informed the PR09 Regulatory submissions is covered in detail in **Sections 2, 3 & 4 of Appendix 4 in Chapter C8**.

The Severn Trent Executive Committee (STEC) holds monthly Operational Monitoring Meetings where KPI performance is reviewed. A more detailed monthly Operational Monitoring Meeting is held with each business unit to review progress against their business plans and budgets. In this way the company strategy and detailed planning objectives for each sub-service area are continually reviewed and updated at board level.

1.3 Valuation of service benefits

AMPAP Test: Appropriate functions have been developed for valuing improvements in service in all relevant service areas.

As discussed in Section 1.1 of this overview, extensive market research has been undertaken via a WTP survey. Our first WTP study was carried out in 2007 by the market research company Accent and economic consultancy RAND. A follow up survey with focus groups was undertaken in 2008 to refresh elements of the data. The approach taken, the evaluation methods used and the independent validation of the approach, together with the methodology for evaluating Cost Benefit Analysis (CBA) has been summarised in **Chapter C8** commentary and **Section 2.1 of Appendix 4**.

Using Service Measures to Form the Investment Plan

We have undertaken a lengthy consultation and survey process to develop measures of services to customers and the environment and established customer's willingness to pay for improvements in these measures, as outlined in **Chapters B3, C1 and C8**. Customer priorities are central to the development of our plans. Therefore customer willingness to pay (WTP) for improvements is the main basis for assessing the benefits of potential improvements. The BRITE programme uses these service measures and they are aligned with the service measures used throughout the whole of the investment planning process.

Each service measure has been attributed a monetary value which represents customer's/society's willingness to pay for a change in a level of service. These values are primarily sourced from the customer stated preference survey, although some of the valuations for environmental service measures and quality obligations are taken from other studies. Examples include carbon and drinking water quality failures. Applying monetary estimates of WTP to the service aspects of the investment means that a full cost benefit analysis can be undertaken for each investment.

The WTP is applied to the 'effective quantity', defined as the expected overall change in the service level provided by the investment, which is given by the change in probability multiplied by the impact. For example, with an investment which affects 100 customers, and reduces the probability of a service problem from 10% to 5%, the expected number of service problems before the investment is ten; and after the investment the expected number is only five. Therefore the effective quantity associated with the investment is five.

The effective quantity is the value to which the WTP estimates are applied. In addition, the effective quantity allows us to predict the expected service level before and after investment. This is used to report and optimise the portfolio of investments and service delivered.

The report uses a robust methodology and has been subject to peer review. The analysis of the results has ensured a conservative approach to valuation and for most aspects of service the values used are below those of most other companies.

The methodology for selection of service measures for investment planning is outlined in detail in **Section 6.2 of this overview**.

2 Leadership, Policy and Strategy

OFWAT'S AMA ASPIRATIONAL STATEMENT: The company's board has demonstrated its commitment to achieving the best value for customers and the environment by implementing a proactive asset management strategy and policy, including processes for ensuring continual management engagement with board policy and objectives.

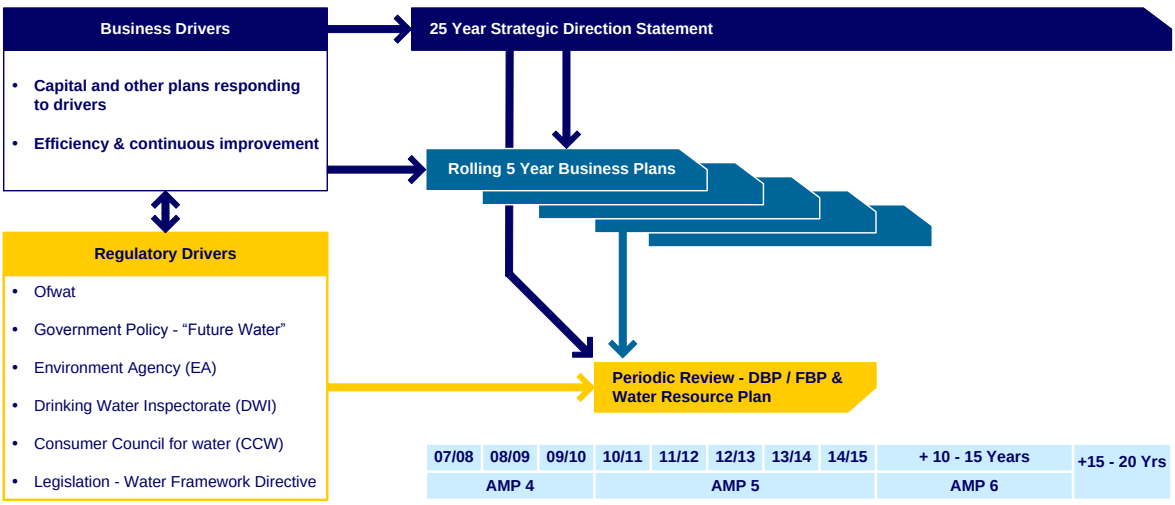
SEVERN TRENT WATER'S RESPONSE

In 2006/7, Severn Trent Water set out with the explicit goal of being the best water and waste water company in the UK by having highest standards, lowest charges and great people. This process started with setting out the strategy in the SDS and is now driving a series of change programmes across the company to deliver the vision. The process we went through is set out in the following sub-sections, starting with the development of the SDS.

Strategic Direction Statement & Business Planning Process

Severn Trent Water published its Strategic Direction Statement (SDS) in December 2007. At that stage we had already introduced a 5 Year rolling Business Planning process that would be central to achieving our aim of becoming the best water and wastewater service company. Following the creation of the Business Planning team in January 2006, we were in an ongoing process of reviewing performance and identifying the efficiencies and improvements that allowed us to produce a highly focussed, high quality and well received SDS document. Milo Purcell from the Drinking Water Inspectorate said '***We welcome both the leadership given to this process by Severn Trent Water, and the focus on long term planning'.*** The Executive team were fully engaged in this process and had dedicated considerable time to identifying and exploring 34 Key Business Issues (KBIs) (subsequently distilled to 28) which then developed into the eight Key Strategic Intentions (KSIs) that were the building blocks of the SDS and became central to the Business Planning process.

We introduced an integrated Business Planning framework in 2007 as set out below:



This shows that our regulatory submissions are not "special event" plans but are the product of an agreed and integrated planning framework. The 25 Year Strategic Direction Statement has created the framework for the development of rolling 5 Year Business Plans which can then be developed into Regulatory submissions. In this way the 2007 Business Plan is the core of the DBP with the 2008 Business Plan then used to update the DBP to become the FBP. Each year the Business Plan is consolidated into the Severn Trent Group Five Year plan.

In the 2007 Annual Report and Accounts, Colin Matthews, the then Severn Trent Group Chief Executive, set out radical plans for improvement and explained that during 2006/07 we had examined every aspect of our performance and this had been benchmarked against other companies in the water, sewerage and other sectors. As part of this work 20 Key Performance indicators had also been agreed which would be used to drive performance, measure progress and ultimately reward employee performance. These were set out in the 2007 Annual Report and are covered later in this document.

A major change and enabler for ongoing performance improvement has been the creation of a process aligned organisation. In the 2008 Annual Report and Accounts for 2008 Tony Wray , Chief Executive Officer, said ***"In 2007/08 we dismantled the previous operating model of Asset Management, Engineering Operations and Customer Relations and created an organisation based around the key aligned processes of Water, Waste Water and Customer Relations. Throughout 2007/08 we selected and appointed new teams in every part of our business. In addition, we have created alignment around our Key Performance Indicators (KPIs)".***

Key Business Issues (KBI)

During March – June 2007 the Business Planning team worked with the STEC to produce a KBI document (dated 30 July 2007). Page 7 of this document states that***, "The document (Key Business Issues) is a key enabler to the production of the 2007 Business Plan (covering the period 2007/08 – 2014/15)".***

A mandatory requirement of the Business Plan was that it was fully consistent with the SDS which set out a 25 year view of the company's strategic direction which was built from the positions set out in the individual KBI documents.

Thirty Four (34) KBIs had been identified by the Executive Team in December 2006 and during the period of March – June 2007 these were developed into 25 year position papers by agreed "accountable owners within the STEC. Each paper was subjected to challenge and review during dedicated STEC sessions resulting in 28 KBI documents being confirmed. Their purpose was to:

- Provide strategic direction on the range of business issues.
- Enable the development of plans that are aligned to the agreed longer term direction (as expressed in the SDS).
- Allow the fuller development of the strategic positions within the horizon of the current business plan.
- Test the feasibility of delivering the positions in the planning process e.g. if the 25 year position is 100% metering, what can be achieved in the 7 year period of the plan and what does this mean to the strategic objective (flat prices/single A credit rating).

Key Strategic Intentions (KSIs)

Following the completion of the KBI work they were distilled into eight Key Strategic Intentions (KSIs) which were the building blocks of the Strategic Direction Statement. There is therefore a direct alignment of KBIs to KSIs and into the vision set out in the SDS.

"Our vision is that we will be in the water and waste services company which achieves the highest quality and customer services standards while offering our customers the lowest prices, with great people delivering the service". (SDS Page 10)

Table 1 documents the KSIs and the impact that they were considered likely to have on the subsequent regulatory submissions.

Table 1

Key Strategic Intentions	DBP/FBP Impact
1. Provide a continuous supply of quality water	• Reduce interruptions • Increase resilience • Meet DWI quality standards
2. Dealing effectively with waste water	• Meet new quality standards • Reduce pollution • Reduce sewer flooding • Increase maintenance
3. Responding to customers' needs	• Increase number of communication channels for customers • Increase call centre capacity
4. Minimising our carbon footprint	• Increase electricity generation • Investment programme takes carbon impact into account
5. Having the lowest possible charges	• Reflecting benefits of business transformation • Efficiency savings from process improvement • Improvements based on customer willingness to pay
6. Having the right skills to deliver	• Ensure our people have skills to deliver to higher standards
7. Maintaining investor confidence	• Cost of capital reflects investor views • Ensuring the programme maintains key financial ratios
8. Promoting an effective regulatory regime	• Development of competition framework for the water industry

Key Performance Indicators (KPI)

Having benchmarked performance externally (see below), the Board agreed a number of Key Performance indicators (KPIs) to measure improvements in performance against what were agreed as the "top 20" level one performance indicators.

These KPIs were then used to set the key planning objectives for each sub service area for the business plan. These planning objectives are outlined in detail in **Appendix 4 of Chapter C8** and **Sections 1.1 & 5.1 of Chapter B3**.

In the Annual Report and Accounts 2007 Colin Matthews (the then Group Chief Executive) said that:

"We have identified 20 critical success factors against which we will measure our performance and progress. We have chosen these with great care, because they represent what we believe are the key concerns for customers, regulators, employees and shareholders. These 20 factors will be represented by 20 KPIs. In all but two cases, we have defined our actual performance based on our benchmarking exercise and we propose to use these as a basis for assessing our performance going forward. For each indicator we will set ourselves ambitious targets for the coming years, and have drawn up action plans for achieving them. Some improvements will be effected relatively quickly; others are longer term, going beyond the current AMP4 period".

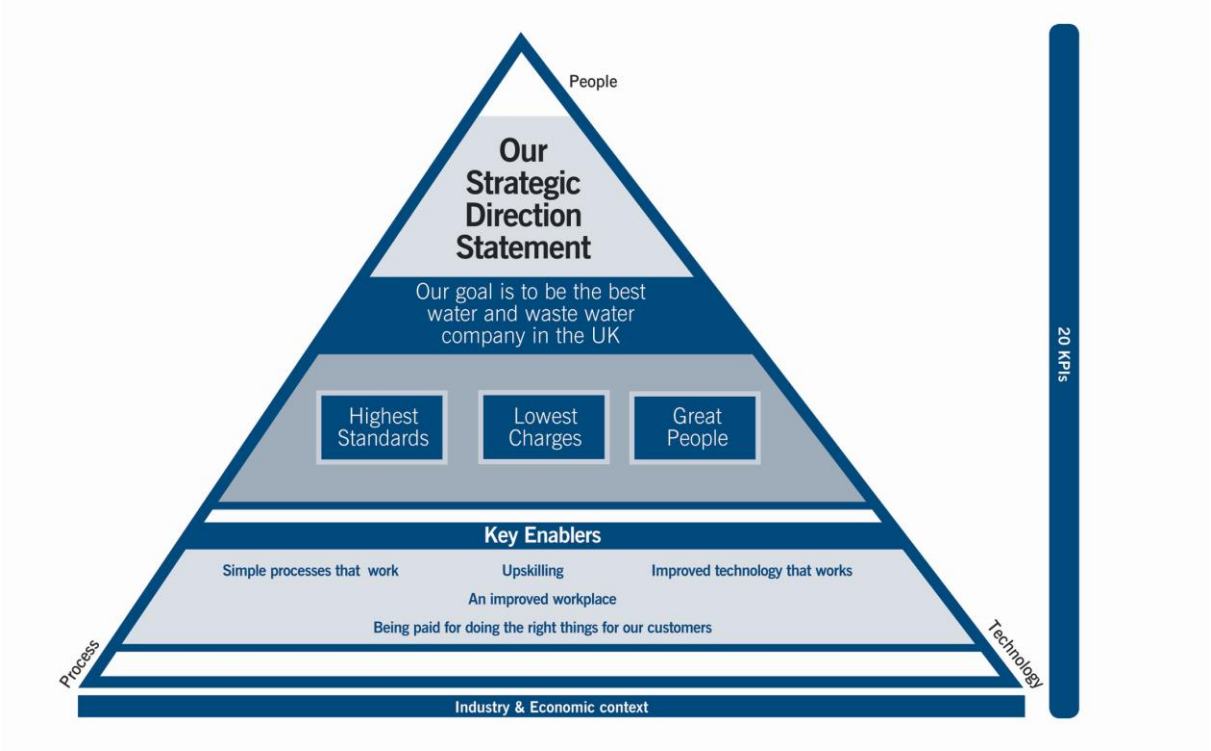
These were key inputs to the business planning process and are covered in Pages 98 to 107 of the *'2007 Business Plan – Guidelines and Assumptions'* document.

KPIs are now an integral part of the company reporting mechanism and continue to be tracked on a quarterly basis and reported in the Company's Annual Report and Accounts. It remains the company objective to attain upper quartile performance across our 20 KPIs.

Summary of Leadership, Policy & Strategy

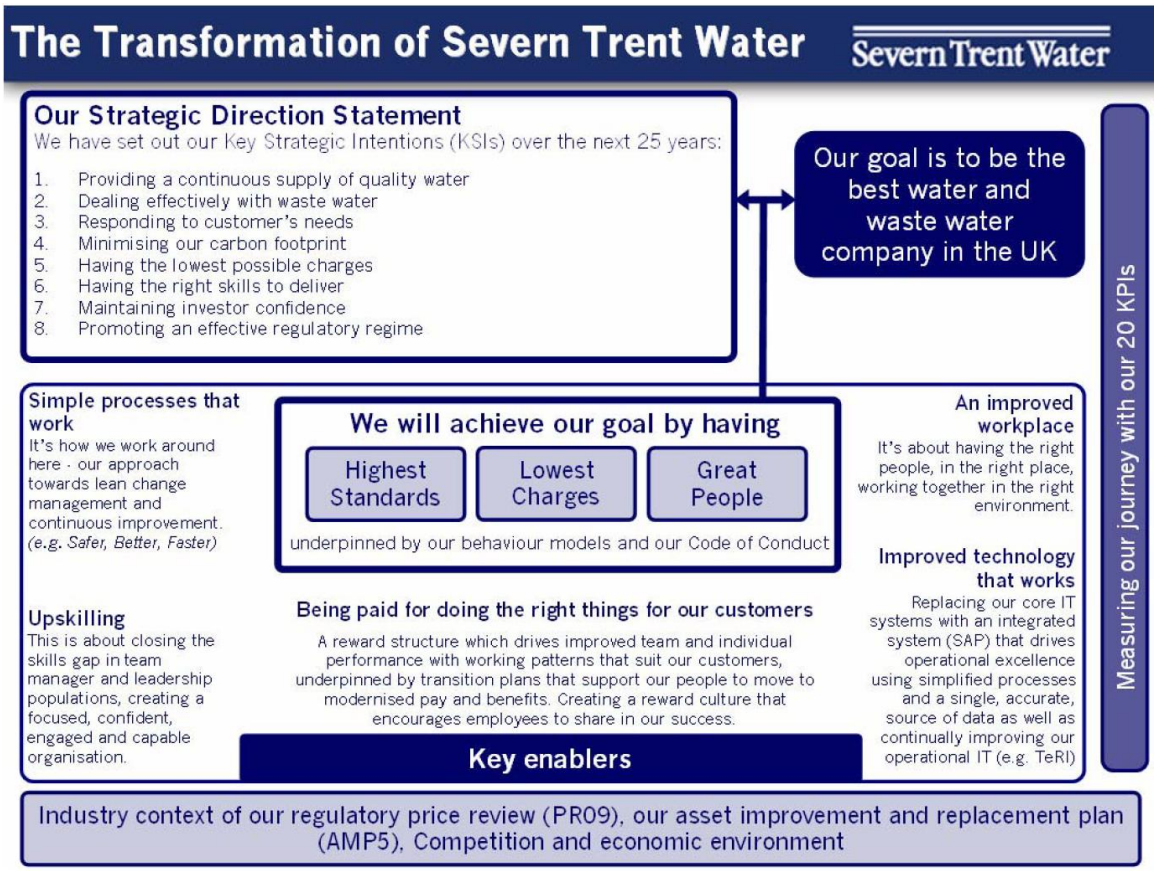
There is strong Board level commitment to the Strategic Direction Statement (SDS) and the 20 Key Performance Indicators that were defined and agreed through a series of STEC meetings. The business planning objectives have been aligned to the KPIs and have been cascaded to inform the policy and strategy at sub service level and guide the business planning process for each sub service area. This is discussed further in **Sections 1 & 5 of Chapter B3**.

The following diagram is used to communicate our overall business strategy internally *(within document titled "Changing together – our journey to be the best")* and all staff have been provided with literature setting out the context for the change programmes underway within the business. The literature describes how all the initiatives fit together to take us to the position of being the best water and wastewater company in the UK and this has been reinforced by staff forums which ensure that staff hear the message first hand and have the opportunity to input to the process.



Further detail on how these change programmes deliver efficiencies is given in **Chapter B2**.

This programme continues to be directed by the Severn Trent Executive Committee and a summary of this change programme is set out in the diagram below.



2.1 Governance

AMPAP Test: There is strong board level commitment to asset management planning policies.

Following organisation changes in 2007, there is clear board level commitment to asset management. The STEC are involved in the asset management process both directly and through the PR09 steering groups. The STEC structure is available on the internal Streamline document management tool for reference by all staff. There are clear communication channels from the board into the key sub-service areas via the STEC.

The detailed management structure is covered in detail in **Section 3.1 of this overview**.

The STEC has a monthly reporting cycle, with each meeting having a specific remit. There are four key monthly meetings:

- Strategy and Business Management Meeting.
- Policy and Planning: The practical development and implementation of those initiatives agreed in the Strategy meeting, throughout the business.
- Operational Performance Monitoring Overview: Monitoring of financial and operational performance of KPIs.
- Operational Performance Monitoring Detailed: progress of business units against the business plan and budget.

There is a total commitment at Board level for Health and Safety with any "Lost Time incidents" resulting in a meeting with the Chief Executive Officer to establish the lessons to be learnt for the future.

There are weekly communications by the Chief Executive and/or Board members, via the intranet, to staff at all levels. The Group Company Secretariat are responsible for managing all agendas, papers, meeting minutes and meetings dates. Meeting dates are published on Sharepoint.

We also publish a monthly news package called "Team Talk" which is circulated by email to all Directors, Senior & Middle Managers within the organisation. This covers key topics cascaded from Board Meetings associated with Safety, Strategy and performance against KPIs and any key information associated with HR and other team information. Each manager cascades this information to his or her relevant teams to ensure thorough communication to all staff. A more recent development has been "Safety Stand Down" sessions to discuss individual safety issues, these are mandatory meetings held by all managers with their staff.

Additional governance and controls were established specifically around the PR09 Business Planning process. These are outlined in detail in **Section 7 of Appendix 4 in Chapter C8**.

There is a clear commitment from the Board to maintaining the approach to asset planning which has been enhanced by the BRITE process which was developed to increase the SVT asset management capability and has informed the PR09 process. The Asset Strategy team has been created to ensure that there is central ownership to maintain and develop the process post PR09, making sure that the investment made in the techniques, data and models is retained. There is a clear transition plan in place through to the end of PR09 and programmes of work mapped out to employ the models for optimisation of the capital programme and to verify that investment is delivering the intended outputs.

2.2 Policy

AMPAP Test: Company policy for asset management planning reflects company objectives and stakeholder requirements and is clear, unambiguous, accessible and dynamic.

Our asset management planning policies are driven from the Strategic Direction Statement through the KSIs, KPIs as described in other areas of this document. In particular the development of the AMP5 delivery strategy (described in **Section 4.1 of this overview**) has been specifically developed to reflect these requirements.

2.3 Strategy

AMPAP Test: Company strategy is clearly linked to company policy and is clear and unambiguous, accessible and dynamic.

Refer to the detailed information contained under **Section 2 of this overview**, which sets out the key stages in policy and strategy development.

As outlined above, STEC has approved 20 KPIs which are driving improvements across the business. All staff, including those with responsibilities for asset management and planning are measured against performance on these 20 KPIs. There are also specific initiatives within each KSI that are driving improvements and more details on KSIs 1 to 6,are available in **Chapter B2**, laid out by Service and showing impacts on standards, costs and

dependencies. The latter two KSIs (KSI 7 & 8) are owned by Finance and Regulation & Competition and are addressed in **Chapters B5 and Appendix 4 of Chapter C8**.

The KSIs are subject to continual review and update through the STEC Operational Performance Monitoring meetings. Ownership of each KSI is assigned to department managers within each of the three Operational Departments but ultimate ownership resides with the Operational Managers who report to STEC.

