Anglian Water

4B. REVIEW OF ANGLIAN WATER'S APPROACH TO INVESTMENT IN PR14

Draft Determination Representation, August 2019

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Review of Anglian Water's approach to investment in PR14

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23 June 2014

Attention is drawn to the important notice on page one of this document.

Important notice

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Contents

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Structure of the report

Executive Summary	Investment Procedures & Governance	Costs, Benefits, Optimisation	Evaluation	AMP 5 to AMP6	Additional Information	Business Cases
Scope and work carried out. Headlines and key findings.	The governance and decision making framework used for asset management and investment decisions. The same top level systems, tools and processes have been used to derive cost forecast for PR14.	The components of Asset Plus: service impacts, cost estimation and Investment Manager. These systems cover the identification and optimisation of solutions and the role of CBA in optimisation.	Criteria developed to assess investment management against good practice. The assessment of Anglian Water's top level systems and processes against the criteria.	Movements from forecast outturn totex of AMP 5 to AMP 6. Ecological improvements and resilience are most of the increase. Consistency of this increase with the ecological and resilience business cases examined.	Additional information intended to be presented to Ofwat and address the risk-based review. Relationship of the additional information to the business cases examined.	Business cases covering the net increase in costs or AMP6, on ecological improvement and resilience. Comments on the specific business cases and the need for additional information.

1 Executive summary

Introduction

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Scope and purpose of report

- This report provides a top level review of Anglian Water's investment approach for PR14, covering the systems and processes used to generate investment proposals for the business plan (and in most cases also for business as usual decision-making). It has been developed to provide comments on Anglian Water's overall investment management approach that underpins its business plan.
- The detailed scope of this review and the limitations to that scope are set out in KPMG's engagement letter dated 21 May 2014. The scope included:
  - Review of the supplementary information Anglian Water will submit to Ofwat on the topics that formed part of the gap between the plan and Ofwat's modelled costs, commenting on the robustness and clarity of the information including justification of benefits and the level of optioneering carried out, indicating the degree to which Anglian Water's approach meets best practice;
  - Review of the approach to the development of the business plans in respect of capital maintenance, commenting on the qualitative aspects of the Asset Plus needs assessment, cost estimation and cost optimisation processes, the Risk and Value process in assessing options, the qualitative aspects of the application of willingness to pay data and the CBA methodology and reviewing where relevant the existing assurance undertaken by Anglian Water both for business as usual and for PR14;
  - Review of the approach to the development of the business plans in respect of enhancement investment, providing comments on the comparison between AMP5 and AMP6 and reviewing and challenging the new areas in Anglian Water's enhancement plan, primarily selected business cases.

Work carried out

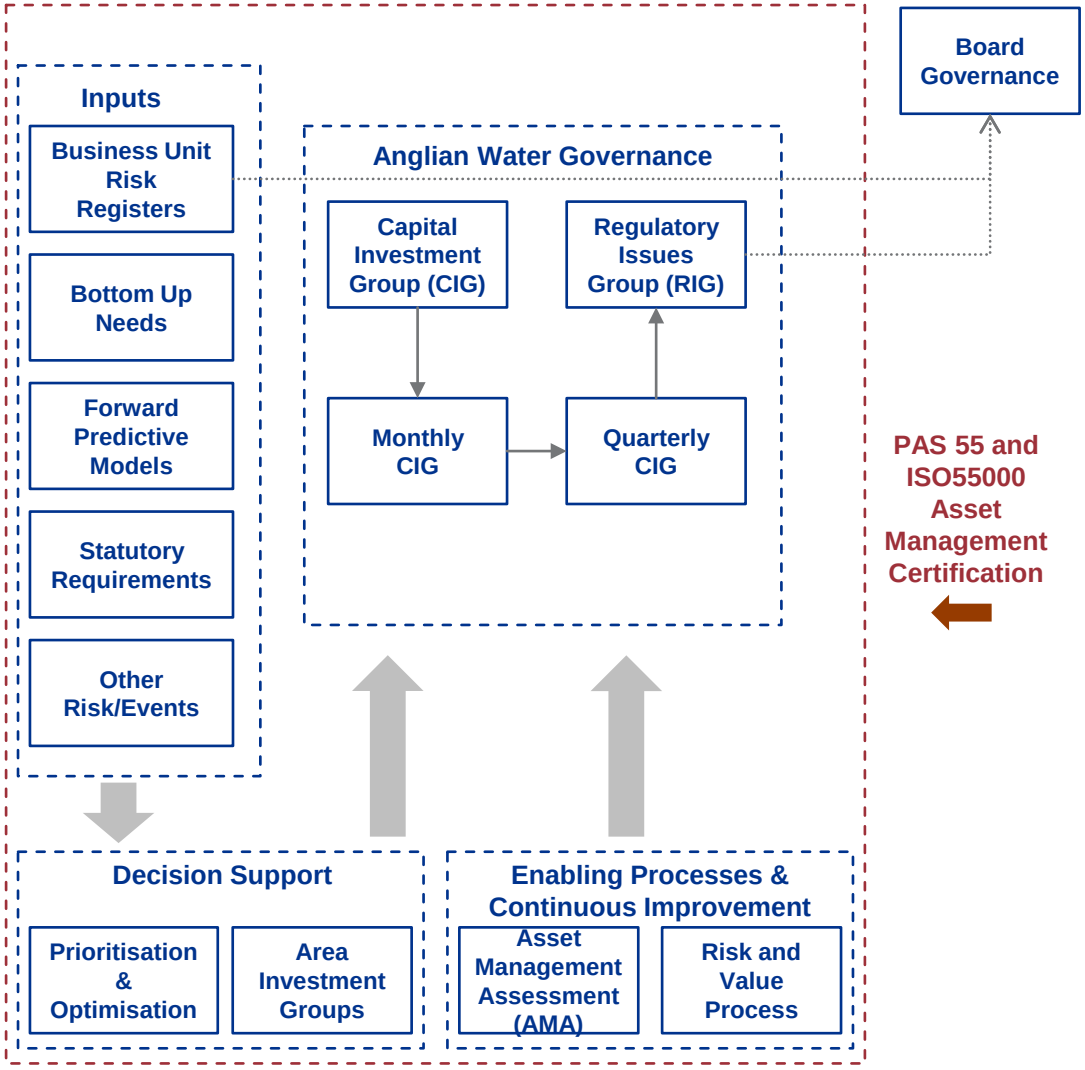
- Visits were made to Anglian Water on a number of occasions including for two days in April 2014 and three days in May 2014. There was extensive further interaction with Anglian Water after the site visits, including conference calls, written questions and answers and requests for further clarification and supporting information.
- The description of the processes and systems and the evaluation of them are based on the interviews with key Anglian Water personnel during those three days, the supporting material provided and follow up questions. These processes and systems have been assessed against criteria for best practice.
- Anglian Water has also supplied specific business cases that cover areas of its plan where more information was required by Ofwat following its risk-based review, and drafts of additional material that may be supplied to Ofwat.
- Anglian Water's approach to the estimation of costs, benefits and risks and to the generation and optimisation of solutions for a limited number of business cases has been reviewed. Certain aspects of Anglian Water's approach to cost-benefit analysis has been examined to clarify how costs have been identified but the absolute level of costs and benefits has not been examined.
- There are also comments on selected business cases, where it has been recognised that it has been difficult for a reader to identify sources of costs and benefits and the processes used to generate preferred options.
- This is why the review was carried out of the company-wide systems and processes that have been used to generate the costs for the PR14 plan. Many of the factors that might be expected in an individual business case are in fact taking place in these company-wide systems. Examples include identifying a business need, creating robust cost and benefits values for each option, carrying out the analysis needed to identify and cost the options and applying cost benefit analysis to the options identified.

Headlines

Summary	■ **Anglian Water's overall approach to investment management is based on well-developed and well managed systems and processes. These processes are certified to ISO55000 and PAS55 Asset Management standards.** ■ **The costs, benefits and CBA calculations presented in the business cases come from a set of well established, structured systems and processes.** ■ **Based on criteria developed by KPMG the systems and processes are considered to be appropriate to generate the cost and benefit information used to support the PR14 plan, and follow good practice. There are some areas for potential improvement.** ■ **There are some areas for potential improvement in individual business cases where the cases are not clear on how options are identified and selected. They have been brought to Anglian Water's attention and discussed in detail. It is understood that Anglian Water is intending to address these comments when providing further information to Ofwat.**
Overall approach to investment	■ Anglian Water's overall approach to investment management has been evaluated against criteria based on KPMG's views of what best practice would be for such systems, and which are consistent with Ofwat's risk-based review and general assessment of PR14 business plans. ■ Anglian Water has carried out extensive assurance on both systems and processes and the costs and benefits used in the plan. Anglian Water's approach to cost-benefit analysis has received favourable academic and peer review. ■ Six criteria were identified to test the systems and processes supporting Anglian Water's overall investment approach. The assessment scored high on four criteria (internal consistency, internal and external assurance, reliability an integration) and medium on two criteria (transparency and auditability). There are some areas where improvements could be made: – the clarity of supporting information, e.g. the documentation of how optimisation is carried out; – ability to track results from inputs, through assumptions, calculations and verification to outputs. ■ Overall the systems and processes are considered to be appropriate to generate the cost and benefit information used to support the PR14 plan.
Evaluation of specific business cases	■ A limited number of business cases covering enhancement have been reviewed. The following findings represent a view based on draft information to be supplied to Ofwat and the review will not be updated to consider final view of Anglian Water's revised PR14 plan. ■ There were areas for improvement identified in certain business cases. For example: – in some cases preferred options had negative rewards; in some cases the need for investment could have been better presented; it was difficult to determine why the preferred options had been chosen in some cases; it was not clear that the cost and benefit numbers presented in the business cases came from a robust and consistent set of company-wide systems and processes. – the business cases could be improved by addressing these points. These issues were drawn to Anglian Water's attention and Anglian Water's response is summarised in slides 27 and 28 ■ The identification of options that are directly related to business need, the costs of each option and the analysis to select the preferred option using cost-benefit analysis are all derived from the overall investment management system and follow good practice.

2 Investment procedures and governance

Decision making framework for asset management



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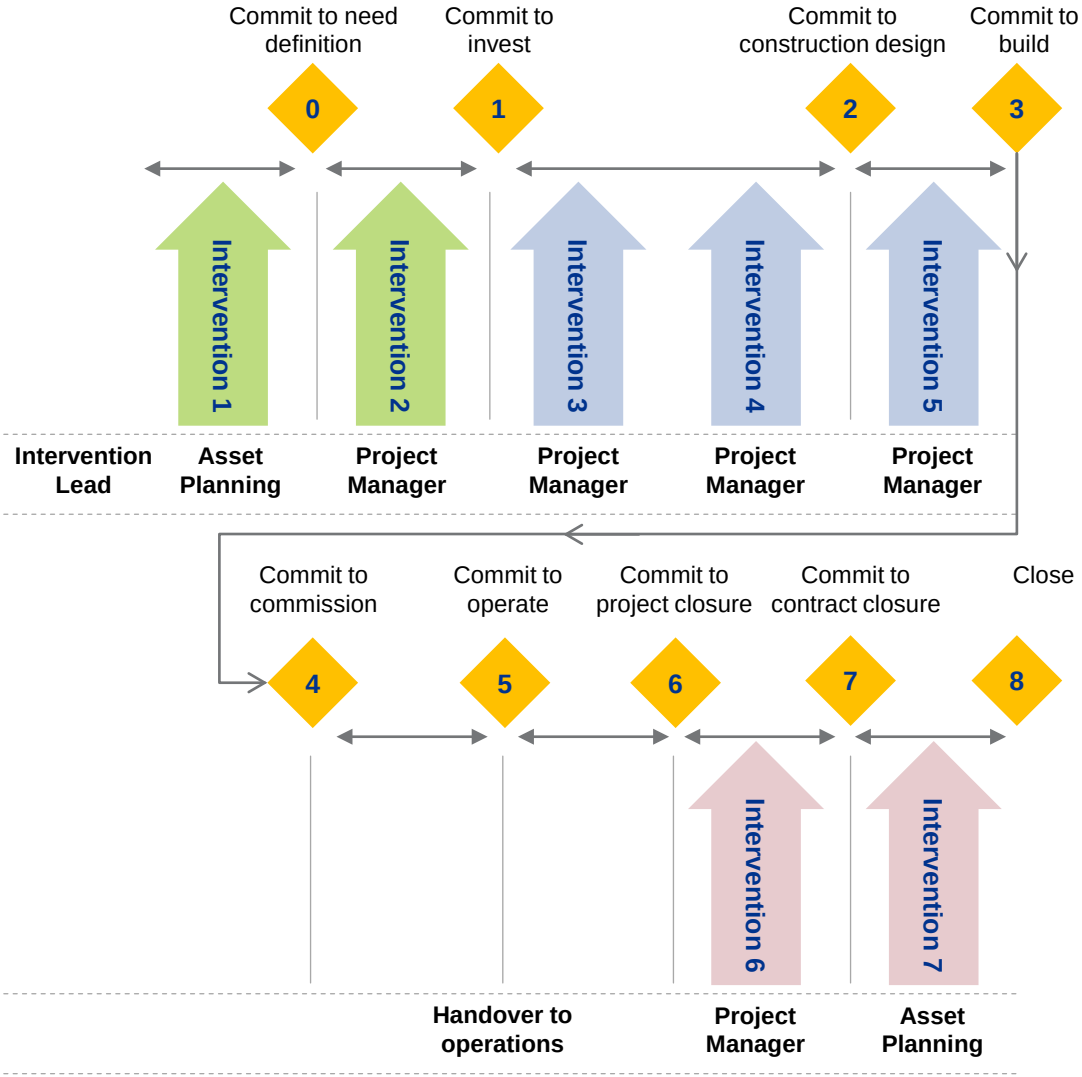
Governance and delivery of asset and investment management

