Bristol Water plc

A reference under section 12(3)(a) of the Water Industry Act 1991

Report

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Material has been omitted from the text of this report pursuant to section 15(6) of the Water Industry Act 1991. The omissions are indicated by [✂]. Non-sensitive wording is also indicated in square brackets.

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Background

1. Bristol Water plc (Bristol Water) is a Water-Only Company (WoC) based in the South West. It is responsible for the sourcing, treatment and distribution of water, supplying clean water to over 1.2 million people and businesses in south west England. Over 56% of the properties supplied are situated in the urban area of Bristol. Bristol Water is owned 30% by the Spanish company Sociedad General de Aguas de Barcelona SA (Agbar), 50% by Capstone Infrastructure Corporation of Canada (Capstone) and 20% by the Itochu Corporation of Japan (Itochu).

2. Under the terms of its Instrument of Appointment (Licence), the charges that Bristol Water can make for its retail and wholesale activities are controlled by the Water Services Regulation Authority (Ofwat), which carries out five-yearly 'periodic reviews' (or 'price reviews') for this purpose on water companies in England and Wales. Bristol Water does not provide sewerage services and is categorised by Ofwat as a WoC as distinct from a water and sewerage company (WaSC).

3. On 12 December 2014, Ofwat published its final determination of the controls which limit the price Bristol Water may charge for supplying water in the five-year period from 1 April 2015 to 31 March 2020.[1] Bristol Water disputed the price determination, and under the terms of Condition B of its Licence required Ofwat to refer the disputed determination to the Competition and Markets Authority (CMA) for a further determination. On 4 March 2015, Ofwat made the reference to the CMA.[2]

4. The reference required us to report on and determine the disputed determination by 3 September 2015. On 11 August, this deadline was extended by Ofwat to 3 November 2015. We must make our determination in accordance with the same statutory provisions and duties as applied to Ofwat when it made the disputed determination.

5. The general statutory duties we must apply are set out in section 2 of the WIA 91, and consist of five principal duties and five secondary duties. The five principal duties[3] are:

[1] Note the 'price controls' actually operate as restrictions on revenues, rather than restrictions on specific prices or tariffs.
[2] Under section 12(3)(a) of the Water Industry Act 1991 (WIA 91).
[3] Section 2(2A)(a)–(e) WIA 91.

(a) to further the consumer objective (to protect the interests of consumers, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the provision of water and sewerage services);

(b) to secure that the company's functions under the WIA 91 are properly carried out;

(c) to secure that the company is able (in particular, by securing reasonable returns on its capital) to finance the proper carrying out of those functions (this is sometimes referred to as the 'financing duty');

(d) to secure that the activities authorised by the company's Licence and any statutory functions are properly carried out; and

(e) to further the resilience objective (which is, in summary, to secure the long-term resilience of water undertakers' supply systems and sewerage undertakers' sewerage systems with regard to environmental pressures, population growth and changes in consumer behaviour).

The 2014 price review

6. Ofwat told us that it introduced a game-changing methodology for the 2014 price review (PR14). Ofwat wanted companies to take more responsibility for understanding what their customers' priorities were and then acting upon them. Ofwat wanted companies to take ownership for managing risk and to ensure a better allocation of risk and reward between investors, management and companies. Companies were required to establish a Customer Challenge Group (CCG) to review and challenge the way companies engaged with customers and to take customer views into account in their decisions.

7. For the first time, Ofwat set separate wholesale and retail price controls. The development of these separate price controls was designed to facilitate the development of more targeted incentives for retail and non-household customers and also reflected legislative and regulatory changes in the water industry in England that are intended to support the development of competition, particularly for the supply of retail services to non-household customers.

8. Many parts of the PR14 framework were similar to previous determinations. In particular:

(a) PR14 set a five-year price control for wholesale activities and for retail supply to households (though a two-year retail price control was set for supply to non-household customers);

(b) PR14 continued to be based around regulatory capital value (RCV) – Ofwat included in its calculations an allowance for what it considered to be a reasonable level of return on the RCV, based on the cost of capital over the price control period;

(c) Ofwat's price control framework continued to seek to incentivise regulated companies to behave in a way consistent with Ofwat's duties; to operate and invest efficiently and provide a suitable quality of service; and

(d) allowed wholesale revenues were indexed to the retail price index (RPI), using the formula RPI + K (K can be positive or negative).