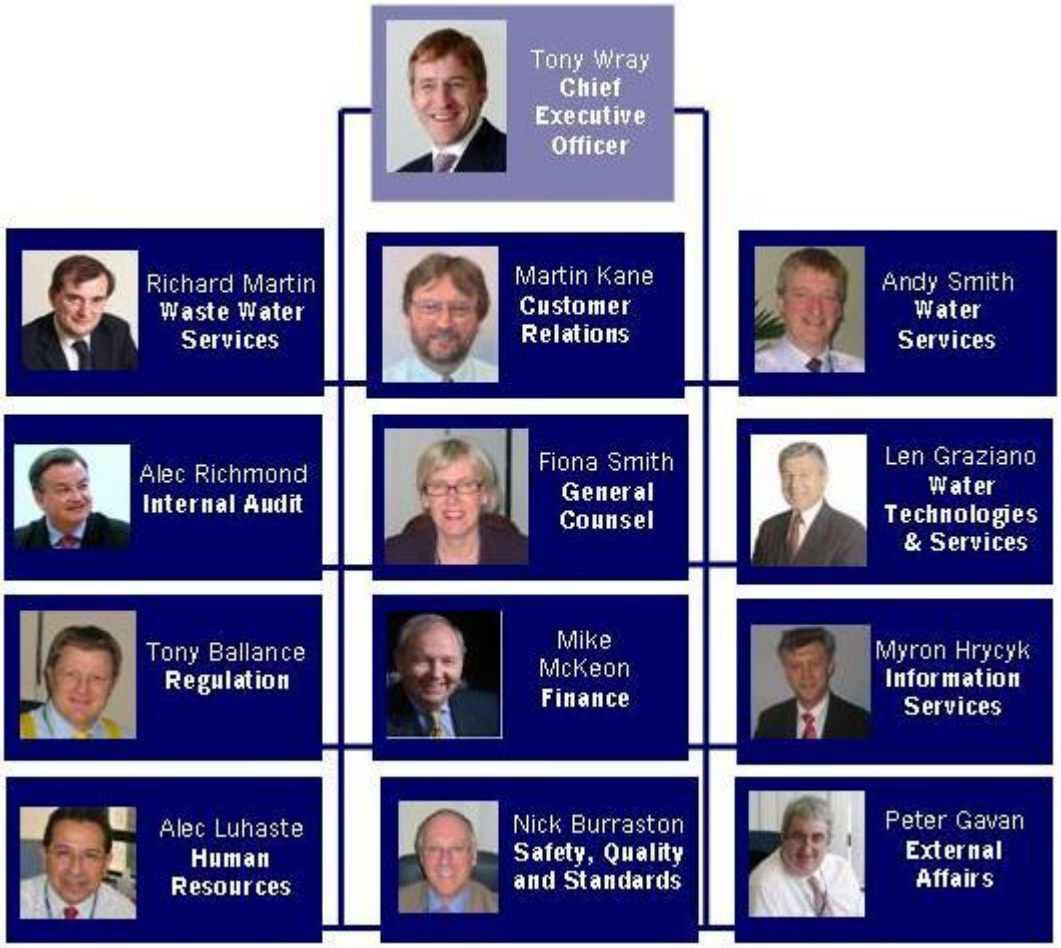
3 Management

OFWAT'S AMA ASPIRATIONAL STATEMENT: Roles and responsibilities of people are clearly identified, evidenced by organisational charts clearly mapped to the company's asset management processes. People management processes are aligned with asset planning objectives.

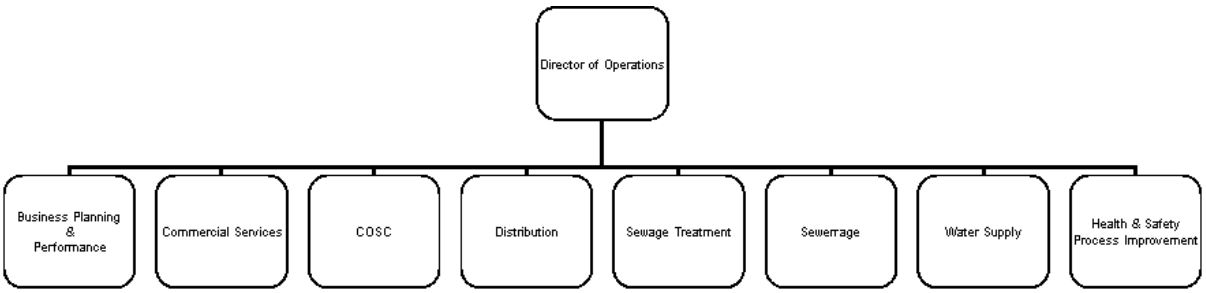
SEVERN TRENT WATER'S RESPONSE

3.1 Management

Changes to the organisational structure took place in early 2007, providing clear end to end accountability in Water, Waste Water and Customer Relations. In place of the previous 'functional' structure, with distinct teams working on planning, engineering and operations, we have created three integrated teams in order to raise standards and drive greater efficiency through streamlined processes and procedures. Strategy teams are responsible for Asset Management Strategy within the Water and Waste teams. Within these teams responsibilities are divided along sub-service lines (Infrastructure, Non-Infrastructure). The Severn Trent Executive Committee (STEC) structure is shown below.

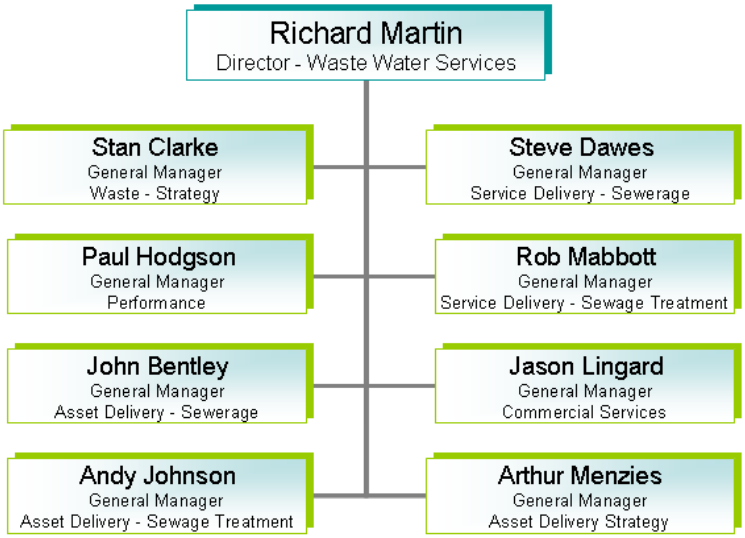


Pre April 2007 Structure – Operations Management Team

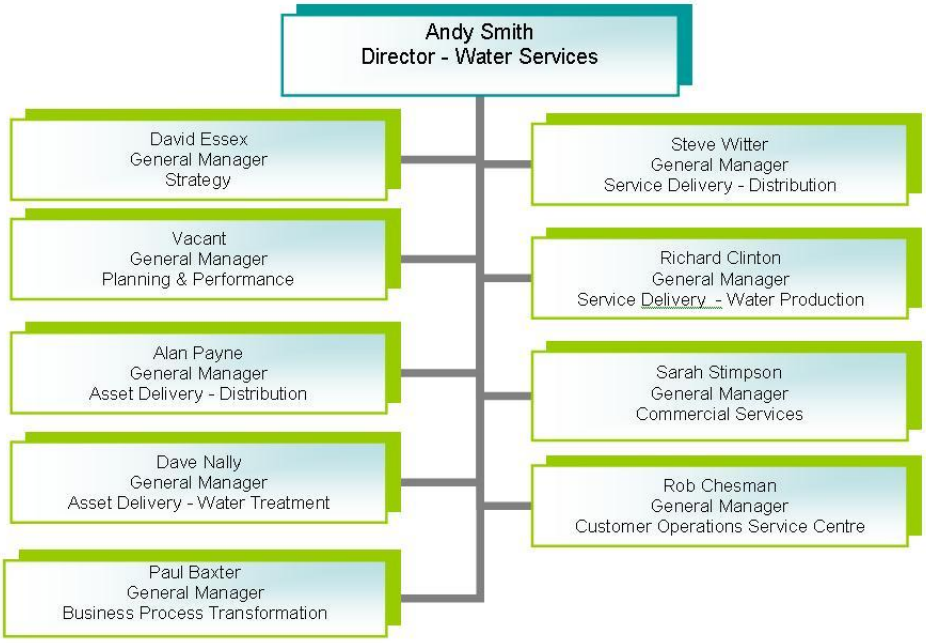


Post April 2007 Structures

The Waste Water services organisation is structured into eight areas; Service Delivery Sewage Treatment, Service Delivery Sewerage, Asset Delivery Sewage Treatment, Asset Delivery Sewerage, Commercial Services, Strategy, Performance and Asset Delivery Strategy.



The Water services organisation is structured into nine business activity areas; Service Delivery Water Production, Service Delivery Distribution, Asset Delivery Water Production, Asset Delivery Distribution, Commercial Services, Strategy, Planning and Performance and Customer Operations Service Centre (COSC). This structure provides a greater focus on assets and customers, whilst enabling greater coordination between Planning, Asset Delivery, Water Production and Distribution, as they are within an end to end processes.



This organisation provides an improved focus on assets and customers, and enables better coordination between Planning, Asset Delivery, Sewage Treatment and Sewerage, through the end to end process.

A restructure of the COSC in September 2008 aligned the structure to geographical areas and also identified duty managers to address key issues. This ensured that an ongoing focus is maintained on issues arising from customer surveys including the company KPIs to support us in the drive for a right first time approach.

Both teams have clearly stated objectives and have detailed improvement plans which have been summarised in **Chapter B2**.

In addition, there is now one Executive Team focused on core water business activities. As a result of this integration we have significantly reduced ongoing overhead costs. Equally important is the opportunity to raise standards and reduce the number of management layers between the Board and the front line of customer service delivery. We have examined all aspects of our performance and benchmarked it against comparable companies in the water, sewerage sector, and other sectors.

As outlined in the Executive Summary, our strategy aims to establish capability in this AMP that will be needed to deliver sustainable future benefits. By raising standards, and minimising failures, process efficiencies and greater standardisation will follow. Having redesigned the organisation blueprint, focus has shifted to further development and implementation of business change plans, focused around people, processes and technology. We are now driving further improvement with the "Safer, Better, Faster" business transformation programme, addressing barriers to achieving the vision set out in the SDS and building a culture of continuous improvement. More detail of all these improvement areas can be found in **Chapter B2**.

More detailed information on management within the Water and Sewerage services can be found in **Sections 2 & 6 of Chapter B3** for Water and Sewerage respectively.

4 Processes

OFWAT'S AMA ASPIRATIONAL STATEMENT: The company is operating asset planning processes that are holistic and well integrated, 'business as usual', such that all relevant inputs (information and data), analysis, time frames, objectives, constraints and outcomes are logically linked and clearly managed. The process is in continual use for business and asset planning and is capable of providing the regulatory business plans without the constraints of the five-yearly regulatory cycle.

In this case, the AMA Components do not map exactly to the AMPAP Components so AMPAP test statements are used as an indicator of the expected information. Additional detailed information around Processes can be found in **Sections 2 & 6 of Chapter B3** for Water and Sewerage respectively.

SEVERN TRENT WATER'S RESPONSE

4.1 Integration into Business Processes

AMPAP Test: The company's business processes provide full coverage of asset management planning, are documented, updated, have defined interfaces and are used in the day-to-day running of the company.

Detailed Business Process maps have been developed for the PR09 business planning process, which shows a four step process:

- Data Provision (led by the Data Control Team)

- Asset Investment Modelling (lead by BRITE Team involving the strategy teams)
- Corporate Optimisation (led by BRITE Team involving the strategy teams)
- Capital Delivery

The detailed process map is contained in **Annex 2 of Appendix 4 in Chapter C8**.

To ensure that the continuing objectives of the business are met following the completion of the PR09 process, the data collection, data improvement and investment planning processes will transition to business as usual in line with the agreed long term business planning and asset management approaches.

In 2005 we established the Balancing Risk and Investment To Excel (BRITE) initiative to satisfy a business requirement for significantly improved Asset Planning capability and through this, a more robust submission for the PR09 Regulatory Review of Prices. The BRITE system has bought about a step change in business working practices helping to make these activities repeatable, auditable and above all transparent.

As a part of the project plan for the PR09 submission the BRITE processes, data collection and improvement plans have a transition process into the control of the Asset Strategy team, working collaboratively with the Water and Waste Water Strategy teams, the SAP programme and the wider company.

Detailed information on our approach to investment planning (BRITE) is covered in detail in **Section 5 of this overview**.

Data Provision:

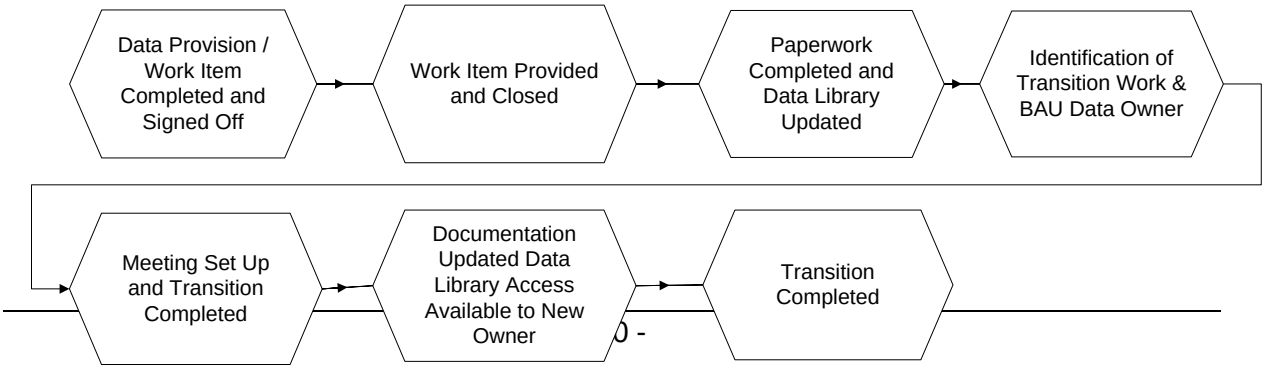
As outlined in **Section 6 of this overview**, extensive data improvements have been made following the DBP. A more proactive approach was taken to securing data for investment planning and asset management and detailed business processes were developed (documented and filed on sharepoint) to secure consistent data for key data sets.

A number of key long term data improvement projects were developed and these will be transitioned to the Asset Strategy team for oversight and delivered by the relevant parts of the company.

Through the SAP implementation project, further data improvements will be investigated and integrated into SAP functionality.

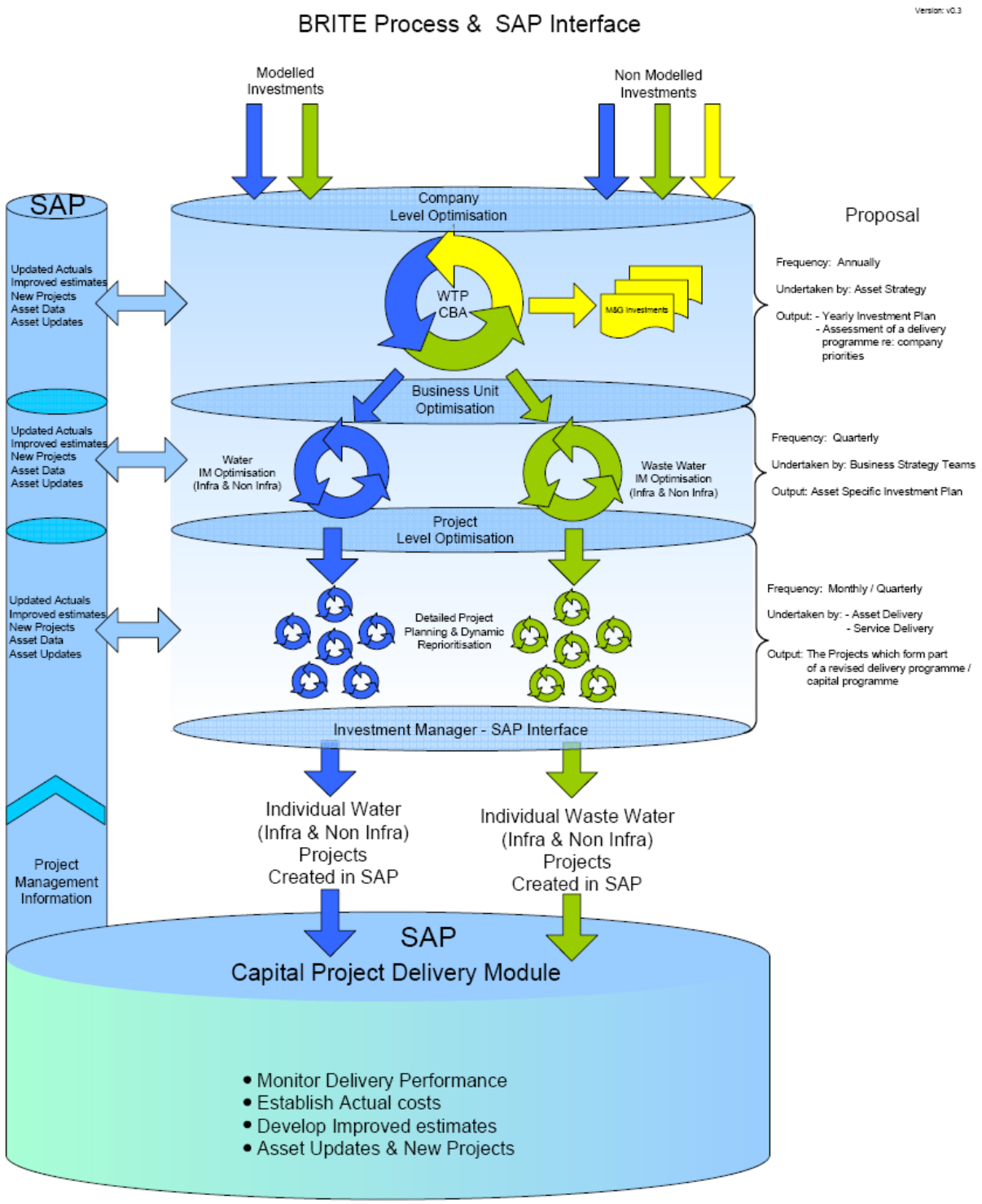
A detailed Transition Plan has been created, to enable effective transition of these data processes into BAU for future business plans and June Returns. Ownership of these data analysis functions within the BAU organisational structure is being managed by the Data Control Team and a transition plan is in place.

The data transition process is shown in the following diagram:



BRITE – Asset Investment and the BRITE Investment Manager:

The BRITE process has contributed to the delivery of an enhanced process for the production of AMP5 investment plans. The systems, processes, core knowledge and skills of the development team will be transferred into BAU when the current development programme ends in March 2009. The existing Asset Strategy team within Regulation and Competition will take on the ownership of the BRITE outputs to ensure that the benefits from the investment made are maximised. Whilst Asset Strategy will continue to own the overall process, the Water and Waste Water teams will own the asset deterioration tools which we will keep up to date with the most recent data and to inform capital investment and operational interventions during AMP5 and beyond. Asset Strategy will own and run the Investment Manager to assess the cost/ benefit of investments as needs arise during AMP5. The system will also be used to provide a regular refresh of the capital programme within Water and Waste and to generate an annual service, cost and benefit refresh of the investment plan within the rolling Business Planning process. By implementing this ongoing process, refreshed with up-to-date performance data, we will deliver a PR14 submission which is based upon a greater proportion of business as usual information and as such will be more robust and mature than at PR09 and therefore minimise the level of additional input required at PR14. The diagram below illustrates the current proposals for ongoing optimisation of the capital programme using the BRITE tools.



A Transition Plan is in progress covering the full range of activities to ensure that all relevant areas of the business are engaged and involved. All BAU processes have been mapped and detailed documentation is currently being produced to support the future way of working in the following areas:

- Infrastructure and Non-Infrastructure asset investment modelling.
- The capture of all candidate investment schemes (incl. non-modelled) in Investment Manager.

- Company wide optimisation in the Investment Manager system.
- Ongoing optimisation processes including updates for the annual business plan and the interface with the live capital programme.
- Business support processes i.e. model validation, sensitivity analysis, quality assurance, report production and system administration

- Training materials, training sessions and training capability will be delivered to specific business team individuals to ensure that the BRITE processes transfer successfully into the normal operating model. In addition, the requisite support structures such as user groups and other regular stakeholder forums will be established and firmly embedded within the organisation. These mechanisms will provide the business teams with the capability to deliver continuous improvements to ensure that the benefits of BRITE continue to be delivered on an ongoing basis.

Business Processes for Capital Delivery:

We are currently in the process of designing a new operating model (along with a clear organisational structure and associated roles and responsibilities) for asset delivery in AMP5, encompassing the concept of the Expert Client and dependent upon collaborative working for mutual success with our partners. The new organisation will focus on programme and project management together with defining solutions to deliver the regulatory outputs.

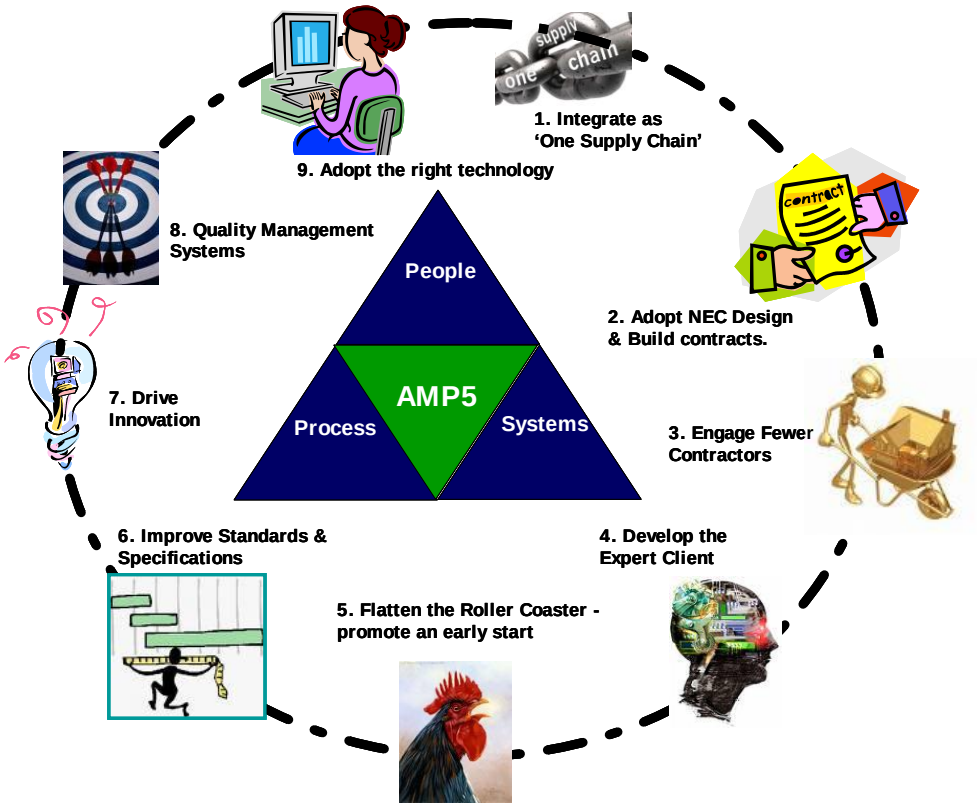
The processes necessary for the move to a standard design and build contract strategy have been developed around a gated delivery model. Process maps have been developed for a range of projects and risk profiles and detailed sub processes are currently being developed. The gated process embeds the governance process throughout the capital delivery process. This process remains largely unchanged from AMP4 with key approvals by Senior Manager, Director, Executive Team and Board depending on stage and contract value. Ownership of the approvals process and governance sits with finance and is embodied in the Capital Investment Manual (CIM).