- The diagram shows a simplified version of the 'business as usual' decision making and governance framework for delivery of Anglian Water's asset management approach. It is intended to provide a robust process and a robust level of challenge to the investment process and management of expenditure. Anglian Water aimed to ensure there is a high level of scrutiny and assurance at all stages of delivery.
- For instance, there was a clear separation of the roles of the different decision makers, and the decision makers are independent of the planning teams.
- All the processes shown in the diagram (except Board governance) are subject to certification by ISO55000 and PAS 55. PAS55 is a Standard from the BSI that covers the specification for the optimised management of physical assets.
  - **Anglian Water achieved PAS 55 certification in March 2011 after assessment by Lloyd's Register.**
- An International standard on asset management, ISO 55001, has now been introduced. ISO 55001 specifies the requirements for the establishment, implementation, maintenance and improvement of an asset management system.
  - **Anglian Water achieved ISO 55001 certification for its asset management procedures in January 2014.**

Same systems and procedures used for PR14

- Anglian Water uses the same governance framework for its asset management approach and the development of the PR14 business plan.
  - **This gives confidence that the PR14 options and costs have been subjected to high levels of scrutiny.**
- Notably, the principle systems and processes used to manage delivery of investments, known collectively as **"Asset Plus"** are also used to identify the business needs and costed solutions that make up the investment plans in the totex forecasts contained in the PR14 business plan.
  - **The Risk and Value process, described on slide 8, is Anglian Water's structured approach to risk and value for delivery of projects that is used for 'b.a.u' and price reviews. The starting point for the PR14 work is PR09 actual costs using a detailed bottom up modelling process.**

Decision making framework - Risk & Value approach



Source: KPMG analysis of information supplied by AWS

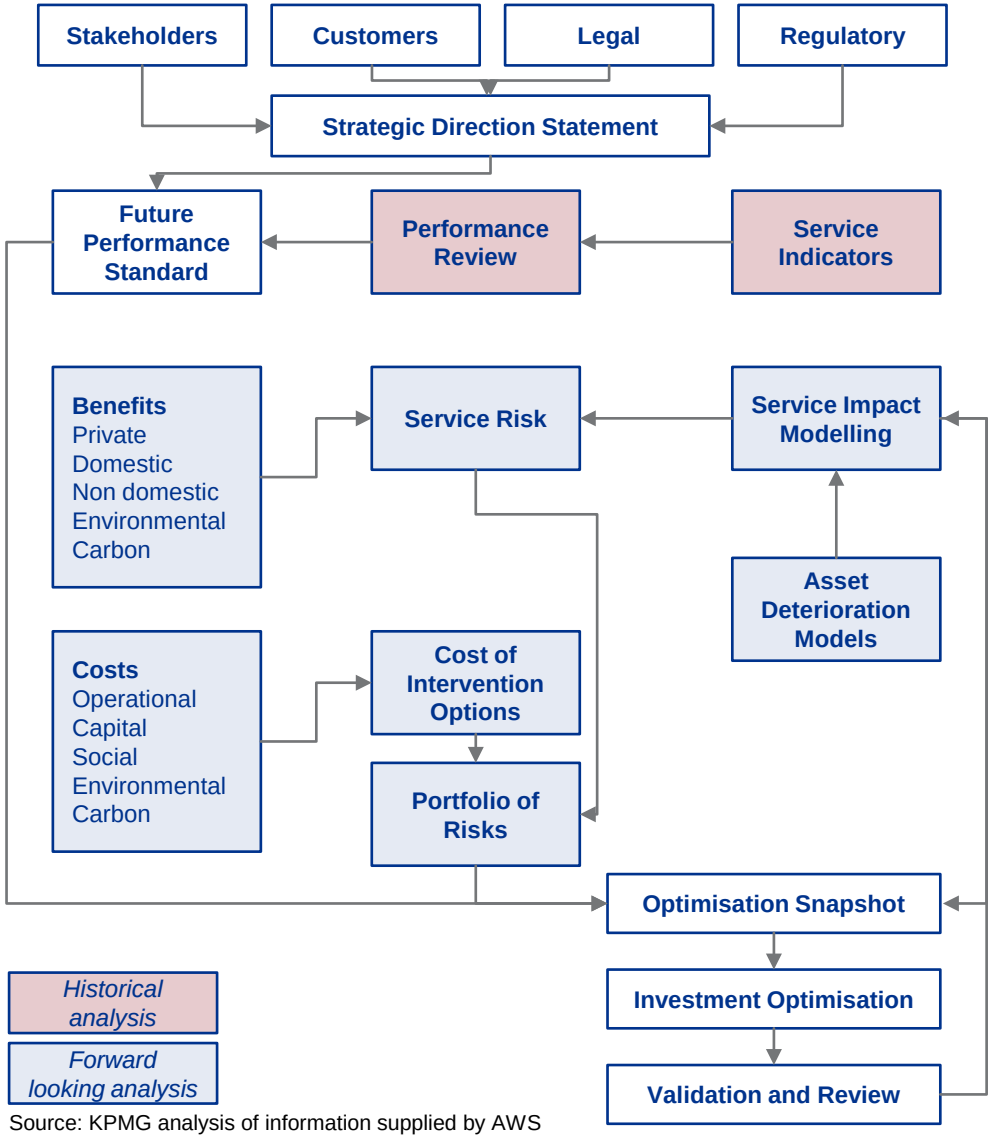
Tools and processes for managing investment decisions

- "Risk & Value" is Anglian Water's structured approach to risk and value for delivery of projects that is used for business as usual and price reviews.
- The purpose of the approach is to turn risks into economic values, using business impact matrices.
- This tool was developed 8-10 years ago as a response to efficiency challenges. The audience is internal – asset planning, operations, delivery, scientists and engineers etc, rather than external stakeholders.

Same systems and procedures used for PR14

- The Risk and Value approach is broken down into individual steps throughout the process of delivering a project, with gateways at major points. Challenges (called interventions) are applied before each gateway.
  - **These features all indicate a high level of standardisation and consistency of approach.**
- It is the same approach used in Anglian Water's Investment Manager tool, and it ties to the business impact matrices in Asset Plus (which sets the baseline for the service assessments for all projects).
  - **These two points indicate a high degree of consistency in the treatment of risk and value across the company.**
- One hundred staff are trained to use this approach; there are around 50 staff actively facilitating the approach and 400-500 Risk & Value sessions are held each year. Anglian Water has stated that its intention was that Risk and Value also create a cultural shift to put risk management at the centre of the business.
  - **The level of training and facilitation gives a high degree of confidence that the tools used to prepare cost forecast for PR14 are actively used in Anglian Water's investment decision making.**
- Risk & Value aims to assists the business to plan and deliver at best value as, among other outcomes, outturn costs from projects in one AMP are used to set cost estimates for the next AMP.
  - **This has the effect that efficiency gains and experience derived from one AMP are automatically embedded in the next AMP as the starting cost base.**

Anglian Water's approach to deriving investment in PR14



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The "Asset Plus" systems

- **Asset Plus is the source of the options, costs and benefits that are considered in Anglian Water's detailed business cases and that feed into the totex cost forecasts in Anglian Water's PR14 business plan**.
- Asset Plus is an integrated collection of systems and processes. The flow diagram shows a simplified version of the inputs and outputs of the set of systems.
- Anglian Water uses this approach for its "business as usual" activities including investment delivery during the life of the price control, not just preparing costs for inclusion of PR14.
- The aim is to have the systems populated with cost estimates that are independent of Anglian Water's investment planners and engineers, and Anglian Water's suppliers.

Historical analysis

- Anglian Water uses a range of historical measures to inform a future performance standard. These include results from its existing service indicators, a performance review, and an expenditure review, covering water, wastewater, infra-structure and non-infrastructure spending.

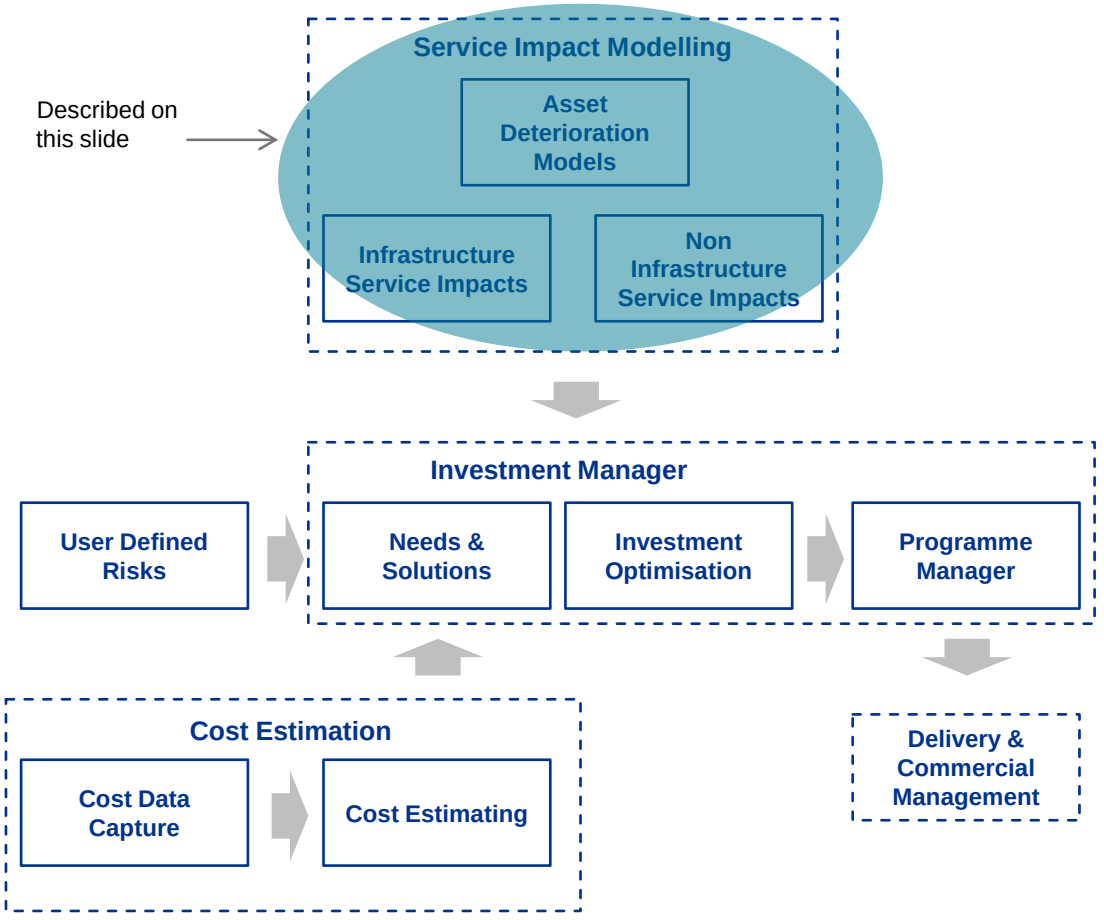
Forward looking analysis

- **Service impact modelling** uses asset deterioration models to identify the probability of service failures.
- **A benefits valuation system** values the impact of a service failure and produces a risk based on likelihood multiplied by impact.
- **Forward looking cost models** derived from historical data predict the costs of solutions
- **Portfolios of risks** are created that look at the incremental gain from the investment (post-investment risk may not be zero).
- **An investment optimisation function** is used to select the options with the highest CBA results. This is the function that is choosing investments, rather than the analysis in the detailed business cases.
- Each of these systems is examined in more detail in the following slides. The individual components of the approach are evaluated in Section 3 and an evaluation against formal criteria is presented in Section 4.
    - **The overall approach is well-designed, well integrated and subject to many quality checks.**

3 Identification of business needs, costs, benefits and optimisation

Components of Asset Plus - Service Impact Modelling (1/2)