9. PR14 also introduced significant differences in its assessment of company expenditure. Rather than the previous distinction between capital and operating expenditure, Ofwat introduced a total expenditure (totex) approach to the way it assessed, remunerated and incentivised company expenditure. Totex was a key measure introduced to help seek to reduce the capital expenditure (capex) bias that it believed to exist, where companies were thought to focus unduly on capital solutions (at the expense of potentially more innovative and sustainable operating expenditure (opex) solutions).

10. Ofwat set a totex wholesale expenditure allowance. It used a number of econometric benchmarking models to assess wholesale totex. It then made a series of adjustments for 'special cost factors,' which were intended to adjust for specific aspects of a company's characteristics and circumstances that affect its costs materially and which may not have been taken into account in Ofwat's totex benchmarking analysis.

11. Ofwat sought to align the efficiency incentives that companies faced across opex and capex. A totex cost sharing incentive scheme was used so that a specified proportion of any over- or under-spend against the wholesale expenditure allowance is retained by the company, with the remainder passed through to consumers. This proportion (the cost sharing rate) affects the profit incentives on the company to operate efficiently during the price control period, as well as the financial risk faced by the company.

12. Ofwat also applied a 'menu regulation' scheme for PR14. Its main purpose was to give extra incentives for companies to submit accurate expenditure forecasts and provide further flexibility to companies in terms of the level of the cost sharing rate that each company faces.

13. In other areas for PR14, Ofwat:

(a) set a wholesale weighted average cost of capital (WACC) of 3.60%. Ofwat assumed the same notional gearing level and notional cost of debt for all companies. It made exceptions for two ‘enhanced companies’ which Ofwat judged had formulated particularly good business plans (therefore they were allowed a 0.1% higher WACC); and two smaller companies which were allowed an uplift of 0.25% on the cost of debt. Ofwat considered that the cost of debt was higher for smaller companies, but only gave the allowance where it considered that there were customer benefits;

(b) included a number of financial adjustments to reconcile allowed expenditure with actual historical performance for the period April 2009 to March 2015; and

(c) encouraged companies to set financial incentives (both rewards and penalties) directly linked to performance above and below their committed performance targets based on outcome delivery incentives (ODIs). These were based on customer research and input from the CCGs, although Ofwat made adjustments in a number of areas.

14. Ofwat used its price control financial model to bring together different elements of its assessment to calculate the total allowed revenue for Bristol Water. These elements included the wholesale totex allowance, allowances for profit and depreciation, financial adjustments for Bristol Water’s performance in previous price control periods, and various other adjustments.

Bristol Water concerns with PR14

15. Bristol Water said that the most significant reason for seeking a redetermination from the CMA was the difference between its business plan and Ofwat’s final determination (FD14) regarding the appropriate level of wholesale costs to deliver the agreed outcomes. It noted that Ofwat had concluded that Bristol Water’s level of wholesale totex during the period 1 April 2015 to 31 March 2020 (the asset management plan period six or AMP6) should be £409 million, whereas Bristol Water’s business plan had proposed expenditure of £537 million. Bristol Water said that Ofwat’s decision was insufficient to deliver the outcomes customers wanted and was an unrealistic assumption of what was required in order to run the business. It said that Ofwat had not considered whether the resulting level of operating costs was achievable in practice, including the immediate reduction in 2015/16 in average household bills from £198 to £162, reducing further to £152 for the remainder of the period. It also said that the reduction in bills meant that Bristol Water was not financeable under the Ofwat determination.

16. Bristol Water raised a number of other concerns. It said the cost of capital calculated by Ofwat was too low, and raised concerns over some aspects of

the financial incentives linked to performance and ODIs and the financial adjustments for the period April 2009 to March 2015.

Our approach to the determination

17. We sought to develop an approach to cost assessment that was practical and proportionate and that also satisfied our statutory duties set out in the WIA 91 (see above). We considered that we were required to apply each of the duties in accordance with its statutory wording and not to apply individual duties in isolation.

18. The reference to the CMA is a reference for the determination of a new price control for Bristol Water, not an appeal on specific elements of Ofwat's decision. Accordingly, we are able to consider any aspects of the Bristol Water price control. Nevertheless, we considered it important to adopt a proportionate approach and to scrutinise most closely the areas in the determination that would have the largest effect on customer prices and Bristol Water. A key area for our determination was therefore wholesale totex. We decided not to make changes to the retail price controls. Bristol Water said that it accepted the retail price controls and no stakeholders made submissions arguing for changes to them. We note that the wholesale price control concerns a much larger part of customers' bills than the retail controls.