A collaborative IT system is currently being configured (Business Collaborator) to enable access to standard documents and procedures as well as facilitating information sharing and workflow. This tool is scheduled for deployment in May 2009 across the supply chain and we are driving for greater access to data systems by 3rd party partners. Early successes include the opening up of asset operation and maintenance manuals on the web.

We are currently embarking on a transformation programme to implement SAP as outlined in **Section 5.2 of this overview**. This will include introducing new asset management modules with the supply chain interfacing with these systems through a portal arrangement.

Within our strategy, nine key principles have been defined for the AMP5 contract strategy and these are shown in the diagram below. These key principles have assisted with developing key business initiatives to drive further improvement. Key process improvements have been initiated from these nine key principles

The Nine Key Principles of the AMP5 Strategy



In order to achieve the goal of being the best Water and Waste Water company, we understand the importance of continuing to improve efficiency through the right delivery model. This is firstly to meet our own expectations as well as those of Ofwat. The delivery model chosen will deliver the efficiencies required and has been developed in consultation with other utilities and feedback from the current supply chain and key employees.

One of the overriding objectives of the AMP5 Asset Delivery change programme is to build one supply chain. This will enable us to work better with everyone involved in the business of planning to invest, investing or running new assets. All of the nine principles identified feed into this aspiration and will assist in eliminating waste, making our processes and relationships smoother and therefore more effective. Building quality into the processes will enable us to adopt and develop a quality based approach to all activities.

The overall process will develop the detailed roles and responsibilities that we will undertake regarding our processes, systems and people to strengthen our expert client role. We will also be introducing a web based collaborative tool prior to the introduction of SAP to ensure that we are adopting the right technologies to gain maximum advantage.

The nine key principles will enable us to develop and implement a robust, efficient and safe AMP5 delivery strategy.

Management of Company Engineering Standards

There is now a dedicated Engineering Standards team responsible for managing and updating all engineering standards, to ensure future capital investment is efficient, effective and consistent.

The Company's suite of Engineering Standards comprises a Design Manual, a set of Template Designs for repeatable solutions and a set of detailed specifications covering civil, mechanical and electrical work. As part of the preparation for AMP5, all of these standards are being reviewed, updated and re-formatted to reflect best practice and to ensure that they are easily transferable to the proposed document repositories. Accessibility has been improved through the provision of a document homepage called iDocs which allows internal and external users to view the documents and to provide feedback. Updating will be substantially completed by the end of March 2009 following which further work will be carried out with the supply chain to explain the content and purpose of the standards to encourage challenge and promote innovation.

Purchasing and Supply Chain Management

There is now a single Purchasing Service Department responsible for all procurement and supply chain management.

Within Severn Trent Water's Purchasing Services Department there is a set of policies and guidance notes relating to the processes and procedures associated with purchasing and supply chain management. Known as the Purchasing Manual, this is in the form of a database within Lotus Notes but was criticised for being difficult to navigate around, not kept up to date and over reliant on using locally stored copies of templates and forms. A project has successfully implemented a more user friendly version which is accessed via a "front page" with hyperlinks and shortcuts to local documents. The manual is now easier to use and navigate, has much tighter version control settings and users should always be taken directly to the latest version of the form.

Work is now taking place in the area of management of our Key Suppliers within the supply chain. We have a standard set of measures which are used to evaluate and assess the performance of the supply relationship which the departments buyers are required to use. We are also working on a set of dashboards to report and highlight areas where further improvements in processes are required.

4.2 Planning Processes

AMPAP Test: The company's business processes are being implemented for short, medium and long term planning which focus upon service delivery.

The SDS cascades through into Key Strategic Intentions and KPIs with long term goals linked to key service delivery improvements.

A robust risk based approach using BRITE has been used for Investment Planning. This is discussed in detail in **Section 5 of this overview**. More information on the Investment Planning approach is described in **Sections 5.1 to 5.12 of Appendix 4 in Chapter C8**.

Within the control limits set, planning has been undertaken across the whole business cycle, and the investment plan optimised to meet the required planning objectives in all sub-service areas. This is discussed in detail in **Sections 2.1 & 5.1 of Chapter B3** for water and wastewater respectively.

Refer to **Section 3.1 of this overview** for more information on our organisational structure and how the management structure has been aligned to business processes.

4.3 Information management processes

AMPAP Test: Robust processes have been established to manage information in the delivery of asset management planning

As outlined in **Section 5.1 of this overview**, there is an extensive corporate data repository which exists for both infrastructure and non-infrastructure information management, which is based on UADMS, STAR and the relevant job management systems. There are existing detailed automated and manual data management procedures.

We have continued our improvement and augmentation of data used for investment planning (analysis of asset condition, modelling of asset deterioration and performance and service consequence) since the DBP and this improvement will contribute to remove uncertainty and provide confidence that the selected interventions are optimised .

As explained in **Section 6 of this overview**, a proactive approach to data management has enabled us to develop consistent processes to manage data provision for all elements of investment planning. These detailed procedures and processes have been clearly documented and filed on sharepoint as key data sets required for asset management and ongoing business planning. A clear transition plan is in place for handover of this process knowledge to new owners within the BAU structure.

There has been significant improvement in data management between the DBP and the FBP with operational validation of the operational data used in the business planning process. A process was established to ensure the source data for the manual assessment of investments (driven by feasibility studies as opposed to asset deterioration models) in the FBP was correct and auditable (covered in more detail in **Section 5.12 of Appendix 4 in Chapter C8**). There have been Quality Control processes established for control of data within BRITE and more widely across the entire business planning process. This is covered in detail in **Section 5.12.2 of Appendix 4 in Chapter C8**.

As we transition these processes into BAU in 2009 for AMP5 delivery and planning for the future, the company is undertaking extensive business improvements around data management systems and processes with the implementation of SAP, a new integrated IT system for data capture and sharing of data. This will strengthen our asset planning capabilities by improving data quality, integrity and reduction of duplication. There will be an increase in automated data upload and processing, reduced manual interventions and therefore improved consistency. Business processes are still under development but significant improvements are expected. We have also recently completed the TeRI programme which will improve operational data capture. Much of this data is now automatically captured through eSCADA and site telemetry systems, cleansed, normalised and available for review and interrogation against each asset within the Corporate Spatial Repository. This will reduce the need for manual sub-systems and continue to improve the integrity of the processes.

Refer to **Section 5.1 of this overview** for more details.

4.4 Quality Assurance

AMPAP Test: Asset management planning has been undertaken in full accordance with documented quality, safety and environmental plans.

The BRITE Programme has a fully documented and recorded process for the Quality Assurance of data. The principles of the BRITE programme data quality assurance process are detailed in **Section 5.12.2 of Appendix 4 in Chapter C8**.

Within Sharepoint, detailed operating procedures and process maps have been generated and filed for:

- Asset data for condition assessments, performance modelling, the Asset Inventory and Asset Revaluation.
- Cost-intervention data – Cost Base (Unit costs), Cost of failure (opex / capex).
- Service consequence data – flooding, leakage, discolouration.

To ensure QA across capital delivery, a full Business Management System (BMS) is being developed and in house staff and external supply chain partners will deliver a high quality product in line with the standards and specifications. As expert client, we will audit and check for compliance with the standards. Rewards for external partners will be triggered through a contract incentivisation system with audits and checks feeding a process of continuous improvement. A key milestone in a project will be the post project review where all learning will be fed back to inform changes to standards.

The process will be set up to drive innovation and improvement from the whole supply chain.

Health & Safety

Our Health & Safety policy is "Zero by Choice" which is based on a drive to achieve no accidents and no work related ill health from the endeavours of Severn Trent. Health and safety performance is based on a comprehensive and integrated safety management system, which supports delivery of these challenging aspirations, including the Occupational Health Strategy. This means working safely, not taking risks, correcting unsafe things, and challenging the behaviour of those who are not working safely.

The H&S policy advises that employees should consider the impact of unsafe working on their health and that of others. PPE (Personal Protective Equipment) is mandatory for all staff and contractors on operational sites.

The Occupational Health and Safety commitment is to:

- Identify the potential work related causes of accidents and ill health and reduce risks as far as practical.
- Require colleagues and contractors to always follow our Employee and Contractors' Safety Rules.
- Assess the risks to those who might be affected by business and work.
- Control exposure to hazards and reduction of risks through design, engineering, systems of work and the use of personal protective equipment.
- Monitor to detect early signs of work related ill health, including work related stress, and act upon the results, utilising the Company's occupational health arrangements.
- Support colleagues through occupational health monitoring and advice, making changes where feasible, when events or their health impacts on work.
- Require all colleagues and contractors to report all incidents to enable measures to be taken to prevent future occurrences.

We have undertaken a fundamental reassessment of both Health and Safety standards and the risks to which we expose people across the business in AMP4 and are delivering a programme of improvements which we will continue through AMP5 and beyond. We consider that the management of safety risk is integral to the delivery of our capital maintenance obligations and we have not separately identified specific Health & Safety driven investment within our Water and Waste investment programmes.

The Environment & Corporate Responsibility

Tony Wray (CEO) stated in the Corporate Responsibility Action Plan (2010 – 2015) ***"Our action plan for the next 5 years 'Delivering corporate Responsibility' takes this <our environmental plans> a step further, setting targets for the workplace and marketplace as well as maintaining our commitment to the environment and the communities we serve. We believe this provides a more holistic view of the way our company performs."***

This plan has been put in place with specific targets, focussing on mitigating potentially harmful environmental impacts of business activities and enhancing biodiversity on sites – this strengthens the relationship with society and demonstrates commitment to environmental excellence. We also have specific actions relating to the Community Workplace, diversity and Marketplace services – these are all detailed in the corporate responsibility action plan.

5 Systems

OFWAT'S AMA ASPIRATIONAL STATEMENT: The company has installed integrated process, data, information and analysis systems to support the continual operation and improvement of asset planning. The systems are operated to deliver asset planning day-today 'business as usual' systems. Where systems are provided by the company's suppliers or partners, these are transparent to the company. The systems allow data to be captured at a suitable level of granularity.

SEVERN TRENT WATER'S RESPONSE

5.1 Systems for capturing and storing asset performance data and conditions data and systems for analysis

We manage infrastructure and non infrastructure assets using two dedicated systems. These systems capture both static and dynamic data, and enable information to be available through the Corporate Spatial Repository. At present, an individual is responsible for managing the asset data on STAR and UADMS. These systems are evolving with the implementation of SAP and through the TeRI programme, explained in detail below.

The following section sets out the systems and process currently operational. Throughout 2009 / 2010 many of these processes and system will be replaced and transitioned to a new SAP software platform. These future systems are also described in detail below.

Current Systems for asset management

Infrastructure

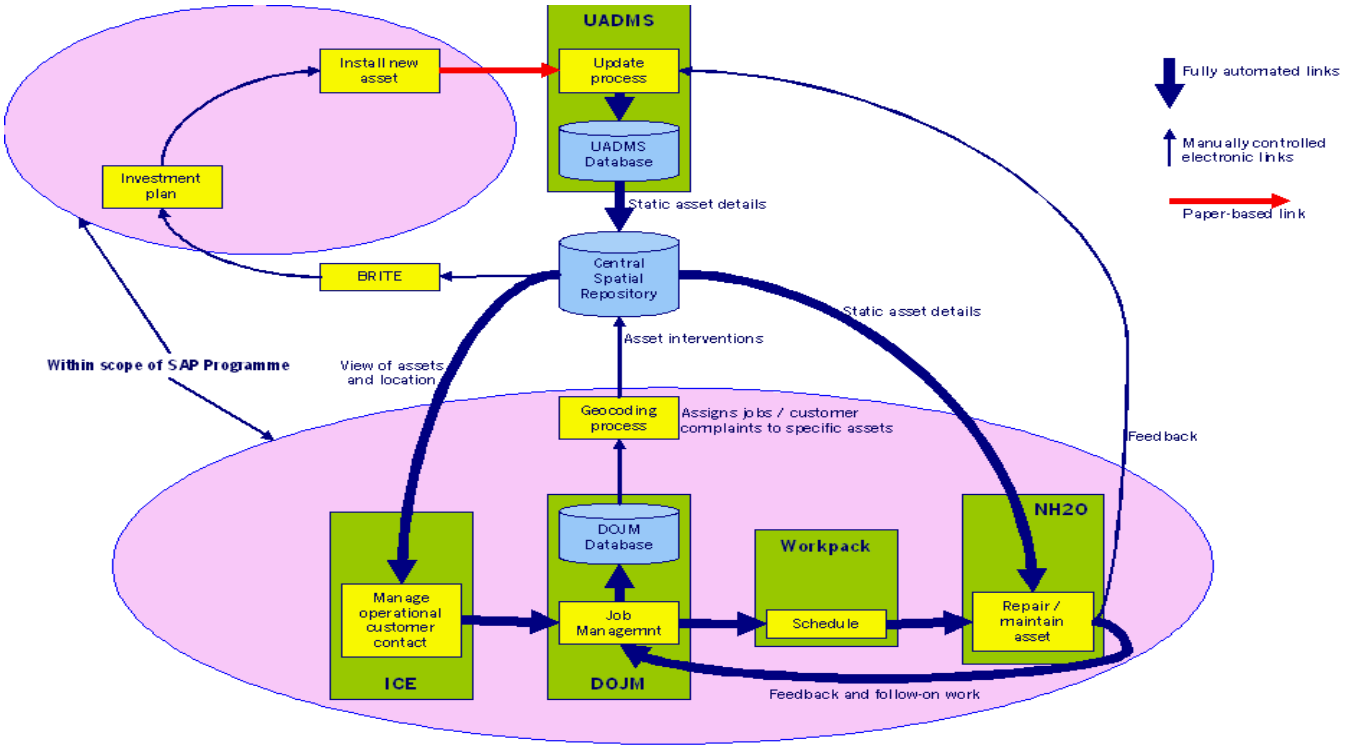
Data describing infrastructure assets is held on the Underground Asset Data Management System (UADMS). Data is manually created on the system from as-built records using an application called UADMS Update. For changes required as a consequence of repair and maintenance activity, changes are notified to the asset data team electronically. There is validation built into the UADMS Update application which ensures data validity, and a manual process in place to check data accuracy. Data can be bulk-loaded into the database but this is the subject of specific quality assurance and testing before the data is made live. The majority of the data in the UADMS database originates from original paper-based mains records and sewer records digitised when UADMS was implemented in 1999.

Customer contacts are managed using ICE (Improving the Customer Experience), which includes a view of the infrastructure assets based on UADMS data. Relevant contacts automatically pass through to DOJM (Distribution Operational Job Management) as work requests. DOJM is the work management application for infrastructure assets and also creates work requests direct, or from the fieldworkers' laptops.

Work requests are scheduled using "Workpack", and sent electronically to field workers laptops using a using a system called "NH2O" which also has a view of the UADMS data. When the job has been completed, the fieldworker captures any feedback or follow-on work using NH2O and this is transferred back to DOJM where a work request is generated and feedback recorded.

Specific work requests from the DOJM database that relate to asset serviceability are copied into the GIS environment and geo-coded. This is a semi-automatic process that uses data, captured during the life of the work-request, to assign the asset serviceability data to the most relevant asset (using the unique identifier in UADMS). Once geo-coded the work-requests are added to the Central Spatial Repository (for location coordinates, addresses) and are available for analysis using the corporate GIS (GISST+).

Assigned jobs and UADMS data form the core data for BRITE investment modelling for infrastructure assets.

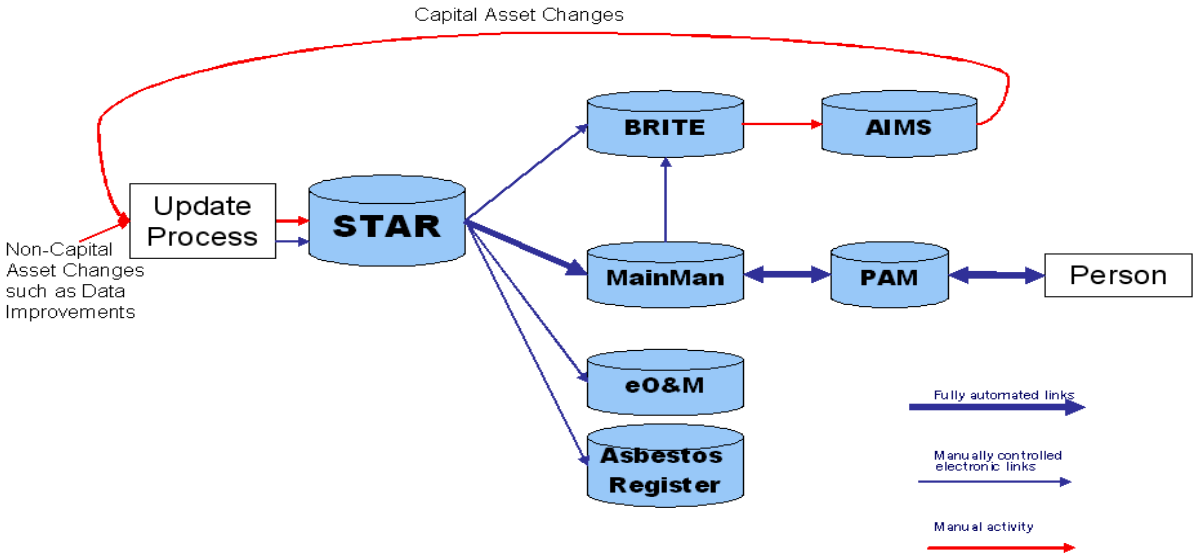


Non Infrastructure

Non-infrastructure asset data is held on the Severn Trent Asset Register (STAR) and validation rules are built into the STAR application to ensure data validity. Asset changes are carried out by two central teams, one for statutory assets and one for all other asset types. There is a dedicated mechanism for statutory purposes, and also one for non-statutory which allows details of existing assets to be copied (useful for projects which have multiples of the same asset groups).

A copy of STAR data is provided into the Maintenance Management application (MainMan), which captures planned maintenance requirements and issues documents for both planned and reactive work. The activities are fed into the Planning and Allocation Module to allow the jobs to be scheduled and issued to an individual. Details of the work subsequently carried out is captured and held against the asset in MainMan.

STAR and Yorvik data form part of the core data for BRITE investment modelling. Capital Projects are managed by the Asset Investment Management System (AIMS).



BRITE (Balancing Risk and Investment To Excel)

The development of BRITE began in 2005 however the systems were not sufficiently developed to be part of the 2007 Business Plan process. They were subsequently used to develop the asset investment plans for both the PR09 Draft and Final Business Plan submissions.

BRITE is a programme of work that was established to provide a step change in the way that we develop our Investment Plans:

- To put customer priorities at the heart of the investment programme via WTP research. .
- To develop an approach to assessing asset investment that is grounded in best practice methodologies (e.g. Capital Maintenance Planning Common Framework).
- To develop a transparent and consistent approach to assessing investment needs against a common set of service measures.
- To deliver balanced investment, taking into account trade-offs in benefits, whole life costs, and the service risk across asset types.
- To develop and embed a 'Business As Usual' approach to developing investment plans.

A key objective of our investment planning process has been to develop an investment plan that uses cost-benefit analysis as the prime driver for selecting investment schemes. This is a stated requirement of Ofwat for the PR09 submissions.

The four stages within this process are as follows and are illustrated in the figure below:

Step 1 - Asset performance & deterioration models

The statistical modelling of the impact of asset age and other factors on asset failures, and the consequential impact on service levels.

Step 2 – Investment options

The identification of investment options and their impact on asset performance, the environment, customer service and operating costs. These investment options emanate from either the asset performance and deterioration models or other sources (e.g. feasibility studies).

Step 3 – Least cost planning model

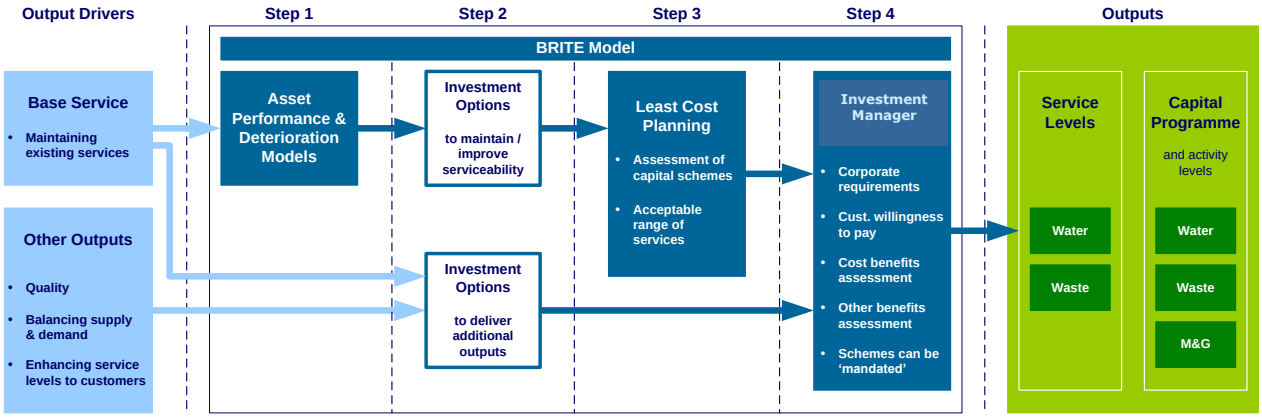
In each asset operating area, the change in risk to service for all options and selection of the least cost options for delivering a range of service levels.

Step 4 – Investment Manager (which optimises investment)

- We have used a tool known as 'Investment Manager' to support the development of our investment plan. Potential investment schemes (BRITE model derived and manually assessed) are input to Investment Manager to be collectively assessed.

Projects are selected where the benefits exceed the cost, or where they are mandatory (e.g. to meet statutory obligations).

The role of BRITE in Investment Planning



Detailed processes and procedures have been developed around the BRITE process and are discussed in **Section 4 of this overview**.

Future Systems for asset management

Two initiatives are planned that will have a direct impact on the business as usual systems and processes in the long term. These are;

- the implementation of SAP to provide a common platform, consistent processes and the reduction of interfaces across disparate systems, allowing us to drive consistency and process compliance throughout the organisation, and
- the extended use of telemetry and geographical information systems (GIS), integrated into core asset systems and increased use of automation and graphical systems to enable effective identification and control of assets remotely, supporting sustainable efficiency improvements.

Enterprise Resource Planning (SAP)

The most significant proportion of IT capital investment over the AMP5 period relates to the introduction and maintenance of an Enterprise Resource Planning system based on the SAP platform. SAP are the market leader in production of such systems. This will replace a large proportion of the core IT systems and provide a significant change in support of new processes, new ways of working and the capture and sharing of data.