The main components of Asset Plus – Service Impact Modelling



Source: KPMG analysis of information supplied by AWS

Modelling the deterioration of assets and the business impact

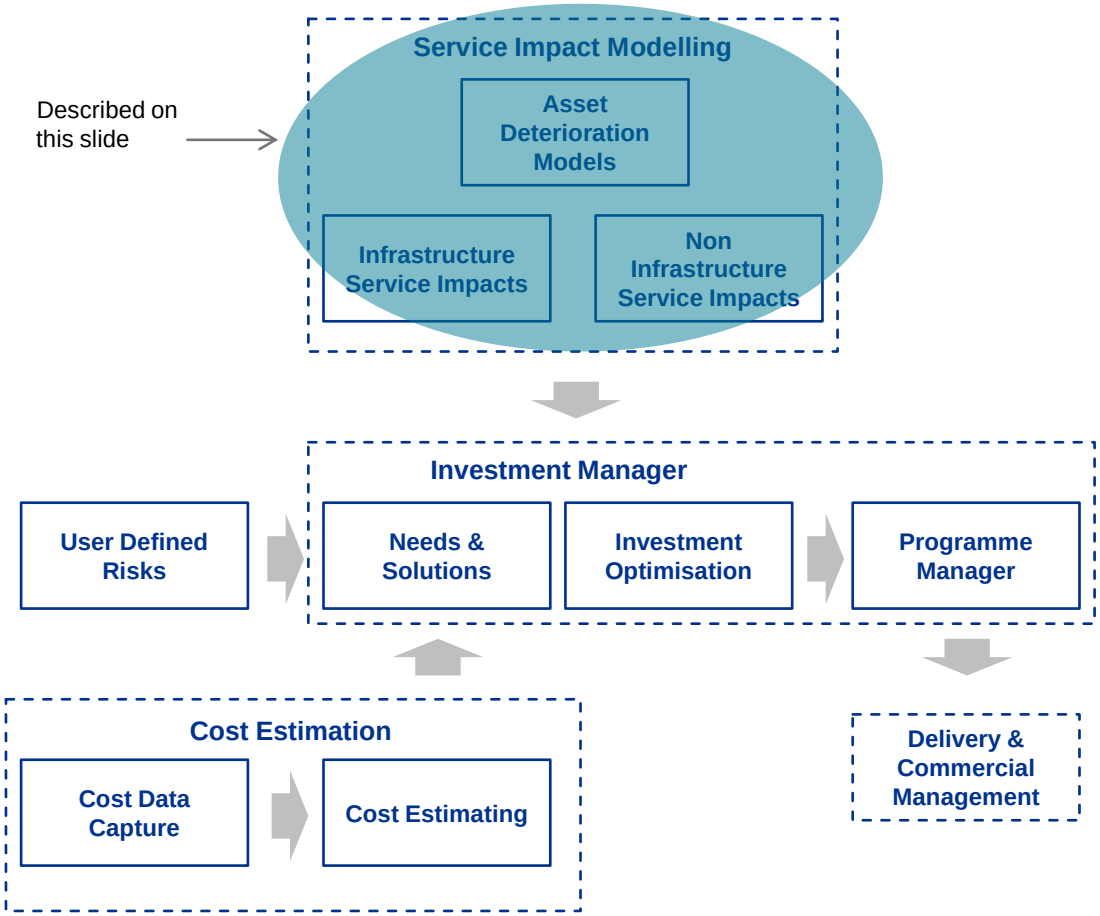
- Anglian Water's Service Impact Models (SIMs) are used to assess the level of capital maintenance required for assets. A consistent approach to modelling service impacts is used for both infrastructure and non-infrastructure assets, using the same service measures.
- Anglian Water's asset planning models are used for both business as usual and price reviews. Hartlepool is covered by the same systems.
- The SIMs are designed to model the likelihood of service failure (rather than just component or process failure) and the consequences. This generates "needs" for which solutions are developed.
    - **There is good evidence that Anglian Water's systems are designed to identify genuine business needs rather than just problems that have no material business impact.**

Infrastructure assets

- Non-infrastructure assets are modelled at component level and infrastructure assets are modelled at pipe level: sewers are broken into lengths of pipe between manholes (c.60m length on average), and water pipes are as per Anglian Water's Geographic Information System (GIS).
- There are around 1.3m infrastructure assets with data supplied from GIS and national data sets (e.g. soil, weather). **Data has been matched up to 2011 based on 9 years of data for bursts and 8 for most other failures. Data on infrastructure assets is validated by GIS updates from the field.**
    - **The length of the data series will help to ensure valid relationships in the service impact models**
- Engineering challenges were used to screen out counterintuitive results in the SIMs, e.g. an anomalous correlation between elevation and blockage and water temperature being excluded as it did not create statistically significant results.
    - **This gives confidence that suitable variables have been included in the models.**
- For PR14 a number of improvements in the infrastructure SIM have been introduced.
    - **Regular updated of models will help to produce reliable cost estimates.**

Components of Asset Plus - Service Impact Modelling (2/2)

The main components of Asset Plus – Service Impact Modelling



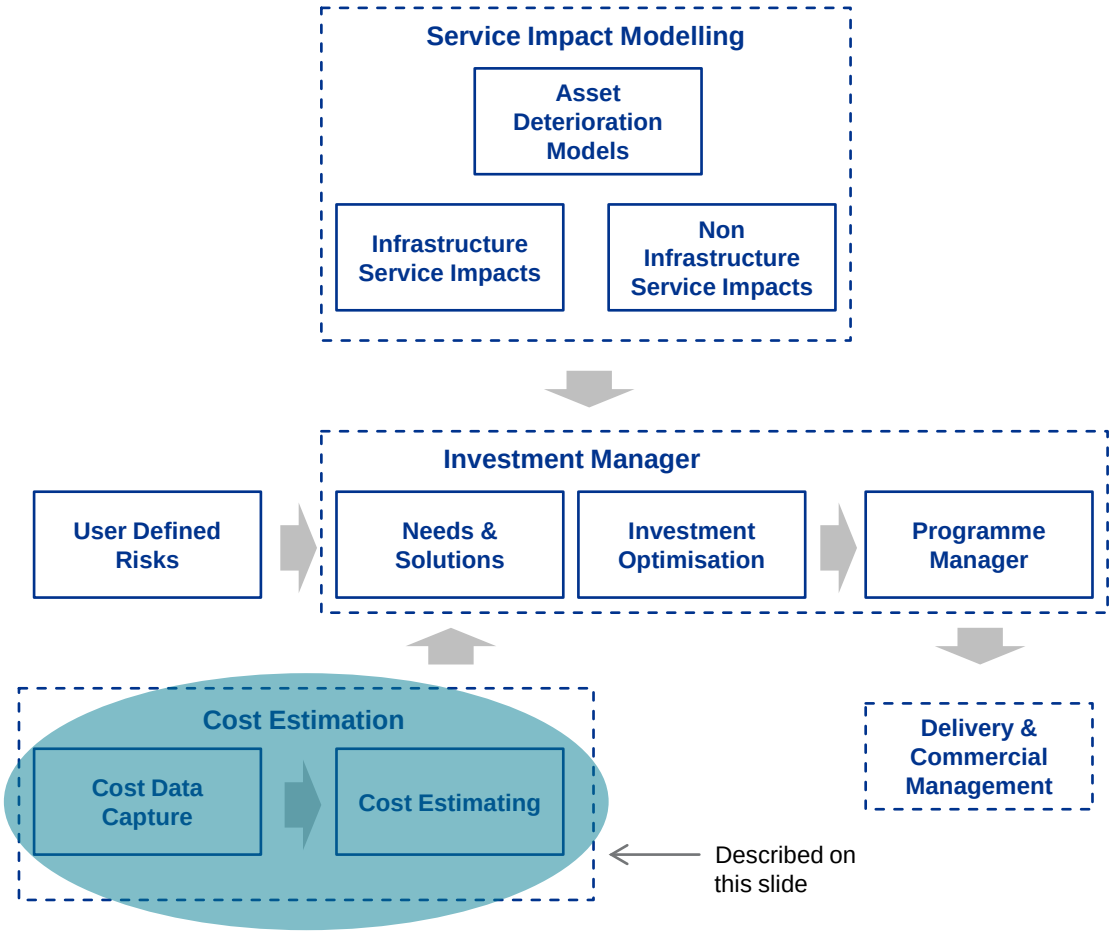
Source: KPMG analysis of information supplied by AWS

Non-infrastructure assets

- There are around 250k non-infrastructure assets. Only operational assets are modelled. Every Anglian Water site has a unique model with up to some thousands of individual components, e.g. pumps. There are around 6,000 models and sites. The level at which assets are set in the SIMs is the same as used in the asset register (e.g. pump, motor, gearbox level). Around 600 apply to water and the rest are wastewater.
- For each asset, data from the SAP systems on failure is used, supplemented by historic data and expert knowledge. When assets are replaced, SAP and models are updated either manually or automatically. Deterministic models are used to carry out simulations on each site to estimate process failures and, in turn, service failures.
- The system is designed so that only a service failure triggers a need for action, not more minor operating or component failures.
    - **This is evidence that failures that will impact customers are being prioritised.**
- Failure rates predicted by the models have been tested against actual failure data from PR09. The two sets of results are broadly aligned (this process of testing arose from internal audit challenges).
    - **These activities provide validation of the models and evidence of quality review and process auditing.**
- When entering new data into the SIM, the actual components need to be selected – components not present are omitted.
    - **This improves the reliability of the models by ensuring irrelevant data is excluded.**
- Monte Carlo is used to build up estimates of failures per year. Once component and process failures have been assessed, service failure probabilities can be assessed based on scenarios plugged into the model.
- For wastewater treatment works the process is more complex because the model needs to be calibrated before it is run to check the quality of each process. Groundwater and surface water options have been separated to reflect the different characteristics of the two water sources.
- **Different service characteristics have purpose-built models.**

Components of Asset Plus - Cost estimation (1/2)

The main components of Asset Plus – Cost estimation



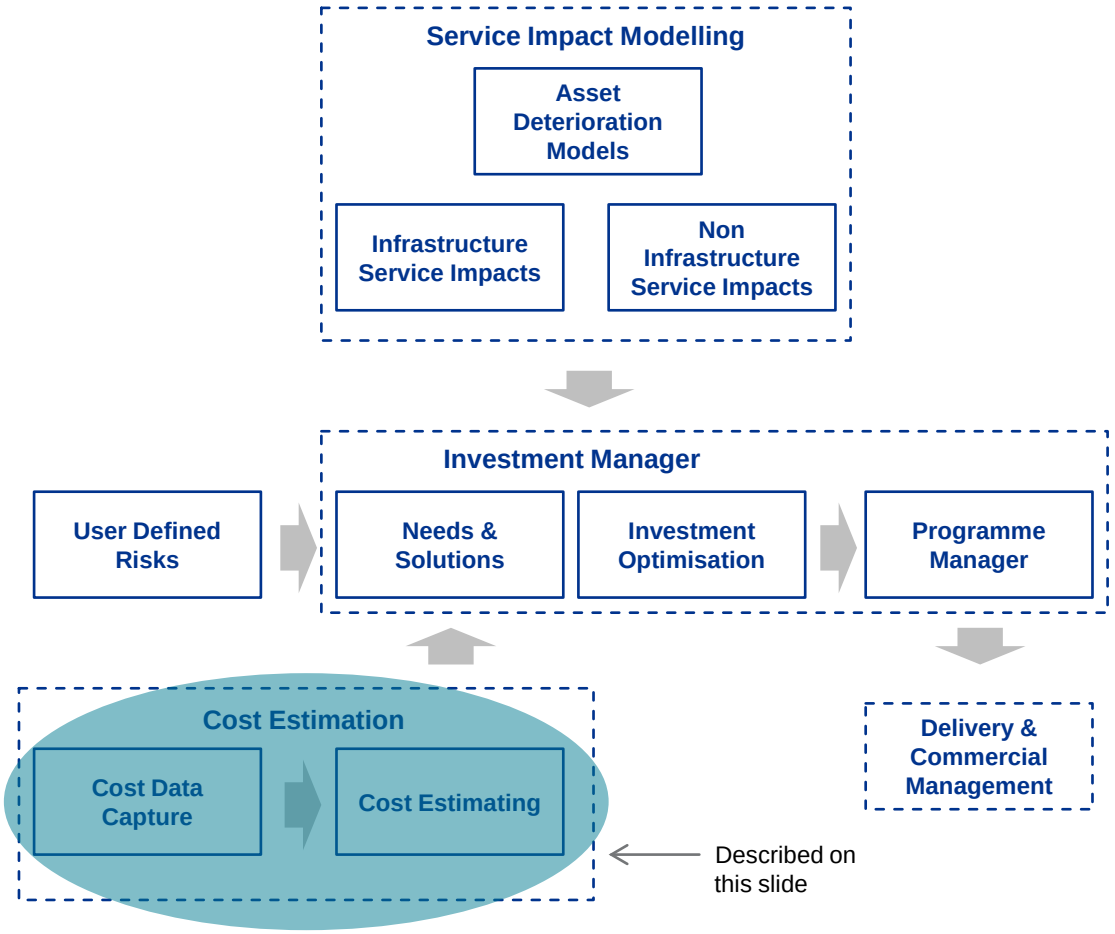
Source: KPMG analysis of information supplied by AWS

Overall approach to cost data capture and cost estimation

- Anglian Water has a structured, documented process for cost estimation that features solution capex templates, capex models, capex data capture and an opex unit cost template. The system is bespoke to Anglian Water, which will allow improved ability to tailor solutions to Anglian Water's needs.
- The overall costing approach includes reporting and validation processes as well as a range of external inputs (such as data and specialist studies) and internal tools and processes (such as statistical tools, data analysis and cost models).
- **The cost estimation process sits within an overall investment cycle process for business as usual and price reviews that covers the whole Anglian Water portfolio (both capital maintenance and enhancement).**
- Asset Plus cost capture is the main tool that captures costs. The data used in Asset Plus, whether internal or from partners, is quality checked. The costs for most solutions in Asset Plus are auto-generated. For PR14 there were around 200,000 auto-generated standard solutions. Around 4,300 solutions for AMP6 have been manually generated, to meet around 2,000 needs which are not generated automatically for SIMs. **Coverage is comprehensive.**
- **Capex solution templates** take into account material project information (location, scheme type and assets involved) including any project complexities, and solution costs then reflect asset costs as well as on costs and any adjustments for complexity. **This allows for a standard approach to estimating costs but also reflects specific project complexities.**
- **Cost models** within Asset Plus are created using a capex modelling process that moves from the cost capture system to the selection of model attributes to analysis of statistical relationships to results and approval of final model. New cost models are created every five years (updated based on actual costs during the previous AMP). For AMP6, most of the cost data is therefore from AMP5.
  - **Regular and systematic updating of the cost models will aid in producing the most robust cost estimates.**
- **Capex data is captured** through a structured process and stored in water and wastewater cost libraries. There are nine main sources of data (a mix of internal and external) that provide outturn prices for data entry. Data collected is subjected to several layers of review and validation before it is included in the models.
  - **There is good evidence of systematic data capture and data validation before a cost model is updated to reflect new data**