19. For our wholesale cost assessment, we undertook the following actions:

(a) We reviewed the econometric benchmarking models used by Ofwat. We identified significant concerns with Ofwat's assessment and risks that it did not adequately reflect Bristol Water's efficient costs. We therefore developed some alternative econometric benchmarking models for Bristol Water's base expenditure (opex plus capital maintenance, which is capex required to maintain the capability of existing systems and assets).

(b) Given the limitations of the econometric benchmarking analysis, we undertook a more expansive review of Bristol Water's needs and circumstances. We assessed separately base and enhancement expenditure and used the base expenditure assessment as a cross-check on the econometric benchmarking analysis.[4] We reviewed aspects of Bristol Water's business plan for base expenditure, considering separately Bristol Water's requirements for opex and capital maintenance

[4] Enhancement is defined as a level of service delivered better than previously defined. Examples of enhancements include fewer supply interruptions for customers, fewer disruptions for the public in general, and less pollution.

expenditure. We focused our review on the more significant issues and projects.

(c) We estimated enhancement expenditure from a review of the enhancements proposed in Bristol Water's business plan. We did not consider that Ofwat's benchmarking models provided a suitable basis for determining allowances for Bristol Water's enhancement expenditure that we could use for our cost assessment.

(d) We drew on Ofwat's review of special cost factors, Bristol Water's and its advisers' views on efficient expenditure for opex and capital projects and our own further review. We were assisted by our engineering consultants, Aqua Consultants (Aqua).

20. In addition to assessing wholesale totex, we:

(a) assessed the appropriate cost of capital for Bristol Water through a bottom-up analysis of individual components;

(b) determined the financial adjustments to reconcile allowed expenditure with actual historical performance for the period April 2009 to March 2015; and

(c) considered the ODI framework and whether changes were required.

21. Finally, we combined these values with an appropriate pay-as-you-go (PAYG) rate and calculated, using Ofwat's methodology, the total allowed Bristol Water wholesale revenue and assessed its financeability. We calculated the overall revenue and K for each year from April 2015 to March 2020 to assess the financeability of Bristol Water and provide an indicative view of the effect of the determination on customer bills.

Summary of determination

Wholesale totex assessment

Wholesale totex assessment based on econometric benchmarking analysis

22. We noted that Ofwat's use of benchmarking analyses had a number of benefits. It helps to mitigate the concerns identified by Ofwat and others that there was an undue bias towards capex. Using benchmarking analysis as a starting point for cost assessment, rather than companies' business plans, reduces the risk that the cost assessment for a company is over-stated or takes insufficient account of the opportunities for cost savings. It also helps to mitigate risks relating to investment deferral that may otherwise arise under a

price control framework that emphasises outcomes. Finally, Ofwat stressed that this approach had benefits in terms of practicality and proportionality. Ofwat needed to determine 18 wholesale water expenditure allowances and ten wholesale wastewater expenditure allowances (for the ten WaSCs).

23. We recognise that no benchmarking analysis or cost assessment method will be perfect, and there will always be limitations in any approach. The type of high-level totex benchmarking models that Ofwat used have some advantages but also suffer from some drawbacks, and we were concerned with the emphasis that Ofwat had placed on these types of models. There were also a number of specific aspects of the design and specification of Ofwat's models that we identified issues with. We recognised that Ofwat's special cost factor process provided companies with opportunities to mitigate, to some degree, the limitations or inaccuracies in Ofwat's econometric benchmarking models. However, we did not consider that Ofwat's approach to special cost factors was sufficient to mitigate fully the limitations in its benchmarking analysis.

24. As a result, we considered that there were significant risks that Ofwat's totex assessment for Bristol Water did not adequately reflect Bristol Water's costs. We therefore considered it important: *(a)* to consider possible alternative econometric benchmarking model specifications; and *(b)* to carry out a targeted review of the expenditure forecasts from Bristol Water's business plan, which would bring a different perspective.

25. We decided to base our assessment of wholesale expenditure for Bristol Water on our alternative models rather than Ofwat's. While both sets of models had limitations we considered that, on balance, the estimates from our alternative models were more likely to contribute to the accuracy of our overall assessment.