Based on industry experience, the introduction of an SAP solution will drive process and service quality improvement and reduce operational costs of business and IT management.

SAP will improve data quality and integrity and eliminate duplication via a single centralised source of data. The integrated SAP modules and controls will mean that many data management processes are enforced by the system itself. The system is being designed with due recognition of regulatory and management data requirements to ensure that, wherever possible, business critical data is captured and managed within the system.

The infrastructure and non-infrastructure asset management systems (STAR / UADMS) will be replaced with systems that are integrated with SAP. Mobile units (PDAs - personal digital assistants) are being provided to capture data in the field and directly update the master data within the SAP system. Collecting data at source using a mobile device will increase both data capture (volume) and accuracy (validation at point of entry) compared with current systems. Improved data capture will provide the business with better quality information for its asset maintenance and investment decision-making processes.

A number of our current asset management systems i.e. STAR, Yorvik, PAM, IPROC will also be replaced by SAP. The integrated approach to data usage and management within SAP will mean costs (manpower, spares, services etc.) associated with any planned or unplanned asset interventions are captured and recorded against the asset/location automatically.

SAP will incorporate the following elements:

- Management of Capital Projects (possibly programmes)
- Asset Records
- Work Management
- Asset Accounting

It is intended that SAP will exist alongside the TeRI (Operational event data) and BRITE (investment planning) to provide a seamless integrated asset management system.

Telemetry – Improvements to Operational Data Capture and Management

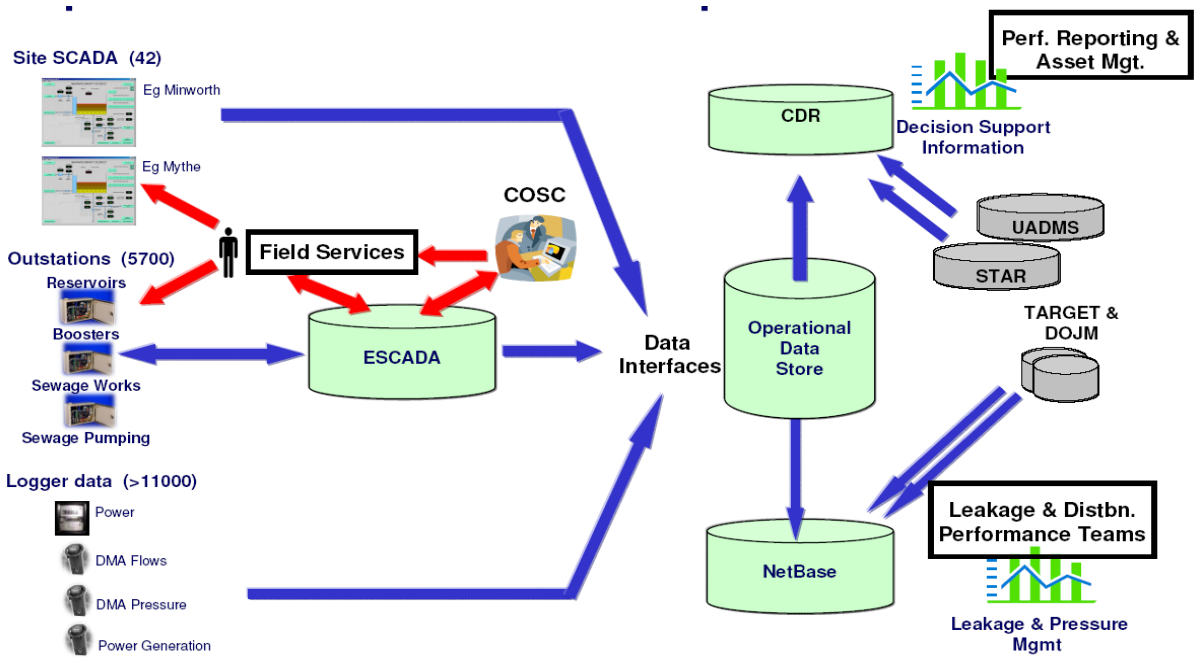
A review of the telemetry systems concluded that they were in need of replacement due to their age and the constraints that they imposed on the company's performance. The TeRI programme was introduced to provide systems and processes for collecting operational information from the field and presenting it in a way that supported the proactive management of our assets (refer to the B2 Commentary for more information on the efficiencies that this programme will deliver).

An extensive telemetry improvement programme (TeRI) was created to provide systems and processes for collecting operational information in the field, to strengthen the quality of the data held within the central data repository which can now be accessed from the central

corporate data repository by general access. Telemetry assets are now assigned to the STAR hierarchy, enabling reports to link asset maintenance and asset telemetry data. Site operational data from eSCADA, major works control systems, flow and pressure data from the distribution networks and energy usage are collected. All events such as equipment failures, configuration changes or asset performance data such as flow rate or energy usage are recorded automatically. Reports can be generated to establish the consequence of failure (service or cost) for a specific asset and correlate these to the resulting operational interventions. Direct correlation between a key event on a specific asset or site can be assessed to see what impact this had on the service provided to the customer.

This will provide better understanding of key faults and failures on a specific site via automated data collection and enable better correlation of these failures to any service impacts and cost interventions.

Operational Data Capture and Management System



Geographic Information Systems (GIS) are key to enabling us to locate and manage its extensive asset base. This GIS system will in time replace the UADMS system, currently used to manage infrastructure assets. The UADMS system has limited functionality, cannot interface with SAP and is considered to be out-dated and inflexible. The GIS programme will concentrate on simplifying complex system interfaces to allow staff to engage, deliver one set of data and create access across the company. This will allow data to be managed spatially, through a single corporate repository and allow;

- easier, more accurate and faster location of assets;
- better planning for asset design across the estate;
- better incident management and incident scenario planning; and
- better continuity planning and increased resilience of the distribution network.

The GIS and SAP programmes will work closely together as GIS is an underpinning technology for the SAP implementation.

More detailed information around systems can be found in **Sections 2.3 & 3 for Water and 6.3 & 7 for Waste in Chapter B3**.

5.2 Systems to support risk management processes and reporting

AMPAP Test: Robust systems are in place to support risk management processes and to produce the necessary internal/external reports.

There is currently an Enterprise Risk Management (ERM) system in place which has clear reporting lines. The risks surrounding capital delivery are captured through this process. Programme level risk management is an area that has been identified for improvement and the new organisational design and operating model will be focussing on this area going forward.

A Programme Risk Management (PRM) system has been developed which sits as part of the ERM system. This system is being rolled out to all change agenda programmes by the Severn Trent Executive Committee Programme Management Office (STEC PMO). All other programmes will be encouraged to use this going forward.

A stand-alone risk management process is deployed on a scheme by scheme basis for project level risk which centres on risk registers, plans for risk mitigation and risk response actions.

Risk management is also embedded into process maps, QMS and governance processes.

Overview of Enterprise Risk Management (ERM)

The ERM process is used to identify, assess and manage key risks to the strategic objectives of Severn Trent. The key components of the Severn Trent ERM framework include;

- objective setting;
- clarifying our attitude to and appetite for risk;
- identification of key risks to the achievement of corporate objectives;
- risk assessment including causes and consequences of the risk ;
- risk mitigation, including;
    - clearly defined ownership, accountability and responsibility
    - standards and procedures
    - internal controls
    - monitoring, validation and continuous improvement;
- clearly defined common language; and
- clear and concise risk reporting up, down and across the organisation.

The process allows Directors and Senior Managers to identify and manage key risks in their areas, and reporting on the most significant of these risks to STEC and the Audit Committee occurs every six months. Risk reporting provides an update and commentary on the risk profile, highlights changes to significant risks over the six months since the previous report, and includes commentary on the wider management of risks.

Information within the risk register is used to identify any programmes of activity required to manage significant risks and acts as an input to the business planning process. Risk information is also used as one of the factors informing the prioritisation of business resilience activities and as an input to the insurance planning process.

There are no direct interfaces to the ORM database (Operational Risk Management), there is an "Upward Reporting of Risks" process which is used to escalate risks identified at the operational level which could impact upon the strategic activities of the Group. This process focuses on two distinct categories of risks which may need to be reported:

i) "**Unique Risks**": risks that are significant in their own right; and

ii) "**Common Risks**": risks that are significant when aggregated together

The process sets out the thresholds above which a risk may be considered significant and how they are to be communicated, what employees should do if they identify a risk which they consider may have the potential to significantly impact Severn Trent and aims to minimise gaps in the coverage of the ERM process.

Overview of Operational Risk Management (ORM) at Severn Trent

The ORM process is used to enable Site or Works managers to record Operational Risks and progress mitigation through the appropriate capital scheme. The ORM database is primarily used as a record of operational risks requiring solutions likely to cost in excess of £3k to mitigate. Risks entered onto the database are scored on quality, quantity and environmental consequences with the outcomes used to create a prioritised list of risks requiring funding through the Small Schemes capital process. Where a risk is entered requiring funding >£60k, the risk is escalated through the capital scheme process; an Identification of Need (ION) is raised and is progressed through the usual route.

The database is open to all operational staff, and all site or works managers who can enter risks as they are identified. The process is "policed" by departmental 'moderators' who ensure the consistency of the risk scores. Part of the risk control management process enforced by this database includes mandatory entry of interim actions whilst capital is awaited.

While these risks do not feed directly into the ERM process, any re-occurring risks will be picked up by the moderators, and all high level risks will be escalated into the capital process. ORM will continue to stand alone after implementation of SAP and ERM is also out of the scope of SAP.

6 Data

OFWAT'S AMA ASPIRATIONAL STATEMENT: The company seeks a basis for all its asset planning in the analysis of data from, or directly related to, its own operations. It employs robust data quality management and testing for the reliability and completeness of data sets relevant to the use for which the data has been applied (statistical significance). The company is aware and has taken account of the overall explanatory power of its data. Where its own data is weak (and it should know this), or where it might have relied on expert opinion, it should seek more reliable data from external sources. Where it relies wholly or in part on expert opinion in place of observed data, it is sceptical and employs vigorous

sensitivity and validation checks. The data is captured at a suitable level of granularity and confidence grade.

SEVERN TRENT WATER'S RESPONSE

We have made major improvements to our data management procedures and systems over the last 12 months. Much of this was too late to influence the Draft Business Plan but has been fundamental to the improved Final Business Plan submission. We selected the information management system, SharePoint, as a tool to ensure that there was a robust system for data management within the business.

During 2008, we adapted our approach to data management by proactively analysing and understanding the key data sets that would be required to strengthen the analysis underpinning the Final Business Plan (FBP). In so doing, gaps and limitations in base data, and lack of clarity in data analysis methodology was revealed and scheduled for remediation. The approach taken to overcoming these issues for the Final Business Plan saw 70 data improvement projects initiated to address gaps in data and the need to improve the quality or quantity of the data sets.

These data sets have supported the following areas:

- BRITE programme (Performance, Service Consequence and Cost Consequence Modelling).
- Asset Inventory (**Refer to Chapter C3**).
- Asset Revaluation.
- Cost Base (**Refer to Chapter C5**).

Only four improvement projects remain outstanding as they are longer term improvements aimed at improving the ongoing quality and robustness of our data and as such their ownership will transition to the Asset Strategy team. The quality of data and the overall confidence grading of the Asset Inventory and Asset Revaluation resulting from these data improvements is outlined in detail in the **Chapter C3**.

Procedures for Data Collection and Analysis
Within Sharepoint, detailed operating procedures and process maps have been produced and filed on SharePoint for:

- Asset Data for condition assessments, performance modelling, the Asset Inventory and Asset Revaluation.
- Cost-intervention data – Cost Base (Unit costs), Cost of failure (opex / capex).
- Service consequence data – flooding, leakage, discolouration.

Detailed procedures have been created to support data creation for analysis for use in the business plan. Examples of key areas of data improvements are:

Historical Data Analysis:

- Infrastructure: Pipework, age, size, material and depth. Inferring missing data and data extrapolation.

- Non Infrastructure: Asset data collection and strengthening. Inferring missing data and data extrapolation.
- Pipe grouping / Pipe cohorts.

Service Consequence & Cost intervention data:

- Discolouration model.
- Water quality failures.
- Leakage.
- Supply Interruptions.
- Cost of Failure (repair costs).
- Private costs.
- Pollution Data.

All of the processes and procedures created during the process have been documented and a detailed transition plan has been created that shows a clear audit trail and a methodology to ensure consistency in data analysis for future business plans and June Returns. Ownership of these data analysis functions into the BAU organisational structure is being managed by the Data Control Manager.

Infrastructure Age Data

During the period between DBP & FBP the opportunity was taken to pilot options on how to obtain data in the future and where possible improvements were made and processes updated to enable more efficient future collection and recording. Improvements made led to an increase in Distribution age data by 2.4% and Sewerage age data by around 7%. The remaining age data was inferred by extrapolation. Our current position is 38% of age data populated for Distribution and 8% of age data populated for Sewerage. Information from the projects and feasibility studies undertaken was collated, and the 25 identified options were assessed and put into a business case with recommendations, costs and resources required. In addition to those areas already identified, a process is in place to capture any further opportunities through data migration to SAP and these will be captured, documented and provided to the relevant business areas.

Asset Inventory: Data strengthening for Final Business Plan

Compilation of the draft submission highlighted shortfalls in the attribute data for Assets (Infrastructure and Non Infrastructure), e.g. size, shape, value, capacity, material. Projects were put in place to target three separate data issues:

- To obtain actual data to fill gaps
- To infer missing data based on extrapolation of existing data within the sets
- To investigate and clarify anomalies within our current data.

The completion of these projects has increased the quality and coverage of data held within our corporate systems. At DBP, there were known issues with associating known pipe repairs (historical interventions) to a specific pipe / asset within DOJM. A process and methodology was developed for spatial correction to overcome this issue in DOJM. A project is in place to ensure that this process is refined and continued to ensure the quality of data in this area is maintained. Automated programs were developed that can be re-run to enable

high confidence random samples of both our Sewerage systems for condition grading and our non-infrastructure assets. Processes have been put in place to ensure data captured by field staff is updated to corporate systems not just for Final Business Plan, but on a regular on-going basis (e.g. CCTV data).

Service Reservoir Inspection reports have been digitised and key information on condition and other attributes have been extracted to assist the development and improvement of deterioration models for Investment planning (refer to **Section 3.14 in Chapter B3** for more information). Additional surveys were completed to collect additional data for typical non-infrastructure asset groups within STAR which has enabled the business to revalue its asset stock, complete condition assessments and build predictive models validated on robust historical data.

Reports have been written for, and provided to, the business to enable them to monitor the quality of the data within our corporate systems to ensure the integrity is maintained or where possible improved.

Cost: - Provision of critical data for Final Business Plan

The Data Control Team managed data provision to ensure consistency and accuracy, in particular to ensure that the same data used in different parts of the business plan was consistent, calculated using the same source data and using the same method. All procedures and processes were formally documented and filed on SharePoint. One of the main improvements between DBP and FBP was the utilisation of standard methodologies for the capture and sign off of the requirements for cost data. This, in conjunction with the documentation of the methodologies and formal 'sign-off', led to a robust, repeatable set of data with an agreed audit trail.

Within the FBP, all Opex and Capex costs were updated with 2007/08 data. Some of the key areas of improvement between DBP and FBP were:

- Capital Cost Models: Robust, a consistent approach was developed for Capital Cost Models (**refer to Chapters C2, C5 and Sections 3 & 7 of Chapter B3**). This included more detailed analysis of equipment costs, with specific on-costs being agreed for specific asset groups, to ensure greater consistency in capital cost estimating.
- A detailed methodology and approach was developed for "Private Costs of Failure".
- Revenue Effects of Capital: i.e. estimating the changes in operating costs associated with capital investment. There were known issues with extracting historical operating costs in detail for various asset types. Some operating costs are already reported within June Returns, but in other areas, operating cost expenditure and thus understanding cost of intervention, is more limited. A robust approach for calculating a bottom up estimate of operating costs for typical schemes was developed, which was then used to develop the Cost Models for Investment Optimisation (using BRITE).

Long term improvements are planned for capture of operating costs within SAP.

Future Data Management within the SAP Programme

During SAP implementation, the existing data management systems , will be migrated over to SAP. As part of this data migration process, the Data Migration work stream will undertake activities to detect data quality issues across the scope of our SAP implementation in Finance, Purchasing, HR and Asset Management. This will be undertaken using

sophisticated data profiling tools which assess data based on a set of core, defined business rules.

Subject Matter Experts (SMEs) will be identified for all of our key data objects in each functional area and they will be responsible for the clean management of our data as it is taken from our existing source systems and transferred into SAP.

A Data Improvement Register will be created and managed. Data improvements deemed essential for a robust asset management system will be logged prioritised and undertaken. All activities will be governed by a dedicated Data Governance Group, which will track the progress of cleansing and data migration tasks to address the data challenges faced by the company in its transition to SAP.

More detailed information around data used to support the specific sub-services can be found in **Sections 3 & 7 of Chapter B3** for Water and Sewerage respectively.

6.1 Asset Observations

AMPAP Test: Appropriate asset observations have been gathered to support robust asset management planning.

Substantial work has taken place to improve the asset data held for both above and below ground assets between DBP and FBP.

The Data Control Team introduced a changed approach to data management taking a proactive stance to understanding and managing the data-sets required for asset management planning. The data-sets were reviewed and missing data or data quality or history problems proactively assessed, and key data improvement plans implemented to rectify these issues. Significant asset surveys were carried out to rectify data gaps in both above and below ground assets. Where limited data was available, a statistically robust methodology for selecting a random sample was established, to enable reasonable extrapolation of data to adequately reflect the entire asset stock (by asset category). CCTV data was frequently not uploaded to UADMS and a process for carrying out periodic data transfer from Infonet was developed and has been implemented. More detail on the major data improvements that have taken place between draft and final business plan for the specific sub-services can be found in **Sections 3 & 7 of Chapter B3** for Water and Sewerage respectively.

All newly developed processes for data management were documented and uploaded onto sharepoint, so that all data was produced consistently, and had a clear audit trail for its source, key assumptions and ultimately sign off and approval of the data for use within the business planning process.

There are four long term data improvement plans that are being handed over to the Asset Strategy team to oversee.

A detailed data management transition plan has been produced to ensure the consistent processes developed and filed on sharepoint are handed over to new owners within the business, as the business transitions into Business As Usual.

A dedicated data migration team has been established within the SAP implementation programme. Their responsibility will be to investigate future data needs for asset management and ensure existing data from existing systems are accurately migrated over to

SAP and any additional data sets required due to data gaps have clear processes developed to ensure accurate control and collection in the long term.

6.2 Serviceability data and associated costs

AMPAP Tests: Appropriate serviceability data have been gathered to support robust asset management planning. Sufficient cost data have been gathered to support robust asset management planning.

We have chosen serviceability indicators which are substantially consistent to those within the Ofwat Guidance and the June Return. The BRITE programme (as outlined in **Section 5.2 of this overview**) uses the indicators and calls them "service measures". They are aligned with the serviceability indicators or service measures used throughout the whole of the investment planning process.

Process for Developing Service Measures

We have developed a web-based proforma to capture all investment information in a common format within BRITE. The proforma:

- Provides the framework for assessing the service and cost impacts of investment
- Captures the service level changes that are delivered by each potential solution.

The proforma was developed to include those service measures identified as important by our customers and to reflect the strategic measures of performance as identified by the STEC and approved by the Board.

A number of activities were carried out to produce the agreed set of service measures:

- Review of investment priorities with the Board, which led to a set of 20 KPIs that reflect the Board's strategic intentions.
- Focus groups with customers to determine which service measures are important, which led to a set of service measures being assessed within the willingness to pay (WTP) study.
- Wider stakeholder consultation within our Business to determine the service measures required to manage service performance and monitor the effectiveness of investment.

The 20 KPIs and the WTP service measures were included in the proforma together with additional service measures developed through wider consultation with stakeholders in the business. The proforma therefore reflects the service measures that are important to customers, the strategic direction of the business, and wider reporting and performance monitoring requirements.

The profiles of cost and service changes are captured annually in the proforma over the 25 year period commencing 2010/11. The proformas are reviewed for completeness and suitability before being used in the investment plan.

Definition of Service

A detailed project was initiated to define each of the proforma service measures, including a clear definition of how to measure risk: i.e. the definition of:

- Probability of failure - such as number of incidents or number of works failures.
- Severity – the set of consequences that may occur following the failure. For each service measure a range of severities has been defined. For example:

- Supply interruptions: Less than 3 hours, 3 to 6 hours, 6 to 12 hours, 12 to 24 hours, Greater than 24 hours.
- Severity of pollution incident: Category 4, Category 3, Category 2, Category 1

- Quantity – the volume impacted by the failure, such as the number of properties, number of complaints, or volumes affected.

Summary of the Service Measures

The set of service measures covers customer related service (such as numbers of supply interruptions and sewer flooding incidents) as well as environmental aspects (such as tonnes of carbon or change to river ecology) and other company and societal factors (such as risk to health and safety).

The list of service measures that we have considered in our investment plan is shown in the table below. This list incorporates aspects of service that the customer survey of willingness to pay showed customers found to be the most important and valuable to improve. It also includes service areas relating to obligations and legal compliance, such as drinking water quality and health and safety.

Future BAU improvements

The service measures have been developed over time and are the result of a detailed consultation process. Since completing the investment plan we have undertaken several lessons learnt and review processes that have included reviewing the extent and ease by which investments could be effectively represented through the service measure definitions in the proforma.

We found that the proforma template was well specified and very few investments could not be effectively captured in proformas and these will be refined in BAU. We intend to review our service measure framework on an ongoing basis and prior to the start of AMP5 to ensure that the measures remain relevant.and align with the strategic objectives of the business.

More detailed information can be found in **Chapters B3 and Appendix 4 of Chapter C8**.

The source data used for assessing the consequence of failure (the service impacts against the chosen serviceability indicators) have also been clearly outlined in **Sections 3 & 7 of Chapter B3**.

Service Measures for PR09 planning

Water

- Water quality – discolouration
- Water quality – hardness
- Water quality – taste and odour
- Water quality – failing DWI standards
- Water quality – unplanned interruptions
- Water security of supply – low pressure
- Water security of supply – low flow rivers
- Water availability - % Contribution to Target Headroom Gap
- Water availability – leakage
- Water security of supply – hosepipe ban frequency
- Water – supply pipe adoption
- Water – metering

Wastewater

- Wastewater quality – sludge disposal route
- Wastewater environment – odour and/or flies
- Wastewater environment – change to river ecology
- Wastewater quality – risk of breach of consent
- Wastewater availability – flooding other causes External
- Wastewater availability – flooding other causes Internal
- Wastewater security– hydraulic flooding External
- Wastewater security– hydraulic flooding Internal

Water and Waste

- Environment – risk of pollution
- Service quality – customer complaints
- Capability – first time problem resolution
- Health and safety
- Other – legal, quality and HSE obligations
- Asset failures

Sustainability

- Energy conservation and carbon
- Congestion

6.3 Interventions and Impact Data and associated costs

AMPAP Tests: Sufficient information on interventions and their impact on serviceability has been gathered to support robust asset management planning. Sufficient cost data have been gathered to support robust asset management planning.