Components of Asset Plus - Cost estimation (2/2)

The main components of Asset Plus – Cost estimation



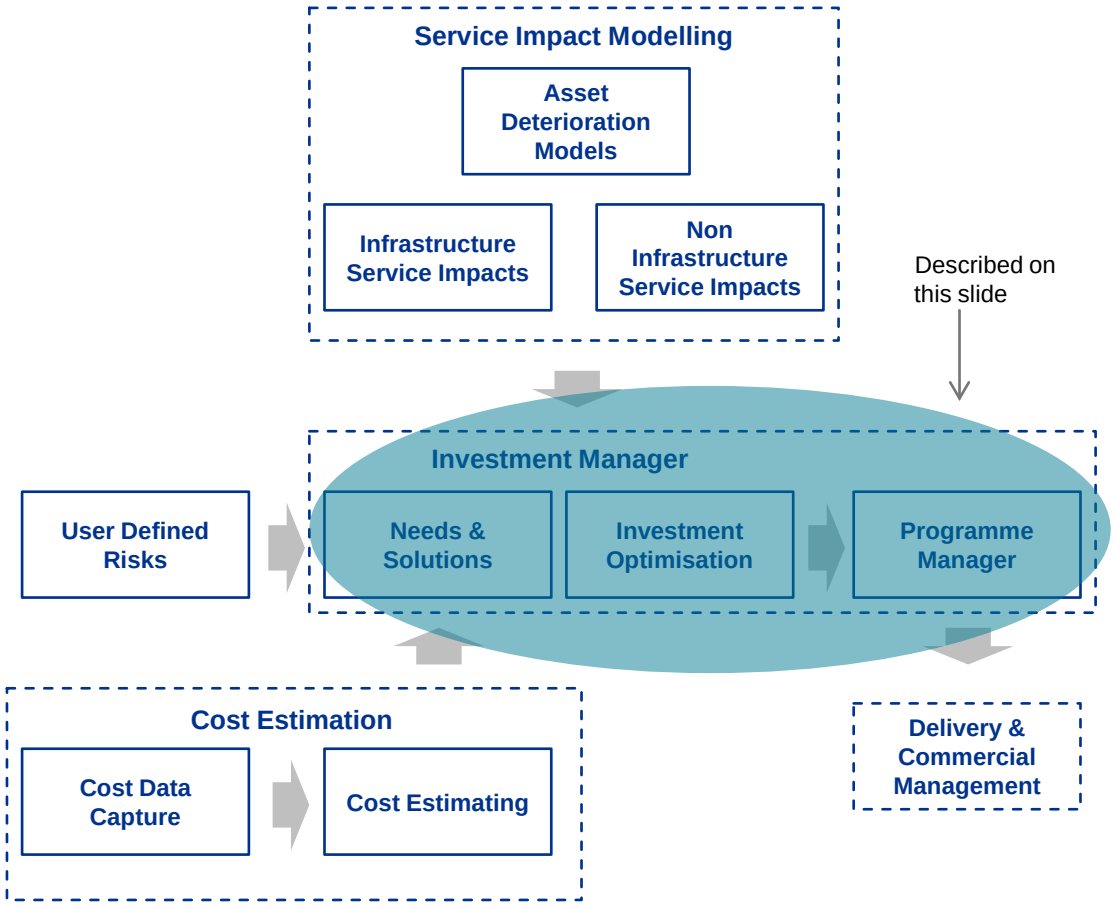
Source: KPMG analysis of information supplied by AWS

Cost model build in detail – capex and opex

- Cost models are created for each asset, e.g. a pump. The price base, inflation etc can be set in the model. Costs input into the model from the cost capture system are mapped on a chart to check for outliers, which can be manually excluded (an audit trail is kept). The model seeks correlations between the cost of the asset and its attributes e.g. kilowatts for a pump. The system suggests the best model and can compare against other models and also consider other factors.
- **As part of the quality assurance process, the person who creates a cost model cannot approve it and clear it for use – it must be a separate person who checks and releases it before it is added to the cost library.**
  - **Separation of these roles is evidence of good governance procedures**
- Once a cost model is created, new data points for it can be compared from examining projects run by external or internal suppliers, based on their costs as inputs. The project is reviewed by the Costs Base Team, which checks whether the cost ties back to results recorded in SAP. The project's assets are compared against expected costs based on the cost models. There is a repeated cycle of challenges on costs until the Costs Team is satisfied that the new costs are as expected, before including the additional data points in the cost models.
- Costs are locked down for a five-year period. Almost all projects can be modelled with Anglian Water's standard cost models, though there are some minor exceptions which are done on separate cost models. There is a strong preference for there to be no manual cost entry.
  - **There is good evidence of a rigorous approach to developing and maintaining the cost models.**
- Manual changes are made for operating costs (e.g. eel screens, which can contribute to increased or decreased opex). Base opex unit costs such as for labour and chemicals are input into the cost system by the Finance and Costs Base teams. Opex above base costs is entered by process block by the user, using operational knowledge: for example, the user estimates extra labour hours for additional maintenance, and opex costs for more chemicals.
  - **A random spot check demonstrated that the cost estimates maintained in the live systems are identical to the whole life and AMP 6 costs presented in the business cases**

Components of Asset Plus - Investment Manager

The main components of Asset Plus – Investment optimisation

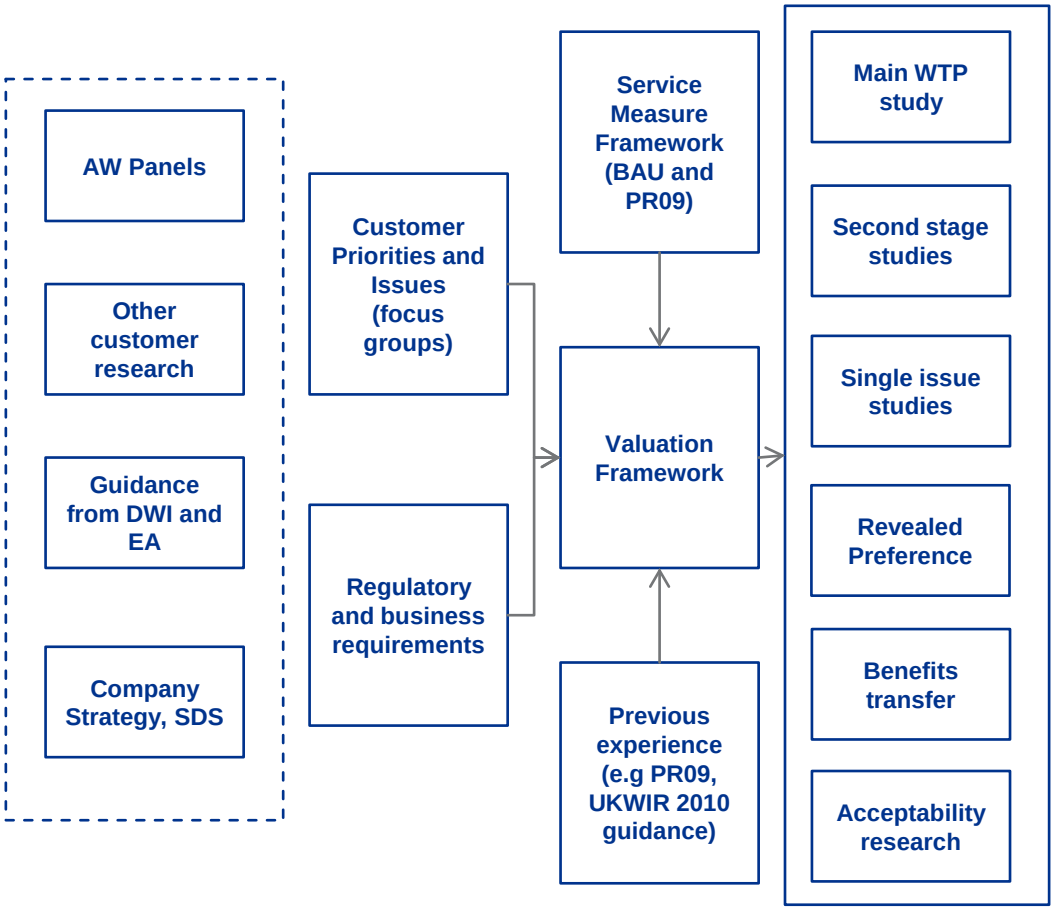


Source: KPMG analysis of information supplied by AWS

Optimising investments to meet business needs

- Anglian Water's Investment Manager (IM) uses inputs from the cost estimation systems and the SIMs to manage investments using processes to identify needs and solutions, create an optimisation snapshot and then produce optimised investments, which are then subject to informed judgement to select an appropriate investment plan.
- The costs used in IM are derived from the costs developed by the cost models elsewhere in Asset Plus, taking into account level of usage per day and maintenance costs. **This provides confidence that Investment Manager uses a common set of cost data and that results are comparable with other systems and processes.**
- After cost data is entered into the system, the next step is to take the risk data (from the Service Impacts Models) and apply it to investments. Risk data creates a need, and solutions are then generated.
- Needs are expressed as expected service failure incidents and are then multiplied by social and private values. The system provides before and after values for failure incidents. Benefits and costs are attached to the solution options. Investment is optimised by looking for the most cost beneficial solutions.
- A need and a solution is only for one component in any particular scenario, therefore multiple needs must be combined into a snapshot. This approach is designed to maximise reward, but is balanced against minimum cost to ensure an appropriate investment.
- The system produces charts showing the investment costs for various solutions to achieve a range of levels of performance to address a need. Judgement is used to select the appropriate level of investment, taking into account Anglian Water's established investment principles. **This indicates that informed judgement is used to generate suitable investments.**
- There are some general rules that are followed for options to address a need: for example, concrete structures (e.g. buildings, tanks) are generally refurbished whereas mechanical and electrical assets are replaced.
    - **It was not clear from the initial description how options were identified, evaluate and narrowed down to the optimal solution. Clarification was sought on how and at what levels in the systems selection and optimisation of options occurs.**

Benefits valuations that are inputs to CBA



Source: KPMG analysis of information supplied by AWS

Approach to benefits valuation.

- Input from a wide range of sources is used to understand the importance and value of service to customers and stakeholders. The measures that allow customer values to be linked to asset investment are the Service Measure Framework.
- **These measures were designed so that customer groups understood the language being used as areas they valued** (e.g. “internal” and “external” sewer flooding were found to be not well understood.)
- This research was input into the design of the specific Willingness to Pay studies. WTP research was done in parallel with the qualitative approach.

Main Willingness to Pay Study

- The work was conducted by ICS, eftec and Accent Market Research, who carried out the field work. The work was supported by favourable academic peer review (Prof. Ken Willis, University of Newcastle.)
- The main study tested 12 attributes: unplanned 6-12 hour interruptions, persistent low water pressure, hosepipe bans, taste and odour of tap water, discoloured tap water, ‘boil water’ notices, sewer flooding inside and external to properties, nuisance from sewage treatment, pollution incidents, coastal water quality, river water quality.
- **Methodological issues explored included survey design, diminishing WTP, whether improvements were valued symmetrically to deteriorations, validity testing and sampling method.** Choice experiments were carried out to identify WTP and models derived the relationship between customers’ preferred service levels and WTP to pay in monetary terms.

Second stage studies

- Second stage studies scaled the relative severity of one service impact to another, e.g. A 3-6 hour interruption is less than half as bad as a 6-12 hour interruption.

Scaling

- Testing was carried out to determine whether an attribute is valued more highly on its own than when paying for a package of attributes. It is generally found that customers’ are willing to pay less for a package than the sum of the components. WTP values were scaled down accordingly.
  - **The WTP surveys are carefully designed and executed and so are likely to produce robust results, subject to the known limitations of WTP.**

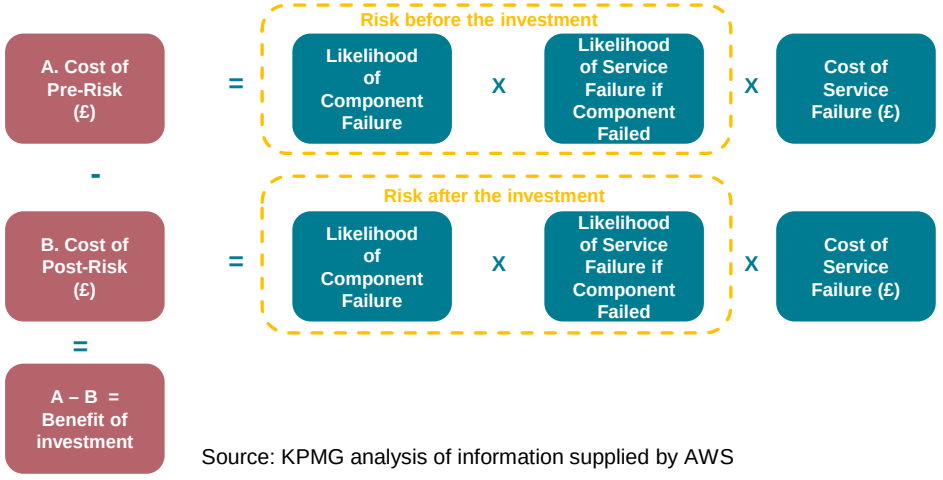
Comments on the use of CBA

Approach to cost benefit analysis

- Whilst Ofwat has not issued detailed guidance on cost benefit analysis, it has mentioned an expectation for water companies to refer to sources that discuss good practice, such as UKWIR's review of cost benefit analysis following PR09.
- There are also other sources of guidance on cost benefit analysis, including HMT Green Book and Ofgem's Strategy Decision for RIIO-ED1. The Competition Commission has also issued guidance on the design and presentation of customer surveys and willingness to pay.
- These sources have been referred to in order to identify approaches that might be considered good practice. Key points are noted within the following comments.