26. We recognised that these alternative econometric benchmarking models were not perfect and there remained a need to consider potential company-specific adjustments for factors that may not be adequately captured in the models. We therefore applied some adjustments for special cost factors to take account of specific characteristics or circumstances of Bristol Water. Overall, we made an upward adjustment of around £26 million.

27. Our assessment of base expenditure from the econometric benchmarking analysis was £340 million in total over the five-year period from 1 April 2015 to 31 March 2020. This is some £22 million higher than the corresponding figure from Ofwat's final determination and £45 million less than the Bristol Water business plan. This figure is £6 million lower than the figure in our provisional

findings because of the net effect of modelling refinements and adjustments to special cost factors.

Review of base expenditure from Bristol Water's business plan

28. We carried out a targeted review of base expenditure in the Bristol Water business plan for the reasons discussed in paragraph 19(b).

29. Bristol Water's business plan forecasts for opex were based on an extrapolation from costs in a base year. We reviewed Bristol Water's approach to the relevant base year, adjusted costs to find an efficient baseline and then projected costs to reflect changes in circumstances over time. Bristol Water included a number of increased costs in its business plan and we considered which of these to include in our adjusted projections. This approach resulted in total projected opex of £218 million, compared with £228 million in Bristol Water's business plan. This is £3 million higher than the figure in our provisional findings, primarily because Bristol Water supplied further support for additional opex, above the level allowed in our provisional findings, associated with additional enhancement expenditure.

30. We reviewed the capital maintenance in the Bristol Water business plan. Capital maintenance is broken down into infrastructure renewals expenditure (IRE)[5] and non-infrastructure maintenance (MNI).[6]

31. We performed a targeted review of the IRE programme. In particular, we reviewed, with support from Aqua, Bristol Water's mains replacement programme. This represented around 62% of Bristol Water's total planned IRE for AMP6.

32. Our high-level analysis of Bristol Water's programme showed that the amount that Bristol Water would need to spend on IRE could be significantly lower than it had forecast. Based on our assessment, we considered that the efficient level of IRE was in a range of £68–£72 million. This compared with £76.3 million in the Bristol Water business plan and the range we provisionally found of £65–£70 million in our provisional findings.

33. We also reviewed the MNI expenditure in Bristol Water's business plan. In particular, we reviewed the evidence for the Bedminster service reservoir, which Bristol Water planned to replace at a cost of £6 million and the Bristol

[5] Infrastructure is mainly below-ground or underground assets, such as water mains and sewers, and also dams and reservoirs that last for a long time. A distinction is drawn between infrastructure and non-infrastructure assets because of the way the appointed water companies manage, operate and maintain them.
[6] Non-infrastructure is mainly above-ground assets, such as water and sewage treatment works, pumping stations, company laboratories, depots and workshops.

Water plans for replacement of treatment works assets constructed since 1990 at a cost of approximately £34 million.

34. We considered that Bristol Water's case for a new reservoir at Bedminster had not been made. We found that no replacement was required in AMP6, as the need to replace this asset within the period had not been demonstrated.

35. With regard to the treatment works assets, we understand that some elements of assets constructed since 1990 will need replacing on a rolling basis. However, Bristol Water did not provide adequate detail of what needed replacing based on the condition and performance of these assets, particularly since the Bristol Water planned spend for AMP6 was 50% higher than in AMP5 (from 1 April 2010 to 31 March 2015) and 200% higher than in AMP4 (from 1 April 2005 to 31 March 2010).

36. It was therefore not clear to us why expenditure on treatment works should be substantially higher than in previous periods. The evidence provided would only justify a small increase.

37. Many of the forecasts in the Bristol Water business plan appeared to have been based originally on the output of Bristol Water's models, without supporting evidence to reconcile this to actual assets and their condition. As a result, much of the expenditure did not relate to identified assets with a demonstrated need for replacement. Therefore, there appeared to be significant uncertainty about whether the level of spend planned would be required in practice. As a result, we considered it likely that Bristol Water may be able to spend materially less than it projected in AMP6.

38. In deciding on a range of outcomes for MNI we therefore considered various adjustments to Bristol Water's proposed areas of spend which gave a range of £49–£69 million, compared with Bristol Water's plan of £80 million and the range we provisionally found of £49–£74 million in our provisional findings.