Capital Cost estimating: STUCA (Severn Trent Unit Cost Application) is a business as usual tool containing data collected from the supply chain whenever a contract moves from the construction phase i.e is top down unit cost data obtained from the procurement of capital projects. These are the same costs as used for business plan estimates..

A detailed process and methodology has been developed to ensure consistency for calculation of cost for both Cost Base and Business planning purposes, which has been explained in detail in the C5 commentary. There has also been significant improvement between DBP and FBP around establishing a common and robust methodology to estimating indirect costs for projects, which is also discussed in detail within the C5 commentary.

Robust processes are in place so that capital intervention information is captured by driver for capital investment with purpose codes and tracked through the life of the project to ensure that the company is delivering what is required and performance can be tracked against determination. This is managed through AIMS which has been in place for more than 10 years and provides a strong history. This and the Maintenance Management system (MAINMAN) are real time and are constantly maintained.

Within MainMan there is an acknowledgement that across the sub-service areas the recording of the detailed breakdown and reasoning for operating expenditure may sometimes lack clarity. Operating cost interventions have therefore been calculated using a detailed bottom up estimate of manpower and other resources to rectify the failure. Improvements in capturing costs relating to operational interventions is a long term goal and will be addressed

through the SAP implementation (refer to **Sections 5.0 and 6.1 of this overview** for more information).

A review of the STUCA model has been carried out by Pricewaterhouse Coopers to determine:

1. Completeness of data.
2. How representative the data was.
3. Audit trails.
4. Security controls.

They supported items 1 and 2 and following their feedback controls have been developed and implemented in relation to items 3 and 4.

7 Analysis

OFWAT'S AMA ASPIRATIONAL STATEMENT: The company is undertaking analysis for asset planning, at a component and granularity level commensurate with the complexity of the assets and performance in question. The analysis is holistic and well integrated, such that optimisation between the possible objectives, constraints and outcomes can be realistically achieved. The analysis includes verification, sensitivity and validation checks that take account of data quality, where judgements are made in lieu of robust data or conclusions based on data, and the competence of the analytical method (for example degree of proven best practice). The company is using the analysis methods for asset planning as 'business as usual' analysis tools and is capable of making continual updates to the planned outcomes. The analysis methods are capable of supporting the regulatory business without the constraints of the five-yearly regulatory cycle.

SEVERN TRENT WATER'S RESPONSE

Our general approach to investment planning has been outlined in **Appendix 4 of Chapter C8**. **Chapter B3** contains the detail for each sub-service. In addition, we have utilised independent, external expertise to carry out model validity and sensitivity analyses which validated our approach and has been positively received by the Reporter. More detailed information around analysis can be found in **Sections 3 & 7 of Chapter B3**.

7.1 Historical Analysis

AMPAP Test: Forward looking analysis is founded upon a robust historical analysis of expenditure, serviceability and expected changes that make the future period different.

Within the business planning process all assets have been subdivided into suitable sub-service groups. The historic data used has been from our own systems and has been validated appropriately as discussed in **Section 6 of this overview**.

The detailed **Sections 3 & 7 of Chapter B3** for Water and Sewerage contain the following information for each sub-service group:

- The detailed approach taken for assessing typical levels of expenditure.
- Clear explanations for variations in expenditure.

- A clear assessment of the most appropriate serviceability data for each sub service group.
- Clear understanding of which assets are contributing to deteriorating serviceability.
- Clear conclusions on the required level of expenditure to achieve planned serviceability levels.

7.2 Performance Modelling

AMPAP Test: Validated performance models have been developed to support reliable predictions of future asset performance.

Our general approach to investment planning has been outlined in **Appendix 4 of Chapter C8**. **Section 5.4 of this overview** sets out the approach taken for asset deterioration and performance modelling for business planning. Additionally a summary of the key BRITE modelling improvements is included in **Section 5.7 of Appendix 4 in Chapter C8**. The detailed **Sections 1 to 8 of Chapter B3** for Water and Sewerage also contain the following information for each sub service group:

- Failure modes for each asset group.
- The modelling approach taken and key assumptions, uncertainties or limitations in the modelling approach or data sets used.
- The justification where modelling of a specific asset sub service group was not feasible and an alternative investment planning methodology was used.
- The level of validation achieved against historical data.
- The improvements achieved in the quality and approach to asset deterioration modelling between Draft and Final Business Plan (the context of which is given in **Appendix 4 of Chapter C8**).
- Plans for ensuring that the models are continually improved during BAU where appropriate.

7.3 Service Consequence Modelling

AMPAP Test: Validated consequence models have been developed to support reliable forecasts of future service.

Our general approach to investment planning has been outlined in **Appendix 4 of Chapter C8**. **Section 5.4 of this overview** sets out the approach taken for consequence modelling for business planning. The detailed **Sections 3 & 7 of Chapter B3** contain the following information for each sub-service group. Additionally, a summary of the key BRITE modelling improvements is included in **Section 5.7 of Appendix 4 in Chapter C8**.

The detailed **Sections 1 to 8 of Chapter B3** for Water and Sewerage covers in detail the following information for each sub service area:

- Service Consequence of failure.
- Key assumptions made in the modelling and any uncertainty in service consequence of failure.
- The level of validation against historical data achieved.
- The improvements achieved in the quality and approach to asset deterioration modelling between Draft and Final Business Plan.

- Plans for ensuring that the models are continually improved during BAU where appropriate.

7.4 Cost Consequence Modelling

AMPAP Test: Validated cost consequence models have been develop to support reliable forecasts of future cost consequences.

Robust models have been developed for estimating the cost consequences of failure using an appropriate approach. Cost models include all principal costs of asset failure.

The general approach to investment planning has been outlined in **Appendix 4 of Chapter C8**. **Section 5.3 of this overview** sets out the approach taken for cost modelling for business planning. Additionally, a summary of the key BRITE modelling improvements is included in **Section 5.7 of Appendix 4 in Chapter C8**.The detailed **Sections 1 to 8 of Chapter B3** for Water and Sewerage also contain the following information for each sub service group:

- Methodology for costing the consequence of failure.
- All costs of asset and service failure: H&S, repair & clean up (bottom up estimates of Opex), Private costs of failure.
- All associated costs of failure used within modelling for each sub-service group.

Across the Business Plan, consistency of cost types has been ensured. More detail of these types of cost are found within the B3 Commentaries, but some example costs used in the models are listed below.

i) *Cost of asset failure*:
Either repair or a replacement.

ii*) Cost of service failure*
Private Costs of Failure: Following a service failure, we will often have additional activities (reporting, sampling, clean up etc) that may be driven by a regulatory requirement, that result in additional expenditure. A significant improvement since DBP is in the development of robust definitions for each of the private costs of failure, with clear process and methodology defined and documented around how to calculate these “Private Costs of Failures”. These procedures are clearly documented on sharepoint and are contained within the Data Control Team’s Transition Plan for transition into Business As Usual.

iii) *Marginal cost of water*: Due to leakage from the water supply system following a burst or ongoing leakage within the system.

iv) *Social & environmental costs*
These have been calculated for company activities relevant to water infrastructure maintenance and water resource planning. These include repair activities, leakage management activities, supplying water and asset, demand, resource and leakage interventions.

Further data on the derivation of cost information is provided in **Chapters C2 and C5**.

7.5 Forecast service

Test: Future service and cost consequences have been forecast without proactive capex and opex interventions.

Our approach to investment planning has been outlined in **Appendix 4 of Chapter C8**. The detailed **Sections 1 to 8 of Chapter B3** for Water and Sewerage also contain the following information for each sub service.

The models include "do nothing" interventions (reactive only) and scenarios to forecast service without investments for the duration of the planning horizons and include asset performance as well. There was an improvement between DBP and FBP, which saw the completion of the development of the investment models for pre-2010 and inclusion of failure costs up to the planning horizon.

These scenarios allowed least cost planning to be carried out and an optimised intervention plan to be developed. The predictive models generate the service-risk improvements associated with the investment schemes; therefore for each type of investment scheme the costs and service benefits are understood compared to a "do nothing" situation. Scenarios relating to different overall levels of service are specified, and from this the least cost approach to meeting the service levels is determined.

A large number of potential schemes are reduced to a much smaller number of different combinations of investment schemes, each combination being the least cost option for a specific, defined service level.

7.6 Systems analysis

AMPAP Test: There is a good understanding of the effects of asset failure upon forecast service at system level.

We have used system analysis in BRITE to improve the understanding of the impact of asset failure. We have found the use of system analysis to be particularly useful when assessing the deterioration of water assets, as without network models it is difficult to understand the direction and speed of water or storage capability, and therefore the numbers of customers impacted by the asset failure. In contrast, on the wastewater side the direction of the flow is understood (as it flows to the works) and service consequences tend to be local to the failure; hence we have not used network models to predict the service impact associated with asset failures.

For water infrastructure we used water network models to work out the direction and flow of water, thereby allowing us to understand the number of properties which would be affected by a supply interruption: we modelled the impact of a pipe break to determine the impact on supply interruptions. We also used the water network models to assess the velocity of water - which was then used to calibrate the discolouration model. This is documented in **Section 2.4 of Chapter B3**.

For water non-infrastructure we used network resilience studies to understand how many customers are impacted by failures at water treatment works and water pumping stations given storage and the configuration of the network. The approach to assessing consequences was to discuss with Asset Strategy and site managers the consequence/severity of asset failures and use the resilience studies to model how many would be affected. This is documented in **Section 2.3 of Chapter B3**.

We have undertaken additional feasibility studies into resilience schemes to inform the Final Business Plan. The assessment of service impacts which drives the need for increased resilience is documented in **Section 2.2 of Chapter B6**.

For wastewater non-infrastructure we used subject matter experts to formulate the service impacts. In the first instance Asset Delivery used their assessments of historic and current performance and spare capacity at individual sites to formulate their view of the consequence of failure at sites. This was then reviewed by Asset Strategy and site managers. This is documented in **Sections 7.3 to 7.5 of Chapter B3**.

For wastewater infrastructure we have used hydraulic models to model growth. We have used historic trend analysis to model the impact of asset failure (such as blockages or collapses) on flooding and pollution. This is documented in **Section 7.1 of Chapter B3**.

7.7 Intervention Identification

AMPAP Test: Appropriate intervention options have been selected.

The general approach to investment planning has been outlined in Appendix 4 of **Chapter C8**. **Section 5.8 of Appendix 4 in Chapter C8** sets out the approach to generating interventions for non-modelled interventions, entered into Investment Manager using a manual process. The detailed **Sections 3 & 7 of Chapter B3** for Water and Sewerage contain more information on the following areas:

- Future service compared to current service no investment
- Identification of key contributing assets.
- Intervention options identified: service enhancements, cost effective solutions, low probability, high consequence events, environmental and social impacts.

Future service without planned investment has been compared with current service. Groups of asset contributing most to forecast or required changes in service have been identified. Appropriate intervention options have been identified to address service changes (including capital and operational interventions). External consultants have assisted in the collection, analysis and validation of information used to create and assess interventions and have carried out detailed appraisals of individual options.

7.8 Intervention impacts

AMPAP Test: The impacts of identified intervention options have been estimated in a robust manner.

Our approach to investment planning has been outlined in **Appendix 4 of Chapter C8**. **Section 5.8 of Appendix 4 in Chapter C8** sets out the approach to generating interventions for non-modelled interventions, entered into Investment Manager using a manual process. The detailed **Sections 3 & 7 of Chapter B3** for Water and Sewerage contain more information for each sub-service group on both modelled and non-modelled investments.

As well as information generated internally, the Strategy teams have also used external consultants to assist in the collection, analysis and validation of information used to create and assess interventions. These external consultants have undertaken detailed appraisals of individual options and put forward the most cost-effective solutions. We have also used consultants to support & review individual elements of our planning, such as cost estimate generation, resilience modelling, flood risk assessments and security measures

8 Reporting

OFWAT'S AMA ASPIRATIONAL STATEMENT: The corporate feedback and strategic review processes operate to maintain links between Board objectives and management

actions relating to asset planning, implementing the plan and the outcomes delivered in terms of costs, activities and impact on service objectives.

SEVERN TRENT WATER'S RESPONSE

8.1 External Reporting

AMPAP Test: External reporting accurately reflects the business as usual analyses undertaken and measures to proportionally allocate expenditure between policy areas are appropriate.

Our approach in ensuring that the business plan accurately reflects the analyses undertaken and has been appropriately proportionally allocated, is covered in detail in **Sections 3 & 7 of Chapter B3** for Water and Sewerage.

The integrated SAP system will hold Asset Management and Finance information and Internal controls within the system will mean that data held in each module is consistent and based on the same underlying data set for both June Return and internal reporting. We intend to use the SAP Business Intelligence product (a data warehouse) to store and report both internally used management information and June Return information. This is in development for future business planning but we are confident that the start position for our planning cycle (the base data) will be sourced where possible from either SAP ECC or SAP Business Intelligence.

Consistent data management processes have been developed from DBP to FBP and are being transitioned into BAU through an agreed transition plan. All processes have clear linkage to source data, state assumptions and methodology and will ensure consistency in data analysis for all reporting requirements, so that data sets are extracted and analysed consistently for all internal and external reporting.

More information on data consistency is contained in **Section 6 of this overview**.

9 Balance

OFWAT'S AMA ASPIRATIONAL STATEMENT: The Company has achieved a balanced asset management plan that meets planning objectives (as derived from stakeholder needs, affordability, statutory constraints and company aims) and has taken account of phasing and deliverability. It has taken a balanced view of risks across the whole plan and between the company and the customers.

SEVERN TRENT WATER'S RESPONSE

This Final Business Plan is the right plan for Severn Trent and its customers for the coming five year period because it is based on a sound validated Common Framework approach, uses the most accurate data available and has been informed by the most up to date thinking across risk, technology and business area investment. It is built upon Severn Trent Water's, and the industry's, best practice and is focussed on great people delivering increased levels of quality and service for our customers, whilst offering the lowest prices and having a sustainable impact on the environment.

The outputs of Investment Manager have been reviewed thoroughly with review sections which focussed on what investments needed to be removed, what constraints and targets were needed and what the real constraints on deliverability were.

Considerable detail and information is available in **Appendix 4 of Chapter C8** to support and validate the following summary of the processes used to deliver a balanced Final Business Plan.

9.1 Overall balance and phasing of plan

A range of approaches has been used to ensure that we have produced a balanced, well phased and deliverable plan that:

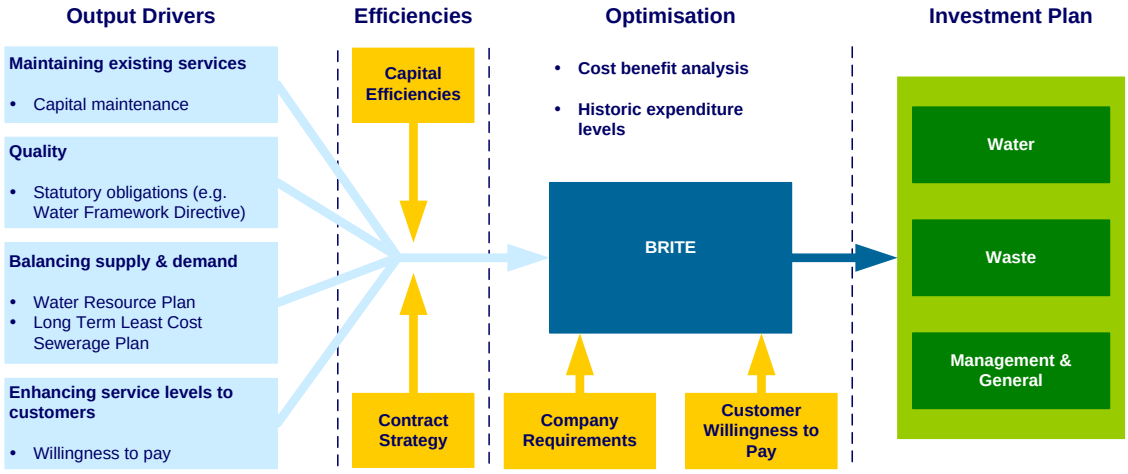
- Follows the principles of the Common Framework for Capital Maintenance Planning as required by Ofwat.
- Uses historic company performance and cost data to determine the condition and deterioration rate of our assets. This information was used to predict future performance of our assets.
- Uses sophisticated technology for whole life cost optimisation to determine optimal solutions to achieve a range of performance targets within asset groups and corporately across the total groups.
- Has carried out detailed, independent model validity and sensitivity analysis on the relationships that were derived and on the results of modelling and optimisations.
- Has consulted and involved experts within the business through the process to ensure inputs and outputs were in line with current practice and that the proposals are reasonable and practicable.
- Has ensured that stakeholder feedback and requirements were taken into account at all stages.

These approaches were applied at a number of levels:

- The overall process.
- Data and cost inputs (signed off by business representatives).
- The logic and content of the different stages of predictive modelling.
- Outputs from the different stages of modelling.
- Plausibility of collated cost and risk outputs (in line with historic performance and/or age/condition).
- Manual proformas produced by Strategy Teams for areas of investment less suited to standard asset modelling techniques and typically based upon feasibility, appraisals or other project specific investigations and analysis.
- Optimisation processing and outputs – use of WTP, CBA, scenarios used, iteration results, etc.
- Investment plan production and sign-off.

The end to end process involved all stakeholders, not only those producing the Final Business Plan but, more importantly, the operational teams who would be responsible for delivering the planned schemes. The approaches used and all outputs were also checked for alignment with wider business expectations (including corporate measures, KPIs, historic spend/performance and known problem works/processes).

The diagram below demonstrates the process that has consolidated the many threads and strategic drivers for Severn Trent to develop a balanced and well phased investment plan. Additional information on this is contained in **Chapters B2 and B3**.



Investment Plan components

9.2 Overall approach to risk

The BRITE (Balancing Risk and Investment to Excel) Programme has been developed to allow the risks, costs and benefits of investment schemes to be put assessed and the programme to be optimised for these elements. This uses a staged approach that:

- Models the service risk to customers and the environment with the minimum 'reactive' level of investment over 25 years.
- Identifies and costs potential investment schemes to improve service risk above this base level. Costs include private and social costs, and are expressed as EACs (Equivalent Annual Costs). For each investment scheme we model the revised service risk to customers and the environment if proactive investments are undertaken.
- Quantifies the change in service risk benefits in monetary terms using WTP estimates.
- Uses statistical techniques to model the service-risk position resulting from reactive investment only, and the change in service-risk associated with potential investment schemes. WTP estimates are applied to the change in service risk to produce monetary estimates of the social costs and benefits. These elements collectively allow the EAC and EAB (Equvalent Annual Benefits) to be produced and compared with each other (a definition of EAC / EAB can be found in **Chapter C8**)
- Ensures that the resulting levels of investment, bill impacts and forecast service levels have been managed and reviewed at Board level through Executive ownership of the Business Plan, as well as through regular iterations and reviews of the Programme and Optimised Business Plan, as detailed in **Appendix 4 of Chapter C8**.

9.3 Overall quality of the business case

Our Final Business Plan is the result of significant internal development and improvement. Most importantly our regulatory submissions are not "special event" plans but are the product

of an agreed and integrated planning framework as shown below. This framework, as shown in the diagram below and based around the SDS, is used year-on-year to develop the rolling business plans and drive the business forward.

Following the submission of the PR09 Draft Business Plan in August 2008 Ofwat have commented that;

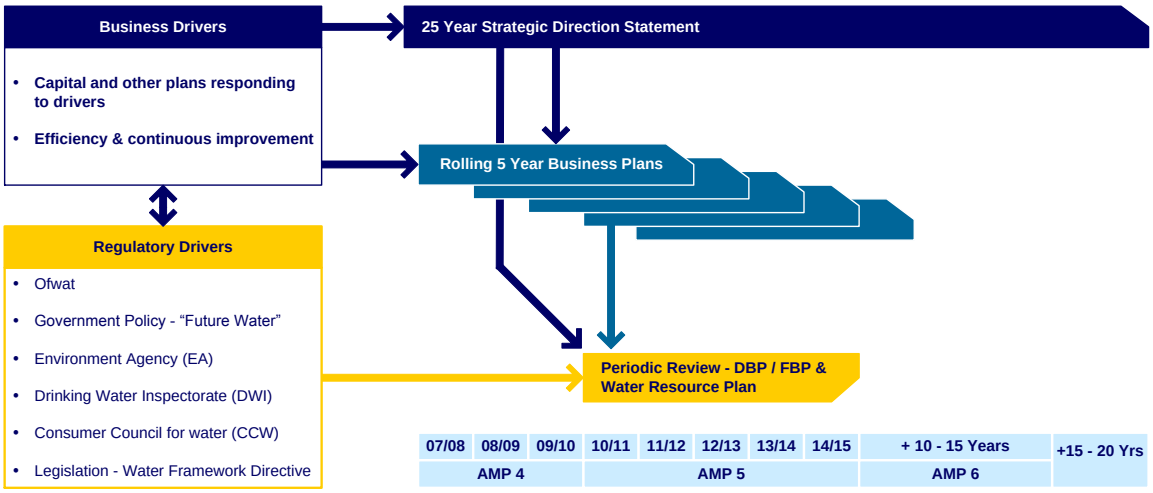
"Ofwat welcomed the holistic approach that Severn Trent had taken to its business planning, which was clearly shown in Part A of the draft business plan.

Ofwat also acknowledged that Severn Trent had clearly considered the burden on customers, and welcomed the challenging efficiency targets that Severn Trent had included in its draft business plan. The draft business plan was in line with the SDS, and was broadly supported by CCWater"

With the considerable investment made to date and the considerable improvements made over the last 12-months which manifest themselves in the improvements between DBP and FBP, and responses to Ofwat and Reporter feedback outlined in this Document, it is clear that we have made a step change in the overall quality of the submitted business plan. In order to meet the DBP submission date in August 2008, the data contributing to the BRITE outputs had to be frozen around April 2008. There has therefore been approximately nine months during which the data and modelling approaches have been significantly improved to provide the robust Final Business Plan.

This diagram shows the high level view of how we have developed the business plan as a part of a BAU planning process.

Business Planning Framework Diagram



There is a high level of confidence in the robustness of the Investment Plan due to the rigour and governance surrounding the data, processes and systems used in its production. Quality assurance and business expert validation has been carried out at every stage of the process. In addition, we have utilised independent, external expertise (Cap Gemini) to carry

out model validity and sensitivity analysis which validated our approach and has been positively received by the Reporter.