Investment Manager software

- Cost benefit analysis (CBA) is developed in Investment Manager (IM) software.
- IM supports producing the most cost beneficial plan taking into account obligations, requirements and other constraints (e.g. deliverability, affordability).
  - **This is in line with what could be considered good practice in terms of Anglian Water owning the CBA process (as opposed to contractors), and integrating the planning and valuation processes, as cited in UKWIR's review.**



Source: KPMG analysis of information supplied by AWS

Costs and investment needs

- Costs include whole life capital, maintenance and operating costs and the expected operating cost savings and increase / decrease in income. Whole life costs are expressed in present value terms and typically over a 40 year period. Financial costs are discounted using the WACC to give the equivalent annualised costs (EAC).
  - **Anglian Water's consistent approach to investment management and cost estimation conforms to UKWIR's definition of good practice around use of "scientific information" about investment needs and impacts.**

Benefits

- Benefits are the non-financial impacts covering customer and environmental impacts. Benefits are estimated based on the change of service risk (cost of event before the investment less cost of event after the investment). The benefit period needs to align with the cost period. Therefore, benefits are considered over 40 years.
- IM calculates the value of the pre-risk and post-risk position, and the difference between the two is the calculated benefit. Benefits are discounted and annualised using the Social Time Preference Rate, which gives the equivalent annualised net benefit (EAB).
  - **This is consistent with good practice around using costs to consumers rather than the company, as cited in Ofgem's approach to RIIO-ED1.**

CBA calculation

- The preferred option is chosen based on an objective function: maximise EAB less EAC, subject to meeting constraints. Both EAB and reward figures are presented in the business cases for the preferred option.
- A spot check on the benefit calculation was conducted and it could be seen that the IM software generates the risks both before and after the investment, and the costs and benefits seen in the business cases.
  - **This is evidence of internal consistency in the CBA process.**

Application of CBA results

- Anglian Water has applied management judgement to the outcomes of the CBA. For example, many small schemes were suggested by IM because of high benefits for avoiding service interruption. These were filtered by focusing only on the high risk / high impact cases.
  - **This is consistent with UKWIR's recommendation that CBA should be a decision support tool, not a decision-making tool.**

Clarification questions on optimisation (1/2)

- It was not sufficiently clear from the description of the Investment Manager system how optimisation of options and costs was carried out, and what the role of the business cases was in this process. Comments to this effect were raised both by Ofwat's risk-based review tests and by the independent analysis of the business cases.
- Further clarification was sought on these points via additional questions to Anglian Water. Responses are shown below.
- The clarifications show that the auditability of the approach is good, but some aspects of the documentation an supporting information could be clearer. This is reflected in the rating of 'medium' given to auditability and transparency in the overall evaluation of the systems and process (see section 4 below).
    - **The additional responses give confidence that appropriate options are being identified, that preferred options are selected by appropriate criteria and that a consistent approach is being taken across all business cases to the identification of the preferred options. It is noted in section 7 that this is not readily apparent from the way the business cases were presented.**

Further questions on optimisation	Anglian Water Replies
Explain clearly and in detail (with examples if possible) the different levels at which optimisation is carried out (e.g. needs, solutions, snapshot service and portfolio)	■ All optimisation for the cases in the PR14 plan occurs in investment Manager. The same process is used for preparing the Water Resource Management plan. Anglian Water used Investment Manager for the final optimisation and also a purpose built tool specifically for the WRMP as this has a separate set of criteria specified by the EA. ■ For these purposes a need is the same as a risk, i.e. a monetised value that takes into account the likelihood and impact of a particular adverse event occurring. All risks and options (solutions) to address them are loaded into Investment Manger, and this system enables Anglian Water to chose the best portfolio of solutions. ■ The main optimisation function is to look for the portfolio of solutions that have the best positive results from the cost benefit analysis.
How do you create a snapshot?	■ A service links to a need such as a pollution incident. The service interruption comes first and has private (company) and social costs attached to it, in order to identify the need. ■ A snapshot is a group of needs that can be optimised in order to identify the best solutions. For example, for DG5 sewer flooding each property has a need. A solution could be examining how to address the needs represented by maybe 200 properties. A snapshot would include all risks of sewer flooding. ■ A scenario is run on a snapshot and may apply constraints. There are a range of possible constraints such as capital, outputs, risks. The portfolio is the output from the optimisation engine that meets all the given constraints. The portfolio also profiles the solutions over time for 5 years using the constraints, to give a time-based projection of the costs of the solution.
Is the optimisation method identical in every case?	■ In general it is all the same process. Needs and solutions are run on an unconstrained basis first. Usually this is all that is needed. In some cases this may result in large amounts of investment, e.g. lots of small schemes with high benefits but low costs rise to the top of the optimisation, but it produces too much investment to be affordable. There is a process of sense checking the optimisations with managers. ■ Where necessary constraints are imposed to get the best portfolio for the capital that is affordable. The constraints can be run as "what if" options to identify possible portfolios.

Clarification questions on optimisation (2/2)

Further questions on optimisation	Anglian Water replies
Does the process of optimisation differ between normal needs and needs driven by statutory obligations e.g. WFD?	■ The aim is to try to use the same process. There is a need (in most cases a set of needs) for every line in the Business Plan. There are some "must dos" driven by the DWI, EA, Natural England and the Security and Emergency Directive from DEFRA. ■ All needs of this type have costs and benefits attached to them. Even if the need is a must do, Anglian Water must still choose the best option to meet the need. In these cases, the optimisation is to choose the solution that gives the best result in the CBA analysis (or gives the least negative CBA result, if no positive CBA solutions are available).
How are the appropriate variables for optimisation chosen (i.e. why is it need A, B and C not D, E and F?)	■ In most cases, all needs for a given investment category are loaded into IM. These can be filtered to identify schemes that are expected but do not appear or the converse. There is a validation process via the engineers and operations managers to test that a sensible result has been found. ■ There are some exceptions to beginning with all identified needs. For example using all the needs from water mains would produce c.600k needs, which is impracticable to try to optimise. In these cases the needs are filtered by concentrating on the high probability and high impact needs.
How are credible ranges set in the benefits valuation model (i.e. on credible performance that might obtain during the AMP)?	■ Historical performance data on serviceability is provided to the market research companies who are running the Willingness to Pay (WTP) surveys. This data is used to make sure that realistic possibilities for service failure or enhancement are put to people being surveyed, so the changes they are considering are plausible given today's level of performance on service. ■ Once the WTP data is collected via the surveys, economic methods are applied to generate statistically valid WTP ranges. ■ Scaling is applied in the process for creating the benefits values used in the modelling. Scaling means that customers will identify a certain willingness to pay to avoid a particular service issue (odour, flooding etc). But when asked to assess many issues together, the stated WTP for the collective issues is lower than the sum of the individual issues. Benefits are scaled down to allow for this before being made available in IM.
What additional factors or considerations are used to select a preferred option when it differs from the optimised option identified by Investment Manager	■ The aim is always to select the most cost-beneficial option. But it may be that some "optimal" solutions are not technically feasible, or cannot be delivered in time (e.g. the lead time to build a pipeline may be 1 ½ years but there is only a year within which to meet the obligation). ■ There are also "pace of change" and affordability factors that can be applied, that would alter the preferred option identified by Investment Manager. Anglian Water may also chose to spread a solution over a longer time than Investment Manager identifies in order to manage the level of spend.
What is the relationship between optimisation, cost benefit analysis and the selection of preferred options in the business cases?	■ In the business cases the preparers will normally articulate the need correctly. Some of the business cases have discussions of options but then progress straight to a presentation of the preferred option. This is because the optimisation that results in the preferred option happens in the Investment Manager process. ■ The business case is where the options, costs and CBA results are all presented together. The financial analysis page in the business cases is a summary of the data that is in Investment Manager. This page later becomes the start of the delivery process as it becomes part of the project initiation document once it moves into delivery.

4 Evaluation of top level systems and processes

Investment approach evaluation – overview

Anglian Water's approach to investment (capital maintenance and enhancement) has been evaluated using criteria developed specifically for price review business plans – there is no authoritative external reference point for such systems.

These criteria have been created to be as consistent as possible with Ofwat's PR14 methodology, risk-based review tests and approach to evaluating investment for AMP6.

This allows the evaluations to be relevant, targeted and proportionate and to cover the key dimensions of Anglian Water's investment plan.

The evaluations are designed to show the degree to which each criterion is met based on KMPG's observations.

In order to evaluate Anglian Water's overall approach to investment, criteria have been developed to address each aspect of the systems and processes that have been used to create Anglian Water's PR14 business plan. These criteria complement and are consistent with Ofwat's approach to evaluating PR14 investment proposals.

- In most cases the investment systems and processes, and the tools associated with them, such as models and data sources, are used for both price review purposes and business as usual. This has allowed Anglian Water to accrue improvements and benefits from business as usual activities to price review business planning, and vice versa.
- The following criteria have been used, with definitions provided in the assessments that follow: Transparency, Internal consistency, Assurance – internal and external, Auditability, Reliability and Integration.
- These criteria have been developed by drawing on experience and expertise across a range of sectors, services and analytical frameworks, taking into account what has been observed of approaches taken by UK water companies and by regulators other than Ofwat. They have been adapted and developed to be specific to water and to be appropriate for making an assessment of investment systems and processes in a price review business plan.
- The use of specially-developed criteria allows the evaluation to be relevant, targeted and proportionate and to cover the key dimensions of Anglian Water's investment plan, including evaluation of the need for investment, risks, estimation of values (of costs and benefits) and cost-benefit analysis, business impact, stakeholder input and investment planning.
- In applying the criteria, an evaluation for each criterion is provided. Each criterion is defined with a number of components. The evaluations are based on observations for each separate component, but combined into a single evaluation for each criterion.
- The purpose of the evaluations is to indicate the extent to which observed evidence supports the satisfaction of each criterion.
- The evaluations thus reflect the degree to which each criterion has been met based on observations of supporting evidence. The evaluations are therefore not scores against a quality standard. Where an evaluation is less than High, it reflects the amount of supporting material observed, rather than the absolute strength of the underlying systems and processes. A strong, robust set of systems and processes may be rated higher by the provision of more supporting material – but it is not the purpose of this report to provide an evaluation of the final state of Anglian Water's revised business plan, so no revised evaluations will be provided. Rather, areas rated less than 'high' are flags for Anglian Water to consider whether it wishes to include further supporting material.

Assessment	Explanation
High	The criterion is met to a high degree because strong/multiple pieces of evidence have been provided satisfying each element of the definition for that criterion.
Medium	The criterion is met to a moderate degree because evidence has been provided satisfying most elements of the definition for that criterion.
Low	The criterion is met to a low degree because weak evidence or no evidence has been provided for all or most elements of the definition for that criterion.

Investment approach evaluation – summary

- The table below summarises the assessments and high-level observations on Anglian Water's investment approach. Further detailed observations on the individual elements of the definition of each criterion are provided in Appendix 2. **Based on this evaluation the costs, benefits and CBA calculations presented in the business cases come from a set of well established, structured systems and processes. The systems and processes are considered to be appropriate to generate the cost and benefit information used to support the PR14 plan, and to follow good practice**.