39. From the above, our assessment of the Bristol Water business plan suggests total base expenditure of £335–£359 million. This compares with the Ofwat assessment of £318 million, the Bristol Water business plan of £385 million, and the results of our econometric benchmarking analysis of £340 million. It also compares with the range we estimated in our provisional findings of £329–£359 million.

Review of enhancement expenditure from the Bristol Water business plan

40. We assessed enhancement expenditure in the Bristol Water business plan. For the individual schemes that we reviewed, we adopted a framework for assessing the evidence on the basis of need; whether the most suitable

option had been chosen (optioneering); and the robustness of the cost estimation.

41. The construction of the Cheddar 2 reservoir was the biggest enhancement scheme proposed by Bristol Water, with a cost of £42.8 million in AMP6. There were three primary supporting arguments made by Bristol Water in support of its proposal for Cheddar 2:

(a) It may be required to supply a new power station.

(b) If not, it may be required to meet a supply/demand imbalance in the second half of the water resources management plan (WRMP) period.

(c) In any case, the need for Cheddar 2 is supported by improved security of supply considerations.

42. We found that there was substantial uncertainty over whether a power station would be built and, if so, whether Bristol Water would be the preferred option for water supply. We considered that delivering a series of smaller schemes to address a declining supply/demand balance as it arises was a more flexible and proportionate approach to addressing any shortfall in supply in the shorter term, given the uncertain demand and the uncertainty modelled in Bristol Water's target headroom. We considered Bristol Water's arguments on customers' desire for resilience of supply, but found that Bristol Water had not provided sufficient evidence to demonstrate that immediate investment in Cheddar 2 was necessary to achieve the resilience objective, or that customers would be willing to pay higher bills to finance this increase in security of supply. We noted that Cheddar 2 was included in the Bristol Water WRMP. We considered that, while we were not bound by the WRMP, we should take account of the WRMP as part (albeit a significant part) of all the available evidence in assessing the need for the construction of Cheddar 2 to commence in AMP6.

43. We found that Bristol Water had not sufficiently demonstrated the need for construction of Cheddar 2 to commence in AMP6, and we therefore made no allowance for expenditure in this price review period.

44. Another large enhancement scheme in Bristol Water's plan was the construction of a new water treatment works at Cheddar at a cost of £20.8 million. We concluded that Bristol Water had sufficiently demonstrated that there was evidence of raw water deterioration at Cheddar reservoir and that this had affected its treatment works. However, there was insufficient evidence that it was appropriate at this stage to commit to the replacement of Cheddar WTW as the most suitable option, given the significant cost to customers. In particular, our analysis indicated that Bristol Water had not

demonstrated that it had appropriately investigated the cause of the marked increase in algae from around 2006. Therefore, there may be a lower cost solution depending on the outcome of further investigation.

45. On the basis of the evidence presented, we decided that an allowance of £1 million should be made to allow Bristol Water to undertake additional investigation, reservoir management and minor capital works. We decided that, should the result of that investigation identify the need for more expensive treatment requirements, this would be a notified item and Ofwat could agree to make an appropriate additional allowance if it is satisfied that such investment is necessary in AMP6.

46. We also considered the case for the Southern Resilience scheme which was included in Bristol Water's business plan at a cost of £28.1 million. We considered that Bristol Water had demonstrated that the scheme would improve resilience to its network by reducing the number of properties served by a single source. We also considered it would provide additional relief to the Cheddar supply area if further issues arising from algae occurred. In our provisional findings, we found that Bristol Water had partially demonstrated that it had chosen the most suitable option but we considered that further justification for a service reservoir with a substantial capacity and in the location proposed was needed. Otherwise, we found that Bristol Water had not overestimated the costs of the scheme. In response to our provisional findings, Bristol Water provided further evidence that a service reservoir was necessary, at a different location to that in the original scheme and slightly less expensive than initially envisaged. We agreed that this reservoir was necessary, and we allowed £27 million for the Southern Resilience scheme, the revised amount requested by Bristol Water.

47. Our review of smaller enhancement projects totalling £60.6 million (raw water deterioration £8 million, growth schemes £12.5 million, national environment programme (NEP) £11 million, asset reliability £10.2 million, lead reduction £0.8 million and other schemes totalling £18.1 million) were all allowed in full. In our provisional findings, we had decided to place an efficiency challenge on the asset reliability scheme, reducing this scheme from £10.2 million to £9.54 million. However, Bristol Water provided further evidence and we accepted the cost of the scheme in full.