Prior to Reporter involvement there was a focussed activity of iterations to ensure that the data used to create the Final Business Plan was of the highest possible order. In all there were six iterations of the Investment Manager for the FBP which were designed to cover different areas of the plan incrementally through to Iteration Six for the final profiling of the programme over AMP5 and out to 2035. The outputs from the PR09 submission will feed into the next round of the Business Planning process. The details of the Iterations can be found in **Appendix 4 of Chapter C8** with the outputs and minutes from the iterations included in the associated appendices.

The internal and external reviews ensured that the Plan is compliant with industry standards, such as the Common Framework approach and a 'sense check' of outputs to compare against other submissions ensured that the investment plan takes account of customer and stakeholder expectations, is cost effective and is properly profiled and deliverable.

More detailed background on the rigorous Quality Assurance in place for the Business Planning process and the Submitted Business Plan itself can be found in **Appendix 4 of Chapter C8**.

Maintaining Service and Serviceability – Water Service

Approach and Structure

We have followed the Reporting Guidelines structure by considering overall objectives, approach by sub-service and **reporting** individual business cases by the asset groups set out in the reporting tables.

Section	Approach
1. Planning Objective, Direction and Delivery 1.1 Planning Objective 1.2 Stakeholder Engagement 1.3 Leadership, Policy & Strategy	These items are generally covered in the company level overview to this chapter. Specific issues for Water Services have been discussed in this section.
2. Approach to Asset Planning by Sub-Service 2.1 Management 2.2 Process 2.3 Systems	We have set out basic information on our management, processes and systems in this section which compliments the overview. For FBP we have relocated discussion of the specific modelling process into section 3

3. Business Case by Asset Group
Infrastructure Assets:
3.1 Distribution Assets Assessed by deterioration and predictive models
3.2 Distribution assets assessed by alternative analysis
3.3 Aqueducts
3.4 Dams and Impounding Reservoirs
Non Infrastructure Assets:
3.5 Disinfection Equipment
3.6 Leakage Equipment
3.7 Monitoring and Control
3.8 Revenue Meters
3.9 Maintenance of Alternative Supplies Capability
3.10 WTW Assets assessed by deterioration and predictive models
3.11 Maintaining Quality at Water Treatment Works
3.12 Maintenance of Borehole Civil Structures
3.13 Maintenance of Other WTW Assets
3.14 Efficiency Enabling Investment
3.15 Pumping Stations
3.16 Service Reservoirs
	We have reported business case by asset group as set out in the reporting guidelines.
	
	We have used a deterioration and predictive model approach for the majority of our analysis. Where data is scarce and/or service impacts are not adequately described by deterioration and predictive modelling we have used alternative analyses.
	
	We have used a consistent set of sub-sections to describe our approach and their compliance with Common Framework methodology.
	
	Each section includes coverage of:
	• Data
	• Analysis
	  ○ Historic Analysis
	  ○ Service and Asset Performance
	  ○ Interventions
	  ○ Analysis
	  ○ Proposed Investment Plan

4. Further Table Commentaries	Comparison to historic investment

Section 1 – Water Service Summary: Planning Objectives, Direction and Delivery

1.1 Water Services Summary of Maintenance Plan

Planning Objective

Our customers' top priority is a reliable, safe water supply.

We have chosen the following output measures for our maintenance plan to reflect Ofwat's measures of serviceability, our customers' views and our priorities as expressed in our Strategic Direction Statement

	Infrastructure	Non-infrastructure
Ofwat serviceability indicators	• Total bursts (nr) • Unplanned Interruptions greater than 12 hours • Iron mean zonal non-compliance (%) • DG2 properties (nr)	• Water treatment Works Coliforms (%) • Service Reservoirs Coliform compliance % • Number of WTW where turbidity is greater than or equal to 0.5NTU. (nr) • Enforcement (Incidents number) • Unplanned non-infrastructure maintenance
Additional service measures	• DG3 Unplanned interruptions (index) • Discolouration Complaints • Leakage (Ml/day) • % mean zonal compliance with drinking Water regulations (%)	• Service Reservoir % coliform non-compliance

Our stakeholder engagement has identified where customers and other stakeholders would like to see improvements in these outputs or a reduction in risk compared to AMP4. Our stakeholders do not expect us to use our base maintenance investment to achieve these improvements and we have therefore selected the cost effective planning objective.

Our maintenance plan is optimised to deliver stable serviceability and outputs at broadly stable risk profile and at least cost. It has been developed in line with our strategy to achieve the lowest customer bills.

We have tested the costs and benefit of improvements and where we have found these to be cost beneficial have included them in the appropriate enhancement Chapter.

Customers have told us that they are dissatisfied with levels of service with regard to pressure issues associated with joint supply pipes and they believe we are taking too much risk with regard to supply resilience. These are dealt with in Chapter B6.

Investments needed to meet new regulatory obligations are included in Chapter B4 and to address supply demand balance (Chapter B5). For these investments we have used the cost benefit objective

The plan is based upon UKWIR common framework and uses robust data

Our planning approach follows the UKWIR Common Framework for Capital Maintenance Planning. We have undertaken assessments of our plan's compliance with the approach through comparison with the Asset Management Assessment process, including Capital Estimating Scorecard.

The approach, process and tools that we have developed to produce this plan will form the basis on which to build further improvements towards PR14. The models and processes are being moved into ongoing business processes. Investment model outputs will be used to generate real projects, for example DMA and cohorts identified by our investment model will be the starting point for mains renewal scheme feasibility.

We have used our historical analysis of performance to build deterioration and predictive models which form the basis for 63% of our planned investment in maintenance. These models are based upon robust statistical relationships derived from our actual asset performance. For example, our proposed mains renewal programme has been derived from relationships, built from our data, of deterioration, numbers of mains failures and the impact on leakage and interruption performance. Similar models have been built for water treatment works, domestic meters and pumping stations.

Where our data is insufficient to build robust statistical relationships we have, in accordance with the common framework, developed alternative approaches based on engineering risk assessments using direct asset observations. We have used this approach for asset groups such as aqueduct maintenance, dams and impounding reservoirs where direct asset observations are more reliable than theoretical condition deterioration models. This approach covers 34% of our planned maintenance investment.

We have used historic activity and expert judgement as the basis for the remaining 3% of the planned investment levels where we need to react to requests for mains diversions from third parties.

To respond to limitations in some of our data we have used extensive validation and sensitivity analysis, undertaken by a third party (Cap Gemini), to understand how uncertainty in data and key assumptions affect our proposals. We have acted on this analysis and modified our plan where we believe that there are practical actions we can take to address uncertainty, for example;

- we have proposed a 20% efficiency increase in active leakage control between AMP6 and 7 to reduce AMP5 investment in mains renewal
- we intend to conduct further surveys and investigations as part of AMP5 feasibility for our twenty year aqueduct tunnel duplication programme

We have improved the accuracy and completeness of our data since DBP. For example we have analysed interruptions data to identify root causes and exclude from our analysis those events not directly attributable to failure of an asset. Additionally, we have digitised and used in our assessments paper inspection reports for service reservoirs and disinfection equipment which have enhanced the data quality.

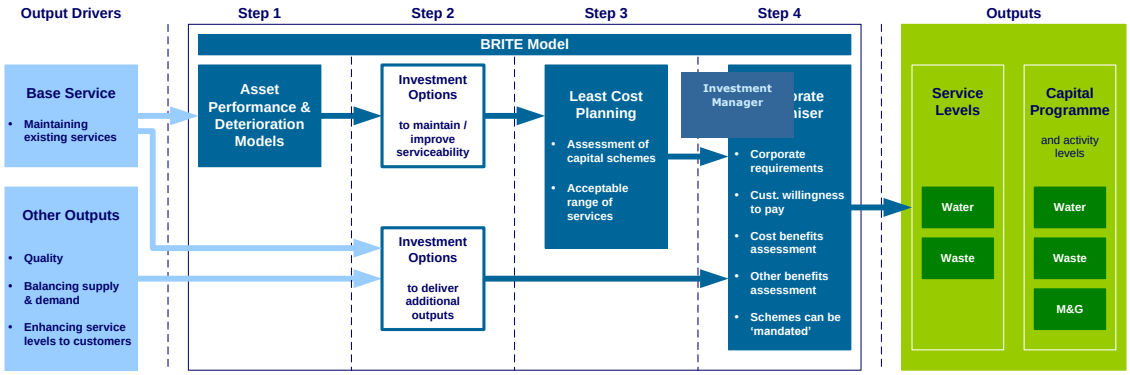
We have challenged historical levels of expenditure by use of deterioration models and our adherence to the common framework approach for example less expenditure is required for communication pipe renewal and revenue meters than is forecast to be spent in AMP4. Details for specific asset groups are contained in section 3.

The plan is optimised and balanced

We have used our company optimisation process, described fully in the overview to this chapter, to optimise and balance our holistic plan. All our proposed investment is cost effective.

The approach is summarised below;

End-to-end investment planning and optimisation approach



We have optimised each asset group by;

- undertaking feasibility studies for large civil engineering projects. For example service reservoir replacement projects and the Elan Valley Aqueduct tunnel duplication. These feasibility studies are used to evaluate all available options through confirmation of need, assessment of alternative options using whole life cost estimation and excluding non-viable or highly expensive options. We then submit preferred options to Investment Manager
- using optimisation techniques within our asset performance and deterioration models. For example our water infrastructure, supply / demand model uses 1.3 million iterations to select best combination of interventions (pressure management, active leakage control, mains renewal, metering and resource schemes) to maintain levels of service and meet the supply demand balance. We have also run 23 scenarios to explore different planning assumptions, targets and constraints.

We have then optimised all asset groups by sub service level using our Investment Manager system to select a combination of different schemes, based on cost benefit, that maintain serviceability over 25 years.

We have used six iterations of the company optimisation process to refine our plan from Draft to Final.

- The first two iterations were used to validate cost-benefit calculations, scheme purpose codes and general quality assurance.
- Iteration three was used to identify low cost-benefit solutions. This list was used to provide options for STEC to decide which schemes should be deferred from the AMP5 programme, on grounds of affordability, without a material impact on service or risk.
- Iteration four included the decisions arising from iteration 3 and was used to instigate the cost effective planning objective by use of a 'maintain service' constraint for non-infrastructure maintenance schemes. This constraint meant that all schemes (starting at the least cost beneficial) beyond that required to maintain serviceability were excluded. This constraint was carried forward for all subsequent iterations.

- Iteration 5. Schemes were re-profiled across AMP5 and AMP6 to confirm deliverability. Further decisions on deferral of low cost-benefit schemes
- Iteration 6 included the revised output from the water infrastructure model that had been re-run with new demand forecasts reflecting the impact of the recession on commercial consumption

Full details of the optimisation process are in Chapter C8.

Our overall objective is cost effectiveness, in that we aim to deliver the required level of service at least cost. We have calculated the costs and benefits of potential changes in service in order to assess whether a change is justified. We have not assessed the benefits of reactive maintenance of non-infrastructure assets. If assets are needed to provide a service, then it is clear they have to be replaced on failure. We have, however, assessed the benefits of proactive investment to reduce risk of failure.

In determining the level of service to be provided we have applied constraints of affordability, based on customers' willingness to pay and our desire to offer lowest possible prices. This enabled us to defer the lowest cost-benefit investments into AMP6 where we believed they had no direct impact on serviceability and only a marginal impact on risk for example we have decided to tolerate the risk of failure of several aqueduct siphon sections that were included in the draft plan.

Our investment planning process uses cost-benefit analysis to value our investment schemes. The benefit of each investment is derived from our researched and verified customer valuations. This analysis shows that our capital maintenance plan is largely cost beneficial. Cost-benefit assessment has not been carried out in some areas of expenditure, including the following categories:

- essential to maintain levels of service, for example domestic meter maintenance
- driven by obligations, for example compliance with new turbidity monitoring standards
- required to protect the health and safety of employees and the public, for example bulk chlorine removal

Our corporate optimisation approach balances risk within water service and across our plan as a whole by ensuring that:

- customer priorities at the heart of the investment programme by linking service measures with customer willingness to pay as well as cost of failure
- we use a transparent and consistent approach to assessing investment needs against a common set of service measures
- investment is optimised taking into account trade-offs in benefits, whole life costs, and the service risk across asset types.

Plan has taken account of Customer, Ofwat, Reporter, EA, CCW, Natural England and other stakeholder feedback

We have engaged with stakeholders through individual and quadripartite meetings (see chapter C1).

Our customer research and interaction with the Consumer Council for Water indicated that customers consider that;

- provision of a reliable, safe water supply is their top priority
- following the Mythe incident, they want increased supply resilience.
- bill increases should be kept to a minimum
- they are willing to pay for some improvements to service levels

The Environment Agency (EA) want us to achieve our statutory obligations at least cost and with minimum impact on the environment.

The Drinking Water Inspectorate want us to meet our statutory obligations at least cost.

Ofwat require us to produce a holistic plan and to pay particular attention to minimising the burden on customers in the present economic climate.

We have used this input to set the maintenance plan objectives and have designed our plan to meet stakeholder expectations. We have acted upon all of the feedback from Ofwat contained in the draft CIS.

We have discussed with the Reporter all of the issues that they raised with our draft plan and have maintained dialogue throughout the preparation of the plan. We believe that we have acted on their views and recommendations with only two material exceptions:

- Elan Valley Aqueduct Maintenance – we agree with the Reporter that we have insufficient evidence on which to base a detailed, definitive maintenance programme. We have considered their view that we should not plan expenditure in AMP5 beyond that needed to complete inspections.. We disagree on the basis that as we know that expenditure is almost certain and that this critical asset is the single source of a piped supply to Birmingham, it is in customers interests to plan on our best estimate of likely maintenance expenditure and log down if appropriate. Full detail is given in section 3.3

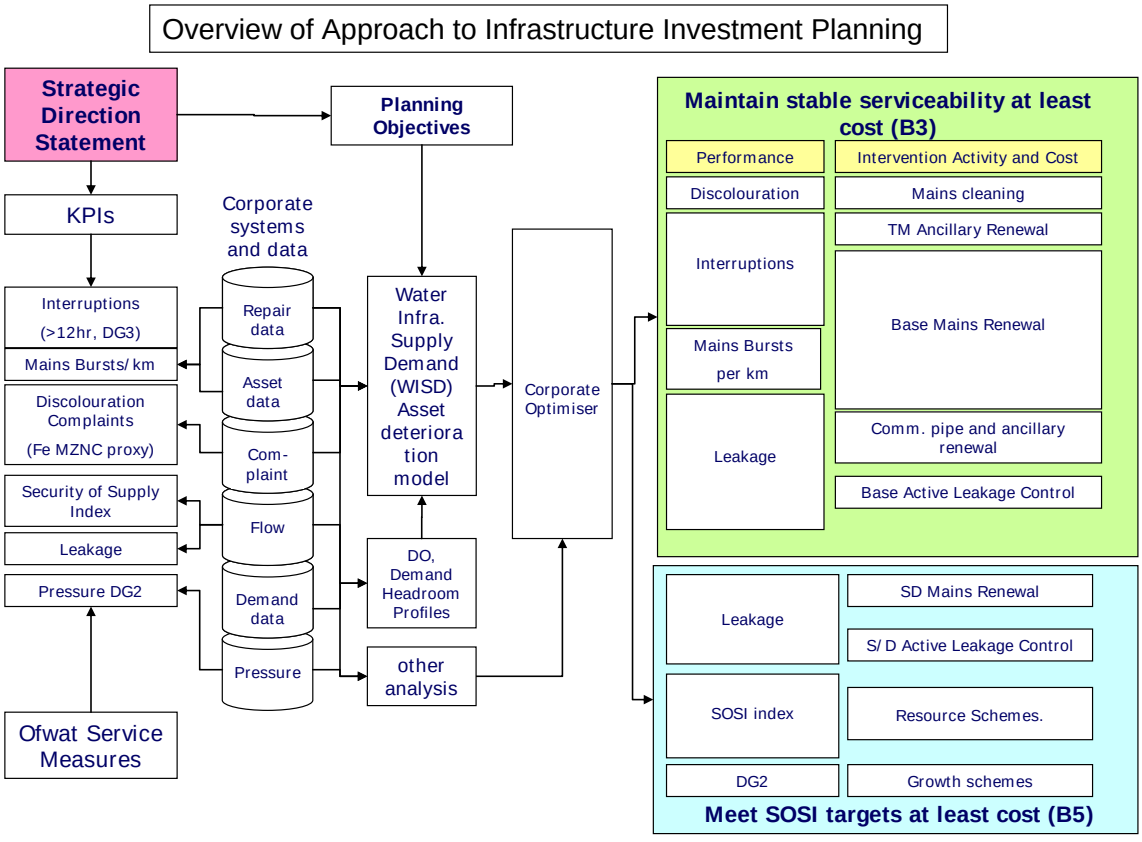
- Investment in Mains Renewal to offset leakage increases in AMP7 – we plan £37.5m of investment in mains renewal the Supply/Demand category to offset leakage increases, which we believe arise predominantly from customer supply pipes, in AMP7 and beyond. The reporter does not believe our data is robust enough to make this proposal. Again, we understand and have considered their views. We believe that the reduction in investment we have made, as a result of their challenges and the sensitivity analysis we have run, mean that this investment can be made with high confidence of cost saving for customers with minimal downside risk. Our analysis suggests failure to invest sufficiently in AMP5 will lead to higher customer bills in AMP6. This is covered in detail in section 3.2 and Chapter B5

1.1.1 Sub-Service Summary: Infrastructure

Planning objective and analysis approach
We have chosen the cost effective planning objective for water infrastructure to maintain stable serviceability, as indicated by the number of bursts, unplanned interruptions greater than twelve hours, leakage deterioration from our assets, mean zonal compliance and discolouration complaints..

We have used stakeholder input to inform our plan outputs. Reducing leakage economically is important to most stakeholders and we have included this as an output measure for our maintenance plan. Customers consider that maintaining supply is important and want us to increase the resilience of our supply to both short and long interruptions. We have reflected this in the selection of [insert] output measures.

We have used an integrated model (illustrated below) to account for the interaction between mains deterioration, leakage and the supply demand balance. Supply demand investment is reported in Chapter B5.



The model produces the least cost plan to meet all the constraints and drivers. Outputs have been proportionally allocated as follows;

- **Maintenance**: Expenditure needed to maintain the fabric of the trunk main and distribution systems to maintain stable serviceability, as indicated by the number of bursts, unplanned interruptions greater than twelve hours, leakage deterioration from our assets, mean zonal compliance and discolouration complaints

- **Supply Demand**: Expenditure needed to address the deficit in our supply demand balance including water efficiency measures, water resource schemes and leakage

control measures; active leakage control, pressure management and mains renewal to reduce leakage and negate leakage deterioration from customer supply pipes.

Proposed AMP5 Investment levels and Comparison to Historic Expenditure

We have compared the outputs from our forward looking risk based analysis to historic expenditure levels. Our analysis shows that in order to maintain serviceability and a stable risk profile we need to spend more on capital maintenance than in AMP4.

Our mains deterioration models, and operational experience, identify a number of issues that indicate why increased capital maintenance expenditure is needed;

- Increasing deterioration of Asbestos Cement mains laid in the 1950s and 1960s (12% of our assets) and early PVC laid in the 1970s (10% of our assets). Repair of these assets often requires replacement of entire sections of pipe which takes more time and leads to a high risk of an unplanned interruption greater than 6 hours
- Historic investment in trunk main ancillaries (line and air valves) has not been sufficient to offset deterioration of these assets that have a significant impact on unplanned interruptions to supply.
- Leakage deterioration is accelerating from both company owned mains and communication pipes and customer supply pipes.
    - Maintenance mains renewal will address leakage deterioration from our own assets.
    - We have no effective way of proactively and systematically renewing customer supply pipes. Our only effective interventions to address leakage deterioration from these assets are active leakage control (ALC) and pressure management on our own assets. Over the long term our analysis shows that further pressure management opportunities become limited and that early (AMP5) company mains renewal is more cost effective than ALC. This additional mains renewal is reported in B5

Additional investment on aqueducts is required given the impact of failure of these critical infrastructure assets. Both the Derwent Valley (DVA) and Elan Valley Aqueduct (EVA) represent single points of failure. A failure of the EVA could easily cause an interruption to supply to more than 700,000 customers for many weeks. Our assessment confirms that the longest tunnel sections, particularly those on the EVA such as Knighton, Dolau and Frankley, are deteriorating and significant intervention is now required to prevent these assets failing.

In the Draft CIS Baseline, Ofwat identified Exceptional items as those where:

- Investment is not typical and a step change from recent historic expenditure is needed (e.g. maintenance of long life assets resulting in ‘lumpy’ investment)
- The investment delivers a benefit that other regulatory indicators would not detect; or
- The business case for the output and expenditure should be assessed independently of the Asset Management Assessment

For the FBP, we have followed this approach but applied a materiality threshold of £5m except where items had been identified as Exceptional in the Draft CIS Baseline. For all Exceptional items, we have defined a clear and measurable output.

We consider that critical investment in the highest risk tunnel on the EVA should be considered as an 'exceptional item' and be tied to a defined output other than the serviceability outputs.

We have identified AMP4 transfers and exceptional items and removed these from our analysis to enable a like for like comparison between AMP4 and AMP5.

In 2006/07 we changed the way we accounted for leakage zonal investigations and distribution ancillary renewals. This has increased our proposed expenditure in IRE. For the purposes of the CIS baseline the full AMP effects of the transfer from opex to IRE should be taken into account.

Since submission of the draft plan we have acted on feedback from customers, key stakeholders and our reporter and have removed or changed the scope of some schemes. For example we have chosen to defer some of the proposed EVA aqueduct maintenance investment on Dolau tunnel and DVA aqueduct maintenance on Chatsworth siphons into AMP6 for reasons of affordability.

The table below summarises the proposed capital maintenance expenditure for AMP5 and the levels of activity required for key interventions.

Serviceability Reference Levels and Control Limits

The investment levels above will deliver stable serviceability. Our proposed reference levels and control limits are shown below and are in line with the draft CIS.

Overall our serviceability will remain stable.

Serviceability Reference Levels and Control Limits						
Performance Indicator	**Draft CIS**			**Final Business Plan**		
	Level of Performance by 2014-15	**Reference level 2010 to 2015**	**Control Limit +/-**	**Level of Performance by 2014-15**	**Reference level 2010 to 2015**	**Control Limit +/-**
Serviceability Outputs						
Total Bursts (nr)		7,150	700	7,150	7,150	700
Unplanned interruptions > 12 hrs	**500**	**1,360**	**1,360**	**500**	**1,360**	**1,360**
Iron mean zonal non-compliance (MZC) (%)	0.3	0.3	0.14	0.3	0.3	0.14
DG2 properties (nr)		680	1,020	680	680	1,020
Other Key Performance Indicators						
DG3 Unplanned interruptions (index)	**0.25**	0.33		**0.25**	0.33	
Discolouration Complaints	**8,000**			**8,000**		
Leakage (Ml/day)	**475**			**453**		
% mean zonal compliance with drinking Water regulations (%)				**99.98**		

1.1.2 Sub-Service Summary: Non-Infrastructure

We have chosen the cost effective planning objective for water non-infrastructure to maintain stable serviceability, as indicated by turbidity and coliforms failures at water treatment works and service reservoirs, number of enforcement incidents and unplanned non-infrastructure maintenance events.