Criteria	Definition	Assessment	Observations
Transparency	1. The inputs, workings and outputs of all systems and processes can be examined individually 2. There are no "black boxes" or hidden workings or concealed data sources 3. It is clear at all stages whether automatic or manual processes have been applied and whether data has originated from internal or external sources 4. There is adequate documentation of how systems and processes work and how they were developed	Medium	There is a structured, documented process for each of the main sets of systems and processes in Anglian Water's investment approach. At key stages in most systems it is clear whether processes are manual or automated and what the sources of data are. Examples have been seen that demonstrate that costs and benefits in business cases can be traced back to the live investment system and the results matched. There is a slightly less transparent approach to the application of judgement to finalise investment decisions.
Internal consistency	1. All systems and processes use a common set of data 2. End results can be compared on a like for like basis or adjusted to be comparable using a transparent basis 3. Systems and processes use standard procedures 4. Users are adequately trained to use systems, processes and models	High	All main models and systems use a common set of data from SAP. The approaches and processes used across similar parts of the business are consistent and standard procedures are used in most models except for a small number of exceptions which are designed to cater for non-standard requirements. There are trained, designated users for key systems.
Assurance – internal and external	1. Appropriate assurance has been carried out on material systems and processes by suitably qualified internal and/or external personnel 2. External providers of inputs or processes have been quality assured 3. Deficiencies have been logged and addressed and improvements have been implemented	High	Internal and external assurance has been carried out on material systems as documented in Appendix 3. This applies both the systems themselves and the cost and benefit data populating them. Improvements to various systems and processes have been documented and addressed, particularly between PR09 and PR14.
Auditability	1. It is possible to track back from a result through the processes to the original data sets 2. It is possible to examine at key stages who has made what changes and when (subject to materiality) 3. It is possible to revert to previous correct versions to unwind errors 4. Appropriate security systems are in place to prevent unauthorised access to systems and processes	Medium	The costs and benefits in a test business case were traced back to the original source data in the live Asset Plus system and the results matched. An audit trail of changes is maintained in Asset Plus and there is functionality to revert to previous versions. Safeguards are in place to prevent unauthorised access and to ensure inputs are correct. More documentation on how optimisation occurs and what the role of the business cases is would be beneficial.
Reliability	1. Systems and processes have been tested during development and use to ensure results are consistent over time and when compared with any relevant benchmarks 2. Models have been compared against actual results to test validity 3. Results have been tested against criteria to detect for bias/variation 4. The most appropriate sources of data have been used 5. The most appropriate models, processes and systems have been used in each case 6. Appropriate sensitivities have been carried out where material 7. Anomalies, variations and non-standard results have been investigated and explained	High	Various systems and processes have been tested over time by internal and external experts. Model results have been compared in numerous cases with actual data to confirm validity. Data sources and models/processes are well selected and documented to ensure accuracy and relevance. Some sensitivities are known to have been carried out – there could be clearer documentation of the optimisation and optioneering processes. Processes are in place to address anomalies in outputs.
Integration	1. Results from different systems and processes have been integrated in appropriate and valid ways, including stakeholder input where appropriate 2. Where judgement is required to produce an integrated result, judgement has been applied consistently with the objectives and limitations of the underlying systems and processes	High	The cost estimation process and Risk & Value sit within an overall investment cycle process for business as usual and price reviews that covers the whole Anglian Water portfolio. Anglian Water has a documented set of principles and governance arrangements for investment decision making, including a Strategy Idea Development Template for review of strategy proposals by the PR14 Strategy Steering Group.

Source: KPMG analysis

5 Comments on narratives – AMP 5 to AMP 6 movements

Comments on narratives – AMP 5 to AMP 6 movements

Movements from AMP 5 to AMP 6 - Water.

- The draft narratives identify the movements in totex for the broad categories of programmes between AMP 5 and AMP 6. The AMP 5 totex baseline for water is calculated by Anglian Water to be £1,701m. The AMP 6 business plan totex amount is calculated to be £1,773m, an increase of £72m.
- Anglian Water's analysis shows that the net changes in the broad categories, allowing for the net of increases and reductions, requires a total of c.£1,670m, a small reduction compared to AMP 5. Anglian Water's plan forecasts increases in ecological improvements and resilience in water of £c.100m, accounting for essentially all of the net increase.
- This is consistent with the water business cases Anglian Water provided. These business cases represent £97m of totex expenditure. The results of Ofwat's risk based review of these investment areas are shown in the table below. Ofwat's analysis has been used to inform its comments on the relevant business cases.

Movements from AMP 5 to AMP 6 - Wastewater.

- The AMP 5 totex baseline for waste water is calculated by Anglian Water to be £2,183m. The AMP 6 business plan totex amount is calculated to be £2,518m, an increase of £335m, close to Ofwat's risk-based review threshold of £2,504. KPMG was not asked to comment on sewerage business cases.

Water business cases			Ofwat risk- based review tests				
Investment area	Business case	£m totex in AMP 6	Need	Most cost-beneficial	Robust costs	Customer protection	Overall
Ecological improvements - RSA	200.04	£25m	Pass	Fail	Pass	Pass	Marginal fail
Ecological improvements - Eel regulations	300.06	£14m	Pass	Fail	Pass	Pass	Marginal fail
Ecological improvements - NEP investigations	300.11	£3m	Unknown	Unknown	Unknown	Unknown	Unknown
Resilience - Mains connectivity	100.03	£36m	Fail	Fail	Marginal fail	Pass	Fail
Resilience - Energy	100.13	£19m	Pass	Fail	Marginal fail	Fail	Marginal fail
Total		£97m					

Source: KPMG summary of information from AWS and Ofwat

6 Comments on narratives – additional information presented.

Comments on narratives – additional information presented

Additional Information

PRIVATE AND CONFIDENTIAL

General comments

- Originally Anglian Water's business plans were assessed in isolation, leading to comments about identification and choice of options, the use of CBA for optimising final choices and the presence of some negative CBA results in the business cases.
- Anglian Water has said that the business cases were intended to be read with the overall narrative, contained in Anglian Water's original business plan. Constraining the length of the business cases submitted was a choice about the balance between fully providing supporting information and keeping the overall volumes of supporting information readable. Anglian Water explained that identification and selection of options was carried out in its Asset Plus systems, not within the business cases themselves.
- Areas where the business cases could be improved were pointed out and Anglian Water's responses are given on below and on slide 28.
- The draft wholesale water and wholesale waste water narratives are intended to address the full range of feedback received from Ofwat, not just the areas for improvement identified in the business cases.
- The draft narratives could be made more helpful to readers by using numbering and other forms of signposting to show which areas of Ofwat feedback they are addressing.

Water business cases				Comments on Anglian Water's draft narratives		
Investment area	Business case	£m totex	CBA results	Anglian Water response to comments	Additional information in draft narratives	Anglian Water comments on changes AMP 5 to AMP 6
RSA	200.04	£25m	■ Negative CBA ■ 2 out of 3 schemes have zero benefits ■ 1 out of 3 schemes has negative benefits	■ Schemes are obligations and form part of the NEP. ■ An error in the original submission caused negative benefits and rewards. ■ This error does not affect any other schemes. ■ Anglian Water has corrected the calculation and all three schemes are cost beneficial. ■ Business case to be amended.	■ Clarification about the relationship between the proposed schemes and the National Environment Programme (NEP). ■ A description of the option appraisal methodology used to select the preferred options. ■ Evidence to show that this process was applied.	■ No comment in draft narrative.
Eel regulations	300.06	£14m	■ Negative CBA	■ This is an obligation as part of the NEP requirements. ■ The least negative CBA option has been chosen.	■ Need for expenditure on Eel regulations as part of the NEP. ■ Sensitivity using benefits calculated by the EA, showing the whole programme is cost beneficial.	■ Eels Regulations are a new requirement for AMP6. ■ There is a step change in investment required when compared with AMP5.

Comments on narratives – additional information presented

Additional Information

PRIVATE AND CONFIDENTIAL

Water business cases				Comments on Anglian Water's draft narratives		
Investment area	**Business case**	**£m totex**	**CBA results**	**Anglian Water response to comments**	**Additional information in draft narratives**	**Anglian Water comments on changes AMP 5 to AMP 6**
NEP investigations	300.11	£3m	▪ Positive CBA.	▪ No issues raised.	▪ More information provided on need in relation to NEP. ▪ Choice of least cost solutions and the derivations of costs for the investigations using external providers.	▪ No comment in draft narrative.
Resilience - mains	100.03	£36m	▪ 2 out of 3 schemes negative CBA. ▪ 1 out of 3 schemes significantly positive CBA.	▪ Original business was calculated at risk of 1 in 500 year event, intended to show that at this very low probability, the programme was cost beneficial, barring the two schemes identified. ▪ Anglian Water agree a more appropriate probability is a risk of 1 in 100 years. ▪ All schemes are cost beneficial at the 1 in 100 year risk level. ▪ Anglian Water will amend the business case accordingly.	▪ Need being driven by commitments given in the PR09 SDS to extend resilience schemes to groups of populations at risk from interruptions from >50,000 to 30,000 to 50,000. ▪ Revisions to the CBA analysis using the risk at 1 in 100 years as opposed to 1 on 500 years. ▪ More information on the options appraisal. ▪ More information of how costs have been assessed.	▪ During AMP5 Anglian Water focused on protecting population centres of greater than 50,000. ▪ Investment is proposed as a continuation of resilience strategy. ▪ Aim is to improve interconnectivity for population centres greater than 30,000.
Resilience - energy	100.13	£19m	▪ 1 out of 2 schemes negative CBA (Grafham)	▪ Anglian Water has carried out some sensitivity testing of both costs and probabilities ▪ Grafham scheme quickly becomes cost beneficial with minor differences in costs.	▪ Business need and customer acceptance of reduced risk of interruption. ▪ Third party assessments of the risk of power failures. ▪ Sensitivity analysis showing alternative views of CBA.	▪ Energy resilience is a risk that we have recently recognised as affecting our business. ▪ Consequently this is new investment for AMP6 with no comparable investment made in AMP5.

7 Comments on the business cases

Context for reviewing the business cases

- Anglian Water's 'gap analysis' submitted to Ofwat on 17th April 2014 identified five areas in the water wholesale control where it indicated it would provide more information and evidence when the plan is re-submitted. The principle business cases that support these areas, as selected by Anglian Water, have been examined, as originally made available to Ofwat when the PR14 business plan was submitted in December 2013.
- The areas identified are shown in the table below. **Mains Resilience**, **Energy Resilience** and three aspects of Anglian's National Environment Programme (NEP), namely **Ecological Improvements - RSA** (BC 200.04), **Ecological Improvements – Eels** (BC 300.06) and **NEP Investigations** (BC 300.11)
- The gap analysis identified totex costs not accounted for by Ofwat's models as follows:

Investment Area	Business case number	Pre-efficiency totex costs in business cases (£m)[1]	Efficiency (£m)[1]	Post-efficiency totex costs (£m)[1]
Mains Resilience	BC 100.03	38	(1)	36
Energy Resilience	BC 100.13	20	(1)	19
Ecological Improvements – RSA	BC 200.04	26	(1)	25
Ecological Improvements – Eels	BC 300.06	15	(1)	14
NEP Investigations	BC 300.11	3		3
Total		101	(4)	97

Source: KPMG summary of information supplied by AWS 1) Rounded to nearest million

- Ofwat assessed proposed costs using four criteria when carrying out 'deep dives' on areas of expenditure in the risk-based review. These were:
  - 1) The need for the cost; 2) Whether it is the most cost beneficial option; 3) The robustness of the estimates; 4) Whether consumers are protected.
- Neither the robustness of the absolute level of costs nor the level of consumer protection have been reviewed, so this report does not make any comment in these areas. In a number of places, Ofwat's risk-based review feedback also refers to a lack of clarity about why a particular option has been chosen as the preferred option, and questioned whether Anglian Water had carried out sufficient "optioneering".
- Therefore comments have been limited to the business need, evidence on how options have been selected and the results of the cost benefit analysis.

Results of the CBA analysis (1/2)

- After assessing the individual business cases, the results in the table shown below were raised with Anglian Water.

Topic	Business case reference	Project name	Total expenditure in AMP 6			Annualised figures			Comment
			Capital (£m)	Operational (£m)	Total (£m)	Benefits (EAB £k)	Costs (EAC £k)	Reward (£k)	
Mains resilience	100.03	Increasing connectivity - Barrow Heath	24.5	0.2	24.7	1175	1337	-162	Negative reward
	100.03	Increasing connectivity - Hillington	10.3	0.1	10.4	568	575	-7	Negative reward
	100.03	Increasing connectivity - Raithby	2.3	0.0	2.3	1071	144	927	
	Sum		**37.2**	**0.3**	**37.5**	**2814**	**2057**	**757**	
Energy resilience	100.13A	Grafham WTW - Standby generetion	13.8	0.1	13.9	1040	1198	-158	Negative reward
	100.13B	Wing WTW - Standby generetion	6.1	0.0	6.1	666	537	129	
	Sum		**19.9**	**0.1**	**20.0**	**1706**	**1735**	**-29**	Negative reward
RSA	200.04	Sustainability reductions - Fenland RZ Transfer	1.7	0.0	1.7	0	99	-99	Zero benefit
	200.04	Sustainability reductions - Norwich Intake to Ban	21.7	0.4	22.1	-8844	1270	-10114	Negative benefit
	200.04	Sustainability reductions - Mattishall	1.9	0.1	2.0	0	126	-126	Zero benefit
	Sum	Restoring Sustainable Abstraction	**25.2**	**0.6**	**25.8**	**-8844**	**1495**	**-10339**	Negative benefit
Eels	300.06	Eel regulations	14.6	0.1	14.8	613	999	-387	Negative reward
NEP	300.11	Water resources NEP	2.8		2.8	186	135	51	
Sum					**100.9**			**-9946**	
Total wholesale water gap					**129.0**				

Source: KPMG analysis of information supplied by AWS

- The table shows that there are a number of proposals with negative rewards (Equivalent annual benefit – equivalent annual cost < 0). It shows that in the RSA proposals the three schemes have either zero or negative benefits. There are a number of reasons why a business case showing a negative reward could still be valid:
  - A scheme **is a legal or environmental obligation**. In this case, the source of the obligation should be made clear, and if no positive reward solution is available, it should be demonstrated that the solution with the least negative CBA result has been chosen.
  - It **is part of a wider scheme for which the total reward is positive**. In this case it should be shown that the wider scheme cannot proceed without the negative reward elements.
  - **Mistakes in calculation or presentation.** In this case, the business case should be recalculated.
  - **The link to identified benefits is not exact enough to justify inclusion** (e.g. long term planning expenditure, where long term benefits will arise from good planning but the true benefits arise from the projects carried out, not the planning). In this case benefits will not have been included in the case.