48. We found that Bristol Water's enhancement expenditure requirements over the period 1 April 2015 to 31 March 2020 were £88.6 million. This compares with the Bristol Water business plan of £152.3 million and the Ofwat approved level of £91.2 million. This represents an increase of £5.5 million on our provisional findings.

Overall wholesale totex assessment

49. For our overall assessment of wholesale totex, we compared the econometric benchmarking assessment for base expenditure with the business plan assessment. The econometric benchmarking assessment for base expenditure of £340 million compares with the business plan assessment low case of £335 million and high case of £359 million. On balance, given the econometric and business plan assessments, our statutory duties, objectives and approach, we adopted a figure of £340 million for base expenditure. This was within the range suggested by the business plan review but 2% below the mid-point of that analysis.

50. We considered it appropriate, in assessing the efficient level of expenditure, to give more weight to the estimate that made use of industry-wide benchmarking analysis, complemented by detailed further assessment to take better account of Bristol Water's needs and circumstances, than to use the mid-point of the estimates derived from adjustments to Bristol Water's own expenditure forecasts. Our business plan review found that it was reasonable to expect that Bristol Water should be able to spend less than it projected in its plan. We considered that a 12% reduction in cost from the Bristol Water business plan was achievable in the light of our analysis and the limitations we found in the Bristol Water business plan.

51. The estimate of base expenditure from our econometric benchmarking assessment plus our estimate of enhancement expenditure from our review of Bristol Water's business plan gave a totex figure of £428.6 million. This compared with the totex figure in the Bristol Water business plan of £537 million and in the Ofwat final determination of £409 million, and was similar to the amount determined in our provisional findings, reflecting a decrease in base expenditure offset by an increase in enhancement expenditure.

Reconciling 2010 to 2015 performance

52. Part of Ofwat's final determination included a number of financial adjustments to reconcile allowed expenditure with actual historical performance, according to the rules and policies set at previous price control reviews.

53. We decided that there was no need to do anything in our determination to change the method used by Ofwat and the decisions it made on the resulting RCV impacts.

Outcome delivery incentives

54. We assessed the ODI framework and agreed that it should be able to deliver real benefits to customers while providing Bristol Water with both the flexibility and incentive to improve performance, where appropriate through investment.

55. On mean zonal compliance (MZC), we set Bristol Water's penalty deadband at 99.95%, and the penalty collar at 99.94%.[7] On unplanned customer minutes lost and negative water quality contacts, we noted that Bristol Water had stated that it had proposed targets based on the results of its customer research. We considered that it was appropriate to retain Bristol Water's target, but raise the reward deadbands to the upper quartile level in each case.

56. We removed any unnecessary ODIs where our determination mitigated or removed the need for them (eg for Cheddar Reservoir 2).

Cost of capital

57. We estimated the cost of capital for Bristol Water.

58. We used an industry average (notional level) for gearing of 62.5%. It is for companies, their shareholders and management to determine the most efficient financing structure (including gearing level) to meet their circumstances.

59. We used a ratio of 75%:25% for embedded and new debt respectively. We calculated a cost of embedded debt of 2.85 to 3.05% (with a point estimate of 2.95%), and a cost of new debt of 1.6%. This resulted in an allowed cost of debt for Bristol Water of 2.54 to 2.69%, with a point estimate of 2.61%.

60. For the cost of equity we calculated an asset beta range of 0.3 to 0.34, with a point estimate of 0.32 (equivalent to an equity beta of 0.85, assuming a 62.5% gearing level). We used a risk-free rate of 1.25% and equity risk premium of 5.25% to give an estimated cost of equity of 5.73%.

61. We calculated a range for Bristol Water's appointee cost of capital as 3.63 to 3.93%. We took a balanced approach to the data, and therefore decided that using the mid-point of our cost of debt and equity ranges gave an appropriate point estimate (3.78%).

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[7] Deadbands represent performance close to the target level which have no associated penalties or rewards, while the level of caps/collars represents the maximum reward/penalty for the associated ODI.

62. Finally, we made a wholesale-appointee adjustment of –0.11% to the cost of capital and concluded that the wholesale cost of capital was 3.67%, versus Ofwat's value of 3.6% and Bristol Water's value of 4.37%.