We have used stakeholder input to inform our plan outputs. Reducing leakage economically is important to most stakeholders and we have included this as an output measure for our maintenance plan. Customers consider that maintaining supply is important and want us to increase the resilience of our supply to both short and long interruptions. We have reflected this in the selection of [insert] output measures.

Proposed AMP5 Investment levels and Comparison to Historic Expenditure

We have compared the outputs from our forward looking risk based analysis to historic expenditure levels. Our analysis shows that in order to maintain serviceability and a stable risk profile we need to spend more on capital maintenance than in AMP4.

The main areas where increased investment over AMP4 levels is needed are;

- Leakage equipment - increasing our bulk meters verification programme and replacing DMA meters that are now obsolete so as to improve the quality of data used for leakage measurement, control and reporting.
- Network monitoring and control - earlier identification of potential events is required to sustain DG3 performance at monitoring plan levels.
- WTW maintenance - In AMP1 we invested in a large number of mechanical and electrical assets to enhance water quality. Our forward looking analysis indicates that many of these assets require capital maintenance investment in AMP5.
- Borehole civil structures - historic investment levels are insufficient to maintain our headroom in our supply demand balance as maintain borehole availability is reducing as structures deteriorate
- Bulk storage of Chlorine gas – the Board have taken a policy decision to remove bulk chlorine from our operational sites. The risks to the public and our staff associated with an escape of these quantities of gas are no longer acceptable. We have agreed dates for removal of bulk gas storage with Defra. We consider this to be an exceptional item.
- Pumping stations and service reservoirs – our largest pumping station (Frankley) and largest service reservoir (Ambergate) are critical to customer supply and require substantial investment. These assets are not typical of their asset group and have a unit cost of replacement that is significantly above the historic average. No similar sized assets have been replaced in. We consider these to be exceptional items
- Turbidity monitoring – this is a new requirement under existing regulations. Such investments are not included in our AMP4 baseline expenditure. We consider this to be an exceptional item

In the Draft CIS Baseline, Ofwat identified Exceptional items as those where:

- Investment is not typical and a step change from recent historic expenditure is needed (e.g. maintenance of long life assets resulting in 'lumpy' investment)
- The investment delivers a benefit that other regulatory indicators would not detect; or
- The business case for the output and expenditure should be assessed independently of the Asset Management Assessment

For the FBP, we have followed this approach but applied a materiality threshold of £5m except where items had been identified as Exceptional in the Draft CIS Baseline. For all Exceptional items, we have defined a clear and measurable output.

We have identified AMP4 transfers and exceptional items and removed these from our analysis to enable a like for like comparison between AMP4 and AMP5.

Serviceability Reference Levels and Control Limits

The investment levels above will deliver stable serviceability. Our proposed reference levels and control limits are shown below and are in line with the draft CIS.

Overall our serviceability will remain stable.

Serviceability Reference Levels and Control Limits						
Serviceability Indicator	**Draft CIS**			**Final Business Plan**		
	Perfor-mance by 2014-15	**Reference level 2010 to 2015**	**Control Limit (+/-)**	**Perfor-mance by 2014-15**	**Reference level 2010 to 2015**	**Control Limit (+/-)**
Serviceability Outputs						
Water treatment Works Coliforms (%)	0.02	0.02	0.02	0.02	0.02	0.02
Service Reservoirs Coliform compliance %	0.08	0.08	0.16	0.08	0.08	0.16
Number of WTW where turbidity is greater than or equal to 0.5NTU. (nr)	0	0	2	0	0	2
Enforcement (Incidents number)	0	0	1	0	0	1
Unplanned non-infrastructure maintenance	16,600	16,600	4,000	16,600	16,000	4,000

Supplementary Service Measure for Service Reservoirs						
Indicator	**Level of perfor-mance by 2014-15**	**Reference level 2010 to 2015**	**Control limits (+/-)**	**Level of perfor-mance by 2019-20**	**Reference level 2015 to 2020**	**Control limits (+/-)**
Service Reservoir % coliform non-compliance	0	0	1	0	0	1

1.1.3 Summary of Programme by Service Measure

In accordance with Ofwat guidance for Chapter B3 we have provided below a concise explanation of the contribution made to the delivery of the selected outputs by investment in different asset groups and across expenditure types. The structure mirrors that of Chapter A.

A. Ensuring a Continuous Supply of Water

The key service measures impacted under this strategy are;

- Number of burst mains (B3.1 L20)
- DG3 Supply Interruptions (overall performance assessment) (3.1 L1)
- DG3 unplanned interruption to supply exceeding 12 hours (3.1 L21)

Maintaining the Network
Our asset group analysis has shown that water mains failures are the key initiating event leading to interruptions to supply. Keeping the overall rate of failures constant will maintain serviceability. We will balance our targeting of mains renewal to address leakage deterioration, burst rate and high interruptions impact mains. We will use the output of our deterioration models as the starting point for our mains renewal programme.

Our deterioration analysis, supported by experience in the field and through our root cause analysis, indicates that we have a growing problem with Asbestos Cement mains laid in the 1950s and 1960s and PVC mains laid in the early 1970s. The failure mode of PVC, longitudinal splitting, makes repair within six hours extremely challenging as often a whole six metre length will have to be replaced. PVC is lightweight and was a favoured material for trunk mains due to its ease of installation. Asbestos Cement tends to deteriorate uniformly meaning that the main is often unable to support the use of a repair collar and a full length repair may be needed.

Our analysis indicates that reducing interruptions to supply by increasing mains renewal is non cost beneficial when measured against customers' willingness to pay.

Our deterioration models for Water Treatment Works and pumping stations utilised the interruptions to supply service measure. Whilst maintenance of these assets is important our analysis indicated that water quality was a stronger driver as most treatment facilities and pumping stations have duty / standby arrangements that mitigate failure. Major works with single points of failure were included in our Resilience programme

Increasing Resilience
The flooding incident in Gloucestershire in 2007 highlighted that we have inherent risks in our network which are no longer acceptable to our customers. We identified in our Strategic Direction Statement the need to improve the resilience of our network to reduce the risk of customers losing their water supply from all potential causes including flooding. The improvements we are proposing in our plan will provide over the next ten years an alternative piped source of water to all communities larger than 20,000 people.

Expenditure for our resilience programme, which represents a step change in risk, is cost beneficial and is supported by our customers' willingness to pay, is included in B6.

Expenditure on our Isolated Communities programme, which is supported by Defra as part of their Security and Emergency Measures Directive, is cost beneficial and is supported by our customers' willingness to pay, is included in Chapter B4.

This investment will to reduce the risk of a major supply interruptions leading to performance outside control limits.

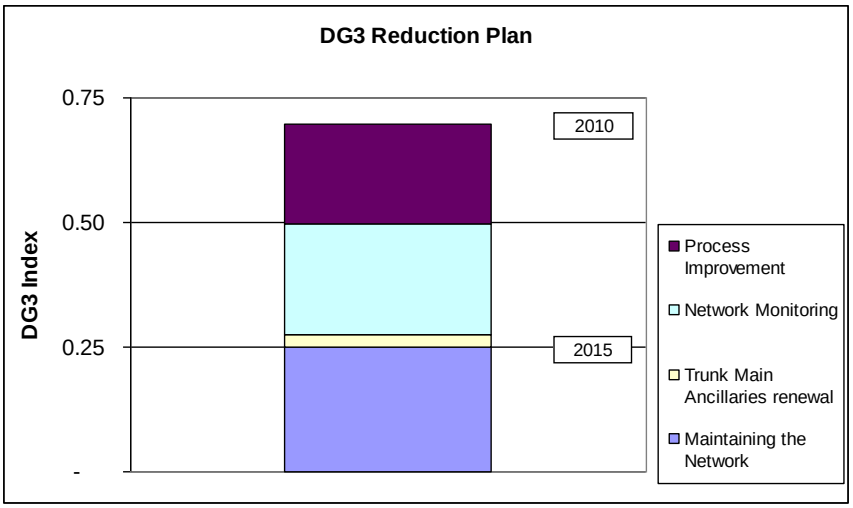
Reducing Interruptions through Improved Operational Performance
We are improving our operational processes through a programme based on 'lean manufacturing' techniques. We have called this programme our 'Safer, Better, Faster' initiative. This work is a major contributor to the operating efficiency improvements as described in chapter B2. The work has started in AMP4 and will continue into AMP5.

Improved operational performance will lead to a reduced impact on customers when assets fail. We will be able to respond more rapidly and reduce repair times thereby helping to achieve service levels.

We propose investment in two areas to drive down the number of interruptions from their current level and to sustain future performance within control limits;

- Our root-cause analysis has helped us to quantify the impact inoperable trunk main valves have on the extent and duration of interruptions. We have included increased expenditure in our maintenance plans to resolve this issue. (see section 3.2.)
- We need to upgrade our monitoring devices to provide real time information so that we can react early to situations and prevent interruptions occurring or minimise their duration. (see section 3.7)

At the end of AMP5 we will be in a position to sustain DG3 performance and use this as a base to move towards our Strategic Direction Statement goal. The chart below shows how our activities combine to achieve our DG3 performance target.



B. Providing Safe, Acceptable Drinking Water

The key service measures impacted under this strategy are;

- Water treatment works coliform non-compliance (B3.1 L3)
- % Bacteriological samples from SRs failing standard (B3.1 L4) and
- % mean zonal non-compliance for faecal coliforms (B3.1 L5)

- Enforcement actions considered for microbiological standards (B3.1.12)
- % mean zonal non-compliance for pesticides (B3.1 L6)
- % mean zonal non-compliance for nitrate (B3.1 L7)
- % mean zonal non-compliance for aluminium (B3.1 L8)
- Number of WTW with turbidity 95%ile greater than or equal to 0.5NTU (B3.1 L13)
- % mean zonal non-compliance for manganese (B3.1 L9)
- % mean zonal compliance with the PCV for lead. (B3.1 L10)
- % mean zonal compliance with the PCV for iron at the tap (B3.1 L11)
- Unplanned non-infrastructure maintenance (3.1 L22 and L23)

The Water Quality Programme

Our commitment to the DWI's Drinking Water Safety Plan approach has identified improvements required to maintain the high standards. Our plan builds on and reflects the priorities in our SDS and we intend to improve our treatment processes where raw water quality is deteriorating. We have made the assumption that, with the exception of the new lead standard, there will be no significant changes in drinking water quality standards.

Our proposed programme, set out fully in Chapter B4 comprises four main categories:

- A continuation of our integrated strategy to deal with the continuing deterioration in nitrate levels in our groundwater catchments.
- Localised schemes to maintain compliance in areas affected by raw water quality deterioration in respect of solvents, pesticides, cryptosporidium and pH.
- A plan to deliver 95% compliance with the 2013 lead standard of 10□g/l.
- A plan for the management of quality risk through Drinking Water Safety Plans and the enhanced management of catchments. This includes review of whether change in farming practices could avoid the need for additional treatment, e.g. to remove nitrates or pesticides.

Maintaining Assets

We will maintain our non-infrastructure assets, Water Treatment Works, Pumping Stations and Service Reservoirs to deliver stable serviceability.

.

We have included some specific expenditure in our maintenance programme to comply with some new regulations, for example Turbidity monitoring regulation 26.

Our infrastructure deterioration modelling analysis indicates that reducing discolouration complaints by increasing distribution mains cleaning or renewal is non cost-beneficial when measured against customers' willingness to pay. We do not have sufficient evidence from our AMP4 programme to fully assess the benefits of a trunk main cleaning programme and have not included any expenditure in our plan. Our analysis shows that a continuation of base maintenance mains cleaning is necessary to prevent discolouration complaints from rising. Areas requiring mains cleaning will be identified and prioritised by our Water Safety Plans.

We will continue to monitor the long term benefits of our AMP4 mains cleaning programme and investigate novel methods and techniques to inform our strategy at PR14.

C. Having Enough Water Available to Meet Demand

Supply / Demand
Our plan delivers a Security of Supply Index of 100 throughout AMP5. This is achieved primarily through driving down leakage to a new sustainable economic level of 453Ml/day by 2014/15 and 410Ml/day by 2035.

Our plan to maintain supply is holistic. We make use of the additional deployable output arising from resilience schemes to the extent that we do not have to develop any new sources in AMP5..

Our plans to address future supply demand deficits and meet growth are set out in Chapter B5

Maintaining Assets
We need to continue mains renewal base maintenance to prevent leakage deterioration from our assets and find and fix leaks efficiently.

D. Ensuring Water is at an Adequate Pressure

We have improved the extent of pressure monitoring by installing permanent pressure monitoring devices in all our District Metered Areas. Low pressure problems will continue to arise due to increased peak flows demand patterns. Our plan provides for removing from the DG2 register approximately 1,400 properties that fail the standard each year.

We will also invest in joint supply pipe separation to comply fully with Ofwat DG2 guidance. Details are given in chapter 6.

1.2 Stakeholder Engagement

We have undertaken a comprehensive review process with all of our stakeholders. We have discussed our general approach in Chapter C1.

We have explained earlier in this chapter summary where and how stakeholder views have shaped our maintenance plan.

1.3 Leadership, Policy and Strategy

We have set out our vision for the maintenance of our Water Service assets in our Strategic Direction Statement (SDS). Within our SDS we have identified our Key Strategic Intentions (KSIs), including KSI1 to provide a continuous supply of quality water.

We have set out the Board ownership, policy and strategy in respect of our service plans in detail in the Overview to this Chapter.

Maintaining Service and Serviceability – Sewerage Service

Approach and Structure

We have followed the information requirements structure by considering overall objectives, and approach by sub-service and reporting individual business cases by the asset groups set out in the reporting tables.

A number of areas applicable to both water and sewerage services are detailed in the overview to B3 and are referred to throughout the service specific sections.

Section	Approach
5. Service Summary, Planning Objective, Direction and Delivery 5.A Sewerage Services Summary of Capital Maintenance Plan 5.1 Planning Objective 5.2 Stakeholder Engagement 5.3 Leadership, Policy & Strategy	These items are covered in the company level overview to this chapter. Specific issues for Sewerage Services have been discussed in this section.
6. Approach to Asset Planning by Sub-Service 6.1 Management 6.2 Processes 6.3 Systems	We have set out basic information on our management, processes and systems in this section which compliments the overview. For FBP we have relocated discussion of the specific modelling process into section 7.
7. Business Case by Asset Group 7.1 Infrastructure Assets 7.2 Sea Outfalls 7.3 Sewage Treatment Works 7.4 Sludge Treatment Works 7.5 Sewerage Pumping Stations 7.6 Renewable Energy 7.7 Efficiency Enabling Investment	We have reported business case by asset group as set out in the reporting guidelines. We have used a consistent set of sub-sections in line with reporting requirements. **Each Asset Group includes coverage of:** • Data • Analysis ○ Historical analysis ○ Forward looking analysis – service and cost forecasting ○ Forward looking analysis – intervention analysis Conclusions
8. Further Table Commentaries	Comparison to historic investment

Section 5 – Sewerage Service Summary: Planning Objectives, Direction and Delivery

5.A Sewerage Services Summary of Capital Maintenance Plan

5.A.1 Planning Objective

We have developed our FBP from our rolling business planning process to demonstrate the steps we plan to take through AMP5 in our drive towards the 25 year vision set out in our Strategic Direction Statement (SDS). We have delivered an optimised plan compliant with the Common Framework for Capital Maintenance Planning that will achieve our specific Planning Objectives. We believe our Asset Management planning process is supported through a holistic, innovative, sustainable and effective set of people, processes and systems to ensure that we manage the risks to service at least cost to our customers.

We have chosen the cost effective planning objective to maintain stable asset serviceability through our optimised maintenance programme where our performance is stable and customers have shown no willingness to accept a service change. We consider that this approach delivers a balance of the level of service that customers are willing to pay for and delivers our objectives as set out in our SDS. This programme has been developed through a combination of asset deterioration modelling and other service risk based assessments.

We will improve asset serviceability where customers have shown a willingness to pay and we have balanced improvements that may be achieved with the impact on customers' bills to maintain the lowest possible charges. Customers have expressed this wish in respect of flooding and pollutions and we have extended the planning objective for these to a cost beneficial approach and this is fully detailed in Chapters B6 and C6.

Our plan will;

- Maintain current levels of stable service to achieve the cost effective planning objective as a minimum across the service;
- Target the cost beneficial planning objective to provide a significant yet affordable betterment in our service level for flooding;
- Maintain our record of best in class sewage treatment works effluent compliance performance;
- Reduce category 1 & 2 pollution incidents and deliver the category 3 action plan resolution;
- Manage the risk of sewer collapses through targeted CCTV surveys and proactive sewer rehabilitation;
- Reduce sewer flooding incidents through increased sewer cleansing;
- Promote the adoption of SuDS and separation, which contribute to sustainable surface water management solutions;
- Maintain our sector leading delivery of generating energy from renewable resources;

- Support the development of our sludge strategy, fully utilising the sludge to agriculture route;
- Minimise our carbon footprint impact in order to enable no net increase in greenhouse gas emissions over the AMP arising from the regulated business;
- Provide enhanced service through the most cost beneficial mix of investments across asset groups for common benefits (e.g. pollutions)
- Be delivered through liaison with all of our stakeholders.

5.A.3 The plan is based on UKWIR common framework and uses robust data

Our planning approach follows the UKWIR Common Framework for Capital Maintenance Planning. We have undertaken assessments of our plan's compliance with the approach through comparison with the Asset Management Assessment process.

The approach, process and tools that we have developed to produce this plan will form the basis on which to build further improvements towards PR14. The models and processes are being moved into ongoing business processes. Investment model outputs will be used to generate real projects, for example non-critical sewer rehabilitation cohorts identified by our investment model will be the starting point for scheme feasibility.

We have used our historical analysis of performance to build deterioration and predictive models which form the basis for 71% of our planned investment in maintenance. These models are based upon robust statistical relationships derived from our actual asset performance. For example, our proposed sewage treatment works reactive and proactive investment programmes have been derived from relationships, built from our physical asset data, numbers of failures, impact on service performance likelihood and consequence. Similar models have been built for infrastructure assets, sludge treatment facilities and sewerage pumping stations.

There are a small number of assets which do not have sufficient data to enable reliable deterioration models to be constructed. In these cases we have undertaken specific asset observations to inform the plan. Assets described in this way include our sole membrane plant and our new sludge dryers.

We have augmented the deterioration based modelling approach with manual intervention proposals to reflect new assets or interventions which are seeking to provide more beneficial asset arrangements rather than the modelled like for like replacement. This approach specifically enables us to drive through those projects which will improve efficiency and deliver the least whole life cost solution for our customers' benefit. We have used this approach within asset groups such as sludge treatment facilities, where the more cost effective provision of alternative sludge dewatering assets to replacement of existing assets is planned.

To respond to limitations in some of our data we have used extensive validation and sensitivity analysis, undertaken by a third party (Cap Gemini), to understand how uncertainty in data and key assumptions affect our proposals.

We have also updated the extract of our sewer records data used for sewerage infrastructure modelling and carried out additional CCTV surveys. This has been used to re-derive the model relationships.

5.A.4 The plan is optimised and balanced

We believe that our optimised capital maintenance plan balances the burden of cost to the customer with the service benefits delivered set at a level the customer has expressed a willingness to pay for. Our base maintenance comprises an investment programme that delivers stable serviceability at least cost across both sewerage sub services and which aligns both with our company Key Strategic Intentions and with researched and verified customer preferences. To achieve this and be able to sustain the approach going forward, we have reinforced our "business as usual" systems and processes. We have;

- Implemented a data collection, verification and analysis programme to manage risks associated with data inaccuracies and uncertainties. This ensures that we know with greater accuracy what assets we have, their condition and performance, and the cost of operation, repair and replacement. This reduces the likelihood of sub-optimal planning resulting from flawed assumptions about costs and benefits.

- Used consistently populated and verified repositories of data to provide asset, performance and cost data that comprise "best central estimates". This avoids systemic error leading to sub-optimal problem and solution selection. In this respect, our plan is both mature and robust.

- If we provide our customers with serviceability levels that they had indicated they were unwilling to pay for, or serviceability that falls short of the standard for which they were willing to pay, our plan would not be optimal. To achieve our optimised plan we have set our maintenance planning objectives in line with customer expectations and willingness to pay.

- Managed and developed our investment plan through a number of iterations to ensure that the most cost effective option to deliver any specific level of service is chosen. Our plan has progressed through six separate iteration phases and these are discussed in detail in Chapter C8.

- Balanced investment options for blockages/pollutions/flooding and collapses to deliver the suite of maintenance and enhancements from a wide number of specific scenarios that has enabled us to select the most cost effective service based investment. This process has additionally been used to choose the most cost beneficial enhancement interventions and these are discussed in later Chapters.

- Ensured that we have identified the interventions that give specific cost beneficial service delivery through our identification of proactive maintenance. A fix on fail reactive approach will not deliver customer's service aspirations and the proactive intervention process ensures that we select only the most cost beneficial investments to achieve the service planning objective.

- Maximised the synergy through maintenance and enhancement to deliver a plan for sludge treatment which will provide an optimised solution for AMP5 and beyond through our proactive approach to rationalise the asset base and provide increased capacity where it is the least cost option.

- Provided an investment plan profile through full discussion with our Asset Delivery function to ensure that the scope of the plan is deliverable with synergy with the enhancement and quality programmes fully developed.

Our investment planning process uses cost-benefit analysis to value our investment schemes. The benefit of each investment is derived from our researched and verified customer valuations.

5.A.5. The plan has taken account of Customer, Ofwat, Reporter, Environment Agency, Consumer Council for Water, Natural England and other stakeholder feedback

We have engaged with stakeholders through individual and quadripartite meetings and these are discussed fully in the overview to this Chapter and Chapter C1. In outline;

Our customer research and interaction with the Consumer Council for Water (CCWater) indicated that;

- avoidance of sewage flooding is a key priority
- following the Gloucester floods in 2007 incident, customers want increased asset resilience
- bill increases should be kept to a minimum
- customers are willing to pay for some improvements to service levels
- CCWater support our plan

The Environment Agency (EA) and Natural England want us to achieve our statutory obligations at least cost and with the maximum impact on environmental improvement.

Ofwat requires us to produce a holistic plan to deliver service performance whilst paying particular attention to minimising the burden on customers in the present economic climate. We have used this input to set our maintenance plan objectives and have designed our plan to meet stakeholder expectations. We have acted upon all of the feedback from Ofwat in the draft CIS Baseline.