Results of the CBA analysis (2/2) – Anglian Water response

- Anglian Water has responded to on the cases where the results of the CBA is negative as follows:

Topic	Business case reference	Project name	Annualised figures			KPMG Comment	Anglian Water response
			Benefits (EAB £k)	Costs (EAC £k)	Reward (£k)		
Mains resilience	100.03	Increasing connectivity - Barrow Heath	1,175	1,337	-162	Negative reward	In the original business case Anglian Water provided some sensitivity analysis around the probability of the risk occurring. They included the 1 in 500 CBA in the investment summary, showing that at a programme level even at this very low probability, the programme was cost beneficial. On reflection they agree that a more appropriate probability that reflects the actual risk to their business is 1 in 100, and at this level each of the schemes is cost beneficial as well as the programme. Anglian Water will amend the business case accordingly.
	100.03	Increasing connectivity - Hillington	568	575	-7	Negative reward	
	100.03	Increasing connectivity - Raithby	1,071	144	927		
	Sum		**2,814**	**2,057**	**757**		
Energy resilience	100.13A	Grafham WTW - Standby generetion	1,040	1,198	-158	Negative reward	Anglian Water has carried out some sensitivity testing of both costs and probabilities, and it shows that the Grafham scheme quickly becomes cost beneficial with minor differences in costs.
	100.13B	Wing WTW - Standby generetion	666	537	129		
	Sum		**1,706**	**1,735**	**-29**	Negative reward	
RSA	200.04	Sustainability reductions - Fenland RZ Transfer	0	99	-99	Zero benefit	These schemes are obligations and form part of the NEP. In the original submission, an error in calculating the CBA meant that Anglian Water reported negative benefits and rewards. This error was caused when inputting service measure information used only for these schemes, and does not affect any other schemes. Anglian Water has now corrected this calculation and all three schemes are cost beneficial. Anglian Water will amend the business case to reflect this.
	200.04	Sustainability reductions - Norwich Intake to Ban	-8,844	1,270	-10,114	Negative benefit	
	200.04	Sustainability reductions - Mattishall	0	126	-126	Zero benefit	
	Sum	Restoring Sustainable Abstraction	**-8,844**	**1,495**	**-10,339**	Negative benefit	
Eels	300.06	Eel regulations	613	999	-387	Negative reward	This is an obligation as part of the NEP requirements. The least negative CBA option has been chosen.
NEP	300.11	Water resources NEP	186	135	51		

Source: KPMG analysis of information supplied by AWS

Generic comments on the business cases

- In the majority of business cases examined, there are some recurring areas where the business cases could be improved. It is often not easy to identify how a preferred option has been selected from the options identified. It is not normally possible to see where either costs or benefits are derived, or how the investment portfolios are optimised. These functions are occurring in the top level systems before a business case is assembled. The analysis of the top level systems shows that all business cases draw costs and benefits from common source – the set of systems and processes known as Asset Plus.
  - **The conclusions on the top level systems supports the view that the issues identified in the business cases could be improved by better description, and are not due to the fact that the relevant activities have not been carried out.**

8 Business case analysis

Mains resilience – 100.03

Ofwat categories	Observation	Commentary
Business Need	■ The narrative of the business case says that there are a large number of customers who are at risk from the catastrophic failure of a water treatment works. ■ The 30,000 to 50,000 vulnerable population thresholds align with guidance from Defra on required SEMD planning (Advice Note 9, February 2005). ■ Failure consequence modelling has been carried out and presents the resilience consequences of 5 sites with a combined population of 208,000.	■ The business need is a continuation of work is related to a commitment given in the PR09 Strategic Direction Statement. ■ Anglian Water cited evidence from its customer research that customers do not expect to experience severe water restrictions in their lifetime and are prepared to pay to avoid them. ■ Anglian Water has indicated it will provide further evidence regarding the business need and the agreed policy with Defra on emergency planning.
Options	■ Approximately 70 schemes have been generated and entered into Asset Plus. ■ 3 options at three sites have been presented (the water treatment works at Barrow Heath, Hilllington and Raithby) in the business case. ■ Totex costs were quantified for each option at each of the three scores but reward scores are not presented for all of them, only the three preferred options.	■ It is not clear how the 70 schemes created have been prioritised into the 5 sites described. ■ It is not clear how the original five sites were then narrowed down to three. ■ It is not clear how the preferred option was selected from the three presented at each site, though it is noted that the least cost option out of the three available has been chosen.
Cost beneficial	Negative reward is shown at 2 cases.	■ The risk presented in the business case was at a 1 in 500 year likelihood of occurrence. ■ In reality the risk to be mitigated by Anglian Water is a 1 in 100 year event. There is a chart in the business case which shows the reward scores for both likelihood, and reward is always positive for 1:100 likelihood. ■ Anglian Water may wish to consider re-presenting this business case.

Project name	Total costs (£m)	Annualised figures		
		Benefits (EAB £k)	Costs (EAC £k)	Reward (£k)
Barrow Heath WTW	24.7	1175	1337	-162
Hillington WTW	10.4	568	575	-7
Raithby WTW	2.3	1071	144	927
Sum	**37.5**	**2814**	**2057**	**757**

Energy resilience – 100.13A&B

Ofwat categories	Observation	Commentary
Business Need	■ Grafham water treatment works and its pumping station have no standby generation while Wing WTW & the Empingham pumping station have limited standby generation. Therefore, Anglian Water is reliant on external electricity supplies to maintain water supplies to customers. ■ The likelihood of an electricity supply failures is very low but the potential impact on the water supply is high. ■ A supply interruption of 12 hours would affect c50,000 customers, rising to c.290,000 after a few days.	■ The need could be made clearer by providing information on the probability of the events occurring. ■ The need could be made clearer by providing information on what proportion of the Water Treatment Works have the same risks, and why these schemes are the biggest priority for AMP6.
Options	■ Three options including do nothing, standby generation and alternative ways of providing power were presented for both Grafham and Wing. ■ Whole life costs and CBA were presented for the preferred option but not the do nothing or alternatives. ■ The risks identified are categorised as “high impact, low likelihood”, so there is little empirical data for this risk.	■ The do nothing option has been described but not evaluated in the business case. Anglian Water has told us that all options are evaluated against the do nothing option in Asset Plus. The evaluation process has been checked during the high level assessment. ■ It is not clear why the preferred option of stand-by generation has been chosen ahead of the alternative means of supplying power. ■ The costs and benefits were not derived, only stated in the business case. They are provided via the Asset Plus systems.
Cost beneficial	Option for Grafham WTW has a negative reward in the business case.	■ The Wing WTW was found to be cost-beneficial. ■ Grafham WTW was found to have a negative reward of 13% of the equivalent annual cost. ■ The business case discussed this negative CBA and presented a sensitivity analysis using a greater chance of a power interruption. This sensitivity showed a positive CBA. ■ However there was no discussion of the importance of this sensitivity, or why the negative CBA option was nevertheless the preferred option.

Project name	Total costs (£m)	Annualised figures		
		Benefits (EAB £k)	Costs (EAC £k)	Reward (£k)
Grafham WTW	13.9	1040	1198	-158
Wing WTW	6.1	666	537	129
Sum	**20.0**	**1706**	**1735**	**-29**

Restoring Sustainable Abstraction – 200.04

Ofwat categories	Observation	Commentary
Business Need	■ A water resource deficit was forecast in the Water Resource Management Plan for both the Norwich and the Broads, and the Hunstanton resource zones. ■ In both cases, the deficits arise from reductions in output required by the Environment Agency's RSA programme. ■ The driver for all the schemes is the Habitats Directive review of Consents (HD ROC). The EA has identified where reductions in licenced abstraction quantities are needed.	■ The business need is clearly articulated, related to the Water Resource Management plan, and the driver an environmental obligation clearly identified. ■ The need case could be improved by providing information on the timing of the investment needed, showing that it needed to be included in the AMP6 programme.
Options	■ Investment was identified as needed at three sites: Hunstanton (Fenland), Mattishall and Norwich. ■ 11 options were identified for both Hunstanton RZ, and Norwich and Broads RZ. Totex costs were quantified for each option. ■ CBA was presented only for the preferred option at each site. ■ In case of Mattishall WTW, the investment (a new borehole is being constructed) has been started in AMP5, investment in a new main to connect the borehole is required in AMP6.	■ The options were optimised in accordance with the Economics of Balancing Supply and Demand and recent updates to the WRP guidelines, using average and incremental social costs. ■ The optimisation was carried out using a tool developed by University College London. ■ Although the options have been optimised, there is no discussion of how this approach differs from the standard approach used by Anglian, which was to identify the most cost beneficial options using Asset Plus.
Cost beneficial	Negative and zero benefits are shown in the CBA.	■ The business cases show two options having zero benefits and one option having negative benefits. ■ The business case does not discuss the negative benefits. ■ These results were drawn to Anglian Water's attention. Anglian water has indicated that their enquiries suggest these results are an error. ■ Anglian Water may wish to consider re-submitting this business case.

Project name	Total costs (£m)	Annualised figures		
		Benefits (EAB £k)	Costs (EAC £k)	Reward (£k)
Fenland RZ	1.7	0	99	-99
Norwich Intake	22.1	-8844	1270	-10114
Mattishall	2.0	0	126	-126
Sum	**25.8**	**-8844**	**1495**	**-10339**

Eel regulations – 300.06

Ofwat categories	Observation	Commentary
Business Need	■ All Anglian Water's surface water intake structures have been assessed as non-compliant with the Eel Regulations (2009) Business need is a legal obligation under the AMP6 National Environment Programme. ■ 14 surface water intake structures at 13 locations have been rated as high or medium-upper priority for action. ■ The programme of work is an agreed obligation under the AMP6 National Environment Programme contained within NEP Phase 3.	■ The business need is clearly articulated. ■ The source of the obligations is clearly stated. ■ Information is provided about why the particular schemes were prioritised. ■ Information is given about the need to begin work in AMP6.
Options	■ 8 different options were identified and assessed for suitability at each location. ■ The preferred option for each site was chosen based upon the recommendation contained within the Eel Regulations Assessment report prepared by Turnpenny Horsefield Associates. ■ If more than one option was technically viable, a recommendation was made for each site as to the most appropriate arrangements, given the existing arrangements. ■ Costs and CBA are presented for each option.	■ Optimisation is based on technical recommendations using external advice. ■ The preferred option was based on a series of technical factors including river depth, location, velocity and current screening arrangements.
Cost beneficial	Negative reward is shown in the business case.	■ The preferred option shows a negative CBA. ■ There is insufficient information to identify whether this is the least negative option. ■ There is no discussion of the negative CBA result.

Project name	Total costs (£m)	Annualised figures		
		Benefits (EAB £k)	Costs (EAC £k)	Reward (£k)
Eel regulations	14.8	613	999	-387

Water Resources National Environment Programme – 300.11

PRIVATE AND CONFIDENTIAL

Ofwat categories	Observation	Commentary
Business Need	■ There is a statutory requirement for water companies to complete the agreed National Environment Programme to assess the potential impact of water abstractions. ■ Satisfactory completion of the investigation is important to ensure the continued security of the abstraction licences. ■ Where an impact is confirmed, Anglian Water is expected to implement a scheme to reduce abstraction or provide mitigation. ■ Where an impact is likely, Anglian Water is required to complete an options appraisal report. 24 such reports are identified.	■ The need is clear, subject to confirmation that all the investigations are needed as part of the NEP. ■ This is driven by the requirements of the Water Framework Directive. ■ The EA has a defined list of sites where investigations must be carried out. ■ Only a small number of investigations have been completed in AMP5, so this expenditure is incremental to that incurred in 2010-15.
Options	■ Four sites have been confirmed as needed mitigation measures. ■ Several options have been presented for each site. ■ Whole life costs have been presented for all of the sites requiring an options appraisal. ■ CBA is presented for the options as a whole.	■ The proposed solution for the confirmed sites requiring mitigation measures have been selected following options appraisals completed as part of the AMP5 NEP. ■ The preferred options for the mitigation measures have been based on the least cost option which provides the highest level of certainty. ■ There is a clear description of the timing of the work to be carried out within AMP6
Cost beneficial	The preferred option has a positive reward score. Project name: Water resources NEP Total costs (£m): 2.8 Annualised figures: Benefits (EAB £k): 186; Costs (EAC £k): 135; Reward (£k): 51	■ The preferred option has a positive reward. ■ As with other business cases, CBA is presented only for the preferred option so it is not clear why the preferred option has been selected ■ As with other business cases, it is not clear how the costs and benefits have been derived.

Appendices

Anglian Water personnel interviewed

Name	Title	Area Covered
[redacted]	Head of Strategic Investment Planning	Approach to asset management and investment planning for PR14 Applying Cost Benefit Analysis in the 'Investment manager' system.
[redacted]	Strategic Investment Manager	Approach to asset management and investment planning for PR14 Applying Cost Benefit Analysis in the 'Investment manager' system.
[redacted]	Business Improvement Manager	Obtaining British Standard PAS 55 and international standard ISO 5500 Using the "Risk and Value" approach to supporting investment decisions.
[redacted]	Strategic Investment Planner	Approach to non-infrastructure investment Live demonstration of Asset Plus
[redacted]	Strategic Investment Planners	Approach to Infrastructure Modelling Deterioration Modelling Investment Optimisation Live demonstration of development of "business as usual tools" from the PR14 systems
[redacted] [redacted]	Cost Base Manager Strategic Cost Engineer	Live demonstration of the cost models used to estimate costs for proposed schemes Discussion of how models are created, validated and updated
[redacted]	Head of PR14 Stakeholder Engagement	Customer engagement, customer research, and the Customer Engagement Forum
[redacted]	Economist	Benefits Valuation Relationship of customer engagement to benefits valuation

Investment approach evaluation - transparency

Criteria	Definition	Assessment	Observations
Transparency	1. The inputs, workings and outputs of all systems and processes can be examined individually 2. There are no “black boxes” or hidden workings or concealed data sources 3. It is clear at all stages whether automatic or manual processes have been applied and whether data has originated from internal or external sources 4. There is adequate documentation of how systems and processes work and how they were developed	Medium	1. There is a structured process for cost estimation that covers solution capex templates, capex models, capex data capture, carbon and water calculations and an opex template and unit cost. The system is bespoke to Anglian Water, which will allow improved ability to tailor solutions to Anglian Water’s needs. 2. Costs and benefits in the business cases supporting the business plan can be traced back to their origins as costs in Asset Plus and Investment Manager and benefits in Investment manager. 3. Capex data in Asset Plus is captured through a capital cost data process. There are nine main sources of data that provide outturn prices for the data entry process with a breakdown of which are internal and which external sources. The costs for most solutions are auto-generated – for PR14 there were around 200,000 auto-generated solutions, covering standard solutions; around 4,300 solutions for AMP6 have been manually generated, to meet around 2,000 (non-standard) needs (eg eel regulations). 4. Documentation has been provided for the most important systems and processes Anglian Water uses to make investment decisions for its business plan. Cost models in Asset Plus are created using a capex modelling process; each step is set out in a structured, documented manner.

Investment approach evaluation – internal consistency

Criteria	Definition	Assessment	Observations
Internal consistency	1. All systems and processes use a common set of data 2. End results can be compared on a like for like basis or adjusted to be comparable using a transparent basis 3. Systems and processes use standard procedures 4. Users are adequately trained to use systems, processes and models	High	1. All models, eg Asset Plus, use the same SAP data as inputs. All costs in the business plan are from Asset Plus. All cost libraries in the infrastructure investment model draw on the same sources of data for all projects. Costs are locked down for a five year period. Data is published and sent to Investment Managers via Asset Plus. All non-infrastructure components are linked to SAP, including their functional location. 2. Hartlepool is covered by the same systems as the rest of Anglian Water's area. The costing and modelling for non-infra assets is consistent with the approach for infrastructure assets. Service Impact Models are used in a consistent manner to assess the level of capital maintenance required for non-infrastructure operational assets, and the level at which assets are set in the Service Impact Models is the same as used in the asset register (eg pump, motor, gearbox level). Anglian Water's Risk & Value system for determining risks for business as usual and price reviews is the same approach used in Anglian Water's Investment Manager tool, and risks are converted into economic values by this system on a consistent basis using business impact matrices. The same cost estimation model is used for almost 100% of projects (the limited number of exceptions are costed using separate models). 3. Anglian Water's Risk and Value approach is broken down into individual steps throughout the process of delivering a project, with gateways at major points; challenges (called interventions in Anglian Water terminology) are applied before each gateway; runways are used to set the level of materiality for the risk and value process. 4. There are around 250 trained users of the investment management system. One hundred staff are trained to use Anglian's Risk & Value approach; there are around 50 staff actively facilitating the approach with 400-500 Risk & Value sessions held each year.

Investment approach evaluation - Assurance

Criteria	Definition	Assessment	Observations
Assurance – internal and external	1. Appropriate assurance has been carried out on material systems and processes by suitably qualified internal and/or external personnel 2. External providers of inputs or processes have been quality assured 3. Deficiencies have been logged and addressed and improvements have been implemented	High	1. Anglian Water's investment decision making framework is PAS55 Asset Management Certified. Asset Plus has been assured. The internal and external data in Asset Plus has been quality checked. Projects created in Asset Plus by investment managers are reviewed by the Cost Base Team and compared against expected costs based on cost models. Service Impact Models for non-infrastructure assets underwent a process of testing as a result of internal audit challenges. 2. KPMG has not reviewed the assurance of external providers in depth, but it is extensive (see Appendix 3.) 3. Anglian Water has addressed issues raised through the Asset Management Assessment (AMA) around lack of system data on wastewater infrastructure and the robustness of Anglian Water's statistical approach. As between PR09 and PR14 the non-infrastructure asset planning system has been moved from spreadsheet to web-based, and therefore has increased functionality (greater speed, better control of input data etc), but outputs are the same type to maintain comparability. For PR14 a number of improvements in the infrastructure SIM have been introduced: modelling for PR09 was done at cohort level (eg all pipes of the same diameter), whereas it is now at the level of individual assets, with a different statistical method used (evolutionary polynomial regression) and no Bayesian tuning. Consequence modelling in water was simpler for PR09, using geographical tracing. For AMP6 Anglian Water is increasing the coverage of more accurate hydrological models to 100%, rather than the static models that currently cover 80% of the network, in order to achieve better management of flooding.
Auditability	1. It is possible to track back from a result through the processes to the original data sets 2. It is possible to examine at key stages who has made what changes and when (subject to materiality) 3. It is possible to revert to previous correct versions to unwind errors 4. Appropriate security systems are in place to prevent unauthorised access to systems and processes	Medium	1. The costs and benefits in a test business case were traced back to the original source data in the live Asset Plus system and the results matched. 2. An audit trail is kept in Asset Plus; eg when costs are mapped on a chart during cost model development, there is an audit trail of outliers that have been manually excluded. 4. The Asset Plus cost estimation system requires positive choices by users so can't accidentally include extra items that should not be part of the costs. Cost models and projects in Asset Plus cannot be cleared for use in optimisations until they are locked and released by the Cost Base Team. The person who creates a cost model in Asset Plus cannot approve it – this must be done by a separate person before it is added to the Asset Plus library for QA. When entering new data on a non-infrastructure asset into a Service Impact Model, the actual components of an asset need to be selected – components that are not part of the asset are omitted.

Investment approach evaluation – reliability (1/2)

Criteria	Definition	Assessment	Observations
Reliability	1. Systems and processes have been tested during development and use to ensure results are consistent over time and when compared with any relevant benchmarks 2. Models have been compared against actual results to test validity 3. Results have been tested against criteria to detect for bias/variation 4. The most appropriate sources of data have been used 5. The most appropriate models, processes and systems have been used in each case	High	1. The PR09 baseline for the Service Measure Framework was revised with customer engagement and updated for PR14. Anglian Water is aware of the level of network coverage of hydrological models at other water companies and has measures in place to achieve similar levels of coverage. 2. Failure rates predicted by Service Impact Models for non-infrastructure assets are tested against actual failure data supplied by Operations; the two are broadly aligned. Data on infrastructure assets is validated by GIS updates from the field. 4. New cost models in Asset Plus are created every five years (updated based on actual costs during the previous AMP). On-costs (such as design and survey costs) are based on historical actual costs for each type of project. Projects are created by external and/or internal suppliers, based on their costs as inputs; Anglian Water cost models are then run to see whether costs fall into expected ranges; there is a repeated cycle of challenges on costs until Anglian Water is satisfied with them. For each non-infrastructure asset, SAP data on failure is used, supplemented by historic data and expert knowledge. For non-infrastructure asset failure modelling for PR14, Anglian Water has used actual failure data and updated expert data from PR09. When assets are replaced, SAP is updated in batches – this can be approved manually or automatically. Data for infrastructure assets comes from both GIS and national data sets, eg soil, weather. Data has been matched up to 2011 based on 9 years of data for bursts and 8 for most other failures; the failure model starts with known data that is well-matched to assets and is later updated where possible; data that could not be applied to assets was excluded from the model but added later as a compensation factor. 5. When modelling investment need Anglian Water has tried to avoid a problem/solution approach by emphasising (business) need so as to (1) reduce the risk of creating solutions for their own sake that don't address a genuine business need and (2) avoid de-risking the business. Every non-infrastructure asset site has a unique service impact model with up to 1000s of individual components, eg pumps. There are around 6,000 models/sites and around 250k assets modelled. The non-infrastructure investment manager system is designed so that only a service failure triggers a need for action; a process failure alone will not trigger action, neither will a component failure; groundwater and surface water options have been modelled separately to avoid distortion of required non-infrastructure investment that can result because of the consequences of failure in one or two locations if the two sources are blended. For infrastructure assets the same service impact models are used as for non-infrastructure investment, however rather than component level, sewers are broken into lengths of pipe between manholes (c.60m length on average) and water pipes are as per GIS, from <1m to 2k; there are around 1.3m infrastructure assets; the investment manager system seeks correlations between the cost of assets and its attributes, suggests the best model and can compare against other models. Assets (totalling around 21m, or three AMPs worth of investment) have been modelled and optimised selectively in Asset Plus because there would be c. 1 million if all were included; instead, Anglian Water has ranked assets by highest likelihood of failure based on probability and consequences (as a combination of one, the other or both).More complex cost libraries are used for estimation of infrastructure asset costs than non-infrastructure because asset attributes are more complicated (depth of mains etc); there are c. 1,400-1,500 infrastructure cost models in total. A model selection process was undertaken for infrastructure assets, with different models selected for different water and wastewater construction materials (eg iron, plastic). Two methods for modelling sewer spills are used: static models and more sophisticated hydrological models using FastNet, which is used to predict the location, rate and size of a spill (it breaks each pipe in turn); these hydrological models have been run on 20% of the network (49 catchments); the hydrological models are updated as the population grows etc. The pathway and final receptors of this flooding have been modelled using flood route modelling software.

Investment approach evaluation – reliability (2/2)

Criteria	Definition	Assessment	Observations
Reliability	6. Appropriate sensitivities have been carried out where material 7. Anomalies, variations and non-standard results have been investigated and explained	High	6. Service Impact Models for non-infrastructure assets use deterministic models to carry out simulations on each site to estimate process failures and, in turn, service failures; Monte Carlo is used to build up estimates of failures per year; once component/process failures have been assessed, service failure probabilities can be assessed based on scenarios plugged into the model; for WWTW the process is more complex because the model needs to be calibrated before it is run, ie to set the quality of the waste water coming in; for PR14 performance curves are adjusted using Bayesian analysis - the Bayesian tuner operates to increase accuracy so that where a failure has happened, the probability of a further failure increases, so it is tuned up, and pipes without failure are tuned down; the base scenario (unconstrained) gives the maximum level of investment and a range of other options lying between the maximum investment and zero investment is considered. 7. Engineering challenges were used to screen out counterintuitive results in the infrastructure SIMs, eg an anomalous correlation between elevation and blockages. Water temperature was also found not to be a relevant variable and was excluded from the models.

Investment approach evaluation - Integration

Criteria	Definition	Assessment	Observations
Integration	1. Results from different systems and processes have been integrated in appropriate and valid ways, including stakeholder input where appropriate 2. Where judgement is required to produce an integrated result, judgement has been applied consistently with the objectives and limitations of the underlying systems and processes	Medium	1. The cost estimation process sits within an overall investment cycle process for business as usual and price reviews that covers the whole Anglian Water portfolio. The Risk and Value approach ties to the business impact matrices in Asset Plus. Both these elements set the baseline for the commercial costings for all projects. The Service Measure Framework was developed for PR09 and is linked to the PR09 investment “engine”, eg for sewer flooding; it is linked to qualitative research with customers; it is linked to PR14 outcomes, performance measures and ODIs. The PR09 baseline for the Service Measure Framework was revised with customer engagement and updated for PR14. 2. Anglian Water has a documented set of principles for investment decision making (best solution, economic option, learning and minimum impact); these were developed for PR09 but are still relevant and are featured in the PR14 investment governance and used to challenge decision-making on a weekly basis. Anglian’ Water’s decision making framework has documented weekly, monthly, quarterly and annual governance pathways. Anglian Water used a Strategy Idea Development Template so that the PR14 Strategy Steering Group could review strategy proposals with sufficient details and in a common format. The template covers the major considerations to enable a sound review of proposals (describes the proposal and delivery alternatives, the outcomes that the strategy supports, expected benefits for customers and shareholders, potential impacts on customers, difficulties, unknowns, success factors, evidence to support, stakeholders and delivery stages). Anglian Water has provided PR14 Strategy Steering Group minutes, evidencing consideration of strategy idea development proposals.

PR14 internal and external assurance carried out by Anglian Water

Area	Detail	Provider
Governance	Programme Management	KPMG
	Ownership, accountability and sign-off	KPMG
	Corporate Governance Code compliance	PwC
Internal inputs	Risk-sharing mechanisms	Halcrow
	Ofwat data tables	Halcrow, PwC
	Historical data	Halcrow
	Future performance standards / ODIs	Halcrow
	Opex	Halcrow
	Capex	Halcrow
	AMP5 carry over	Halcrow
Methodologies and process	Financial modelling	PwC
	Costing	Halcrow
	Investment planning and optimisation	Halcrow
	Customer views incorporated	Halcrow
	Water resource planning	Halcrow

Area	Detail	Provider
IT systems	Asset Plus	Halcrow
	Efficiency models	Halcrow
	Financial model	PwC
Assumptions	Growth	Halcrow
	Opening RCV	Halcrow, PwC
	RCV run off and PAYG rates	PwC
	Tax	PwC
	Inflation	PwC
	Competition projections	Internal
	Efficiency	Halcrow
	Economic assumptions	PwC
External inputs	Stakeholders' expectations	Internal
	Quality regulators (DWI, EA, NE)	Halcrow, Internal
	Customers'' priorities	Halcrow, Internal
Top down	Compliance with statutory obligations	Halcrow
Aligned with SDS		Halcrow, Internal

Source: KPMG summary of information supplied by AWS

cutting through complexity