We have discussed with the Reporter all of the issues that they raised with our draft plan and have maintained dialogue throughout the preparation of the plan through the Audit process.

5.A.6 Service Summary by Sub Service

We have calculated the service benefits arising from all of our investments and have measured the value of this benefit by using either our customer willingness to pay research or the avoided internal private cost of failure. The cost benefit ratio of each investment proposed is calculated in our Investment Manager process.

5.A.6.1 Serviceability since AMP1

We are committed to maintaining our serviceability to customers and building on the performance improvements we have achieved since privatisation and we report this serviceability through the June Return process.

Service performance associated with the AMP5 programme is demonstrated on the graphs below, together with our planned reference and control totals. We have generally provided reference levels for future service based upon the average performance achieved in recent years with target levels of +/- 2 standard deviations. This performance represents a stable service position which recognises the natural variation on issues such as weather patterns as well as specific performance issues arising from third party action such as trader discharges. We have not followed the draft CIS Baseline approach of using the best performance in

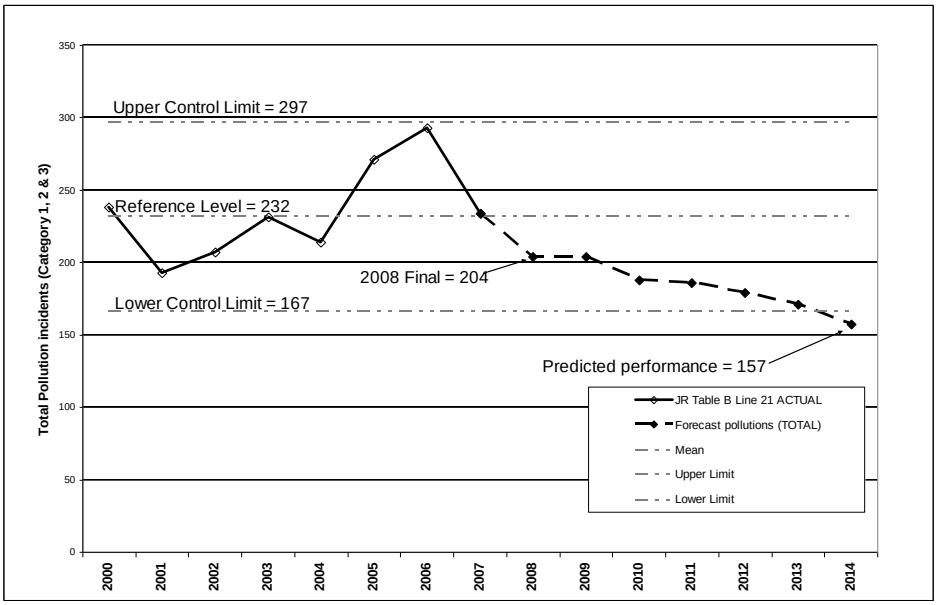
recent years to define the reference level, as this would, on average, require a change in service position or company risk which is not supported through the customer willingness to pay.

5.A.6.2. Infrastructure

While we have experienced significant variability in some infrastructure serviceability indicators, and Ofwat's view that our serviceability is "marginal", we believe that it is broadly stable. We will invest to both maintain our stable performance and to improve performance on pollution incidents and sewer flooding in line with our SDS and our customers' wishes.

Pollution incidents:

In 2006, the EA expressed concern over our performance in respect of Category 3 pollution incidents. An action plan including thirteen areas of improvement was agreed and is being implemented. The number of pollution incidents in 2007 and 2008 was significantly reduced despite a change in reporting requirements to include rising main related incidents.

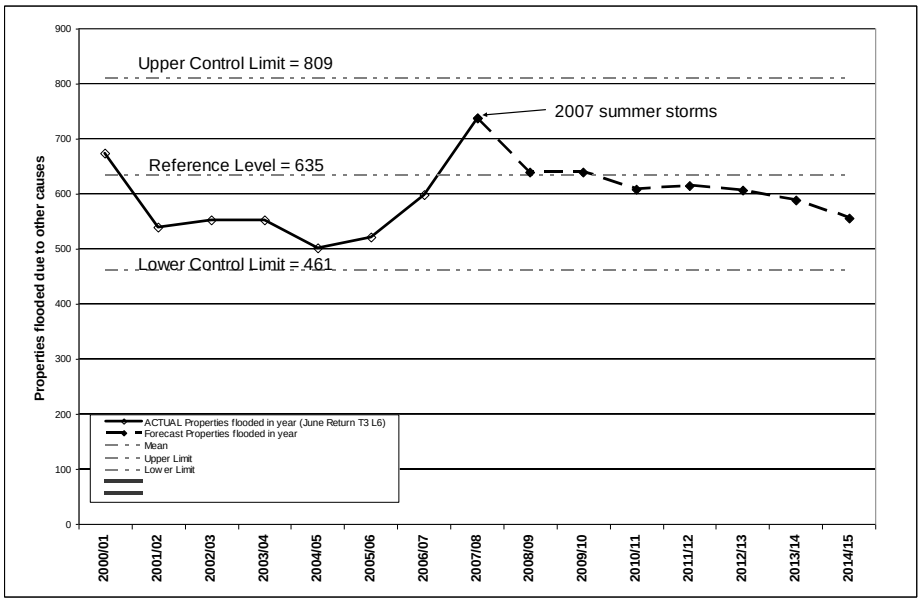


Building on our ongoing AMP4 strategy we are predicting significant reductions from the combined effects of investment in our existing assets and improving telemetry and controls. Weather patterns and any EA definition changes will affect performance in individual years.

Flooding – other causes:

In 2007/08 we saw a significant increase in the number of properties experiencing sewer flooding related to sewer blockages and collapses. This was affected by the summer 2007 storms which highlighted defects in the system. In 2008/09, we have increased our level of activity and expect the number of incidents to reduce to more normal levels.

In AMP5 we plan to maintain the number of collapses, but drive down the number of flooding incidents due to other causes through our optimised approach to cleansing, inspection and renovation.



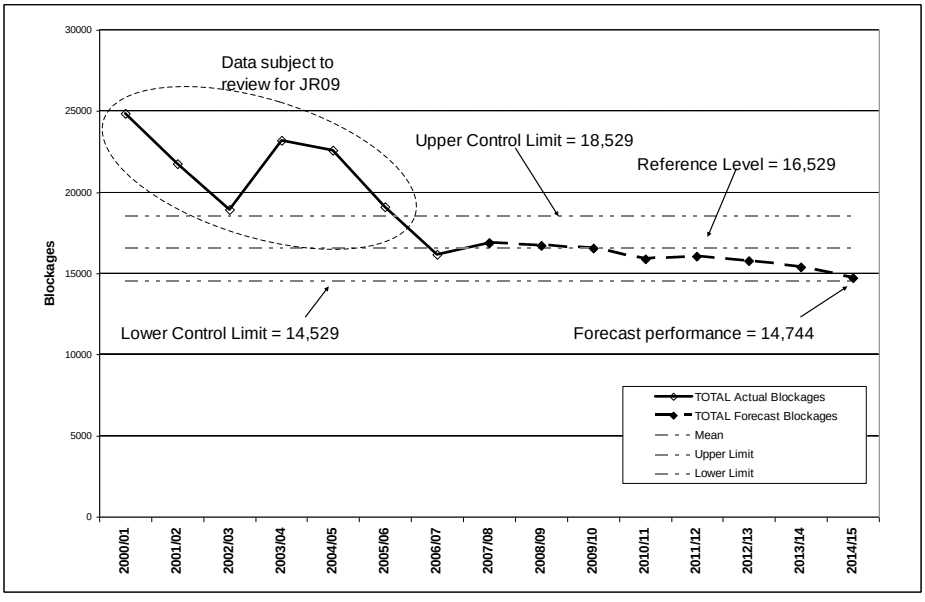
Collapses

In JR08 we stated that since April 2007 we had aligned our data systems with the reporting requirements to ensure that proactive defect rectification work on Grade 5 non critical sewers were recorded as collapses.

For AMP5 we intend to use proactive interventions to maintain collapse numbers at current levels in the most cost-effective way.

Blockages

In JR08 we stated that our historical blockage data did not capture the number of blockages cleared as a result of proactive maintenance. Our planned increase in sewer cleansing over AMP5 improves performance by 2014/15.



Equipment failures

This measure has only been reported since JR07. As we stated in JR08, we are only able to extract data from our systems that shows where a failure resulted in an actual service incident and not those which were "likely to have a detrimental impact on service". We plan to maintain this indicator however changes in data capture techniques are likely to result in a step change in the recorded numbers, however this would not represent a material change in serviceability.

Flooding overloaded sewers

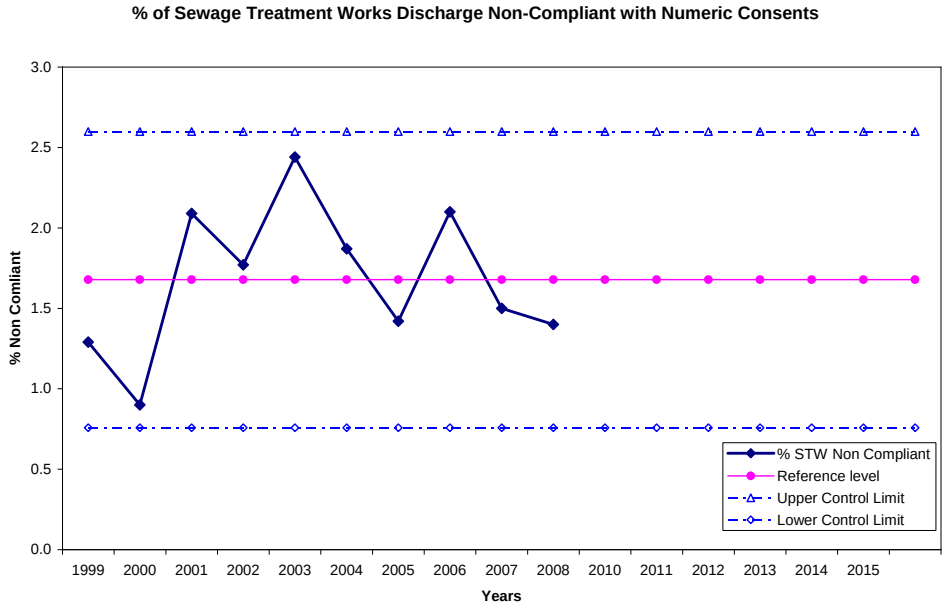
Serviceability indicators for flooding due to overloaded sewers have been derived from the 8 year historical average. Our plans for improvement in this area are described in Chapter C6.

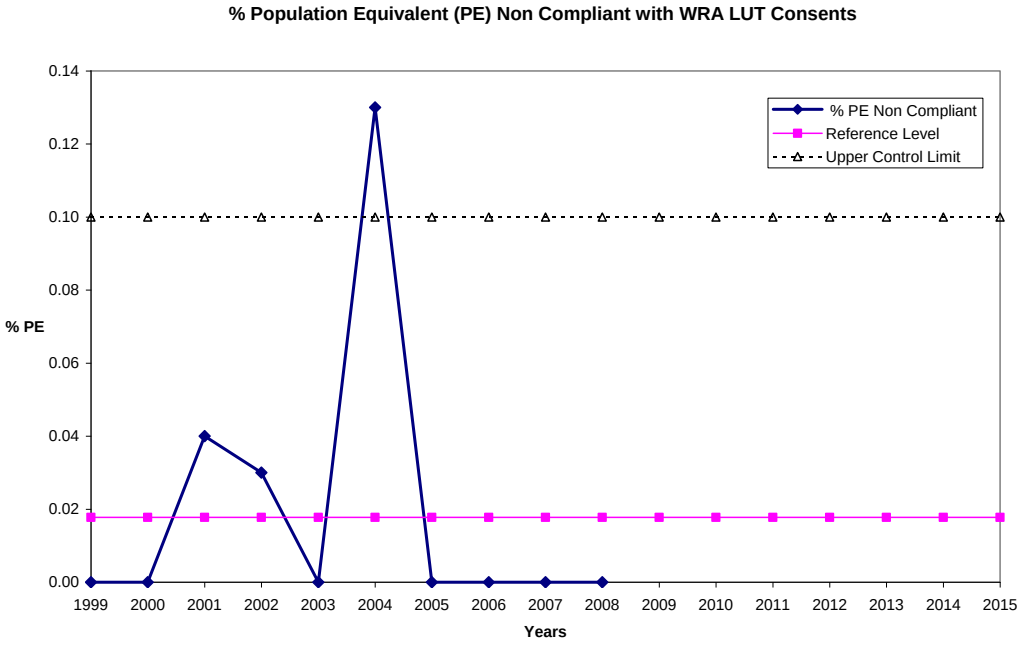
5.A.6.3 Non Infrastructure

We plan to target the reference levels of service to maintain stable serviceability performance in AMP5 and beyond.

Consent compliance:
Our sewage treatment works assets have delivered stable performance for many years with the initial enhancement in performance post privatisation being maintained. The inclusion of tighter consenting through quality and growth enhancements and particularly the inclusion of specific metals limits associated with the nutrient removal programme, represent the main challenges to this serviceability performance.

We are confident that our investment plan will maintain our risk position for consent compliance and we have targeted reference and control limits based on average recent performance.



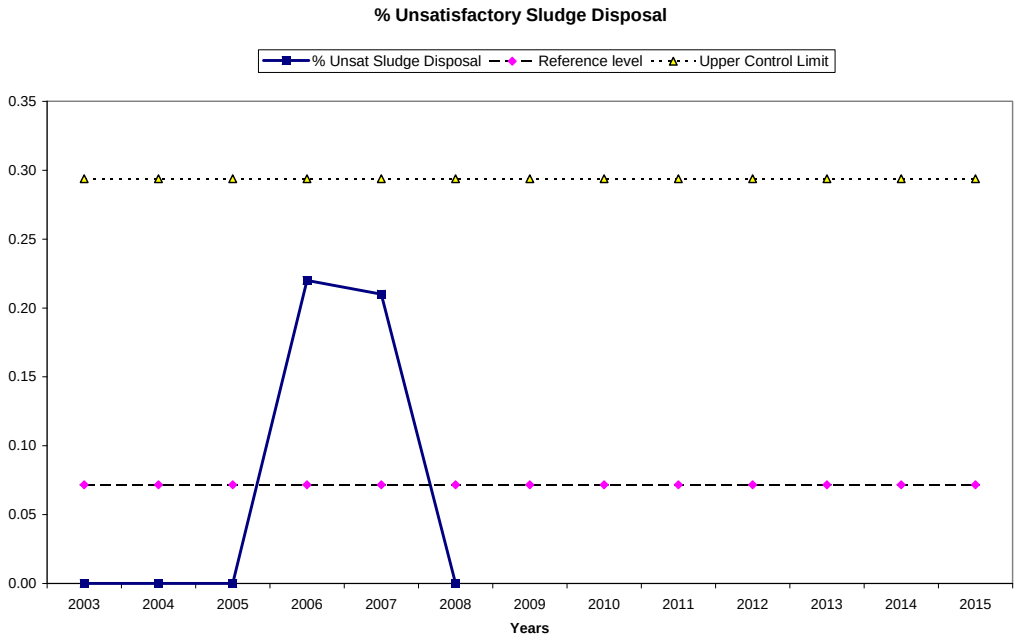


Unplanned Maintenance:

This measure reviews the number of unplanned maintenance activities undertaken on our STW/STF assets. We have demonstrated a small reduction in AMP4 JR07 to 08 from 39,119 to 37,429. We consider that a potential increase in this number would be initiated by an ageing AMP1 asset base however the additional M&E investment in AMP5 will counteract this. We expect a step change in the reported number of events following implementation of a new Enterprise Resource Planning (ERP) tool which should capture events at a greater granularity than current processes. This step change would not indicate a deteriorating service trend.

Unsatisfactory Sludge Disposal:

Our sludge treatment facilities have delivered stable performance for many years and our Plan will enable performance to continue in this way. We have set the upper control limit for this service measure as 0.29% unsatisfactory disposal of sludge and the lower limit at 0.



This is our output measure of sludge serviceability. As this measure has been zero for four out of the previous six years, it is difficult to use it effectively for Capital Maintenance planning. For this reason, we have sub-measures relating to Sludge that are used within Investment Manager to assess the impact of Capital Maintenance upon sludge serviceability.

5.A.6.4 Reference and Control Limits

The service positions are fully detailed in the sub-group discussions in section 7. The service positions are summarised above to demonstrate the planned service outputs.

We have proposed reference and control levels for our serviceability measures that reflect our service planning objectives based on the current level of risk derived from past and planned performance. We have set levels which best reflect our current asset base and performance position. These are fully discussed in the relevant asset sub group chapters.

We have not used those levels included in the draft CIS baseline report where we consider the reference levels proposed by Ofwat may include data not representative of current performance or where we consider that delivery of the reference levels represent a net improvement in service and require additional expenditure to maintain current service risk which our customers do not support.

5.A.7. Programme Cost Summary

5.A.7.1 Sub Service Costs

Our analysis shows that we can deliver our forward looking risk based planning objectives at broadly comparable investment to AMP4 across the overall infrastructure and non-infrastructure sub services taking into account the increasing maintenance requirements on the increased asset base since privatisation. We see a step change reduction in the M&G expenditure associated with construction of our new Headquarters in AMP4.

We have provided an outline of the changed investment profile to achieve the service objectives and demonstrated the changes between AMP4 and AMP5. We have extracted exceptional items using the Ofwat methodology outlined in the draft CIS baseline. We have provided a summary of this comparison in the step charts below

Our Approach to Exceptional Items

In the Draft CIS Baseline, Ofwat identified Exceptional items as those where:

- Investment is not typical and a step change from recent historic expenditure is needed (e.g. maintenance of long life assets resulting in 'lumpy' investment)
- The investment delivers a benefit that other regulatory indicators would not detect; or
- The business case for the output and expenditure should be assessed independently of the Asset Management Assessment

For the FBP, we have followed this approach but applied a materiality threshold of £5m except where items had been identified as Exceptional in the Draft CIS Baseline. For all AMP5 Exceptional items, we have defined a clear and measurable output.

Infrastructure

After allowing for transfers and exceptional items, we plan to invest £60m more in sewerage infrastructure to maintain serviceability. This is driven through the comprehensive service based asset deterioration modelling undertaken and reflects the better knowledge we now have about these assets and will offset service deterioration as the asset stock ages. It will deliver some improvement in related flooding and pollution incidents in line with our customers' wishes and contribute towards our Key Strategic Intentions.

We have increased our expenditure on infrastructure above our PR04 FD plan to address the rise we have seen recently in some of the negative performance indicators.

Non Infrastructure

We plan to decrease our overall expenditure on our non-infrastructure assets whilst delivering a stable service and achieving the cost effective planning objective.

One key change is in respect of our Management and General (M&G) function where our expenditure is significantly greater in AMP4. This is discussed in detail later in Section 11.

We have applied our approach to exceptional items in line with the methodology outlined in the draft CIS baseline report. There are a number of investment options included within our plan which we consider to be significantly different from previous investment periods and we consider these areas to be exceptional items.

To enable direct comparison between the underlying maintenance position between AMP4 and AMP5, we have identified exceptional" items from the AMP4 programme. We have separated out investment areas that have transferred from Maintenance to Enhancement for AMP5. These are discussed in detail in the sub groups in section 7 and are listed below.

In AMP1, we invested heavily in our sludge and sewage treatment facilities to enhance their performance to achieve newer, more stringent quality requirements to improve river quality. Our forward looking analysis, supported by asset deterioration modelling, indicates that many of these M&E assets will come to the end of their useful life and require replacement in AMP5. This adjustment in investment profile is demonstrated through a change in the balance of shorter life and longer life assets in our investment programme compared to previous investment periods.

This upward pressure due to M&E assets is tempered in some of the asset sub groups as we have identified a reduction in civils structure renewals when compared to historic levels, due to high level of replacement associated with meeting post privatisation quality objectives. Our overall AMP5 programme for sewage treatment, (excluding exceptional items) is broadly in line with long term historical average.

We plan a marginal increase in investment on our sewage pumping stations, and other non-infrastructure assets within the sewer network, to assist in our cost beneficial planning objective to reduce the number of pollution incidents discussed fully in Chapter B6.

We have set ourselves a challenging Opex efficiency programme, and a number of these efficiency initiatives require enabling capital investment. The efficiencies are generally based around reducing power costs and additionally contribute to our SDS commitment on energy and carbon reduction commitments. We have separately identified these in section 7.7 and have included the predicted efficiency benefits in Chapter B2.

5.1 Planning Objective

We have discussed our approach to setting and delivery of our planning objectives in the summary above.

5.2 Stakeholder Engagement

We have undertaken a comprehensive review process with all of our stakeholders. We have discussed our general approach in Chapter C1, the Overview and introduction to this chapter.

There are a number of stakeholder engagement issues specific to the sewerage service which we have detailed below.

Pollutions: As a result of concerns raised by the EA at the annual Environmental Performance tripartite meeting between OWFAT, EA and ourselves in 2006, we are progressing a Pollution Action Plan to improve our performance on category 3 pollution incidents. Whilst this is primarily an operational improvement action plan, we have identified that a minority of incidents are due to asset failures.

Significant gains have already been made on this issue and we have been mindful of this when assessing AMP5 maintenance requirements. Whilst it has not proved to be cost beneficial to directly drive an improvement in performance through increased maintenance activity, our willingness to pay survey data does support further interventions to reduce pollution. We have included cost beneficial proposals to achieve this under our Pollution Control Strategy outlined in B6. However, for this strategy and our other, operational, improvements to be effective, we will ensure that cost effective maintenance activity is sufficient to support these gains.

Environment: We have held a number of constructive meetings with the EA and Natural England to discuss the detail of the planned investment programme and the impact on the environment. The Quality enhancement programme has been reduced by £36m since DBP following our constructive challenge in respect of technological and environmental issues to ensure that the planned programme delivers the benefits required at least cost. We additionally held a full day workshop with Natural England to discuss all aspects of our programme that impacted on the natural environment where they had concerns.

Sludge: Facilitated by Water UK, we actively engage with the British Retail Consortium (BRC), Defra and the EA via the 'Biosolids Focus Group' and the 'Waste Recycling Network'. We have also met with Ofwat and had subsequent correspondence regarding technical difficulties in completing our AMP4 Dryer investments in order to keep them informed.

5.3 Leadership, Policy and Strategy

The sewerage service is a key contributor to the delivery of the vision set out in our SDS through its contribution to delivery of the base strategic intention, KSI2: Dealing Effectively with Waste Water.

We have set out the Board ownership, policy and strategy in respect of our sewerage service plans in detail in the Overview to this Chapter and further in Chapter C8.