Total allowed Bristol Water revenue and financeability

63. We considered the appropriate level of wholesale revenue for Bristol Water to receive in the period compared with the value added to its RCV, which aimed to balance the needs of current and future customers, as well as protecting the company from longer term financeability issues.

64. To determine total wholesale revenue for Bristol Water, we updated the Ofwat financial model to calculate the overall impact of our determination. We used the revised wholesale totex assessment and cost of capital, made appropriate assumptions for the PAYG and RCV run-off rates, and used our approach to the menu scheme to calculate the overall wholesale revenue and K for each financial year from 1 April 2015 to 31 March 2020. We found that the total allowed wholesale revenue for this five-year period should be £469.9 million (in 2012/13 prices before the effects of RPI indexation). Our determination of total allowed wholesale revenue and K is set out below in Table 1.

Table 1: Total allowed wholesale revenue and K

2012/13 prices

	2015/16	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*Total*
Total allowed wholesale revenue (£m)	95.0	93.2	93.7	93.9	94.1	469.9
K%	0.0%	–1.8%	0.5%	0.3%	0.2%	

Source: CMA analysis.

65. We estimated total revenue, after including estimates of household and non-household retail revenues arising from Ofwat's retail price controls, in 2012/13 prices, to be £534.7 million.

66. We assessed the impact of our determination on the financeability of Bristol Water. We considered that the assumptions we used (including a depreciation of new assets of 3.7%, RCV run-off of 6%, PAYG rate of 55.3%, wholesale WACC of 3.67% and gearing maintained at 62.5%) resulted in a determination which under which Bristol Water was financeable and which fulfilled our statutory duties.

67. We estimated the effect of our determination on customer bills. In its determination, Ofwat projected household bills over the period from 2015 to 2020. These showed that Bristol Water's household bills would reduce in real terms (ie before RPI inflation is considered), from £191 per customer in

2014/15 to an average annual bill of £155 across AMP6.[8] On the basis of our determination, we estimated that average annual household bills would be around £160 across AMP6 before RPI inflation is considered. Although these would be higher than under the Ofwat determination, they would be substantially lower than the bills estimated by Bristol Water (average annual bills were projected to be £187 across AMP6 before RPI inflation is considered).

[8] The figures in FD14 were expressed in 2012/13 prices. All figures in this report are also 2012/13 prices unless otherwise stated.

Determination

1. The reference

1.1 Under the terms of its Licence,[9] the charges that Bristol Water can make for its retail and wholesale activities are controlled by Ofwat, which carries out five-yearly 'periodic reviews' (or 'price reviews') for this purpose.

1.2 On 12 December 2014, Ofwat published its final determination of the controls that limit Bristol Water's charges in the five-year period from 1 April 2015 to 31 March 2020. Bristol Water disputed the price determination, and under the terms of Condition B of its Licence required Ofwat to refer the disputed determination to the CMA for a further determination.[10] On 4 March 2015, Ofwat made the reference to the CMA[11] (see Appendix 1.1).

1.3 The reference required the CMA to report on and determine the disputed determination by 3 September 2015. On 11 August, this deadline was extended by Ofwat to 3 November 2015. As explained in further detail below, the CMA is required to make its determination in accordance with the same statutory provisions and duties as applied to Ofwat when it made the disputed determination, and in accordance with Condition B of Bristol Water's Licence.

1.4 The functions of the CMA with respect to this reference were carried out by a group constituted for the purpose by the Chair of the CMA[12] and the reference was conducted in accordance with the usual CMA rules of procedure.[13] Non-confidential versions of relevant documents, including the administrative timetable, written submissions from the main parties and third parties and summaries of hearings with third parties, have been published on the CMA's webpages.[14]

[9] Condition B, paragraph 8.
[10] In accordance with section 12(2) of the WIA 91 and Condition B of Bristol Water's Licence.
[11] Under section 12(3)(a) of the WIA 91.
[12] In accordance with section 12(3D) of the WIA 91.
[13] *Rules of Procedure for Merger, Market and Special Reference Groups (CMA17)*.
[14] See the Bristol Water plc price determination webpage.

2. Background

2.1 We set out below a brief description of Bristol Water and of the statutory framework for the determination, an outline of Ofwat's approach to PR14, and a summary of Bristol Water's concerns with Ofwat's approach.

Bristol Water

2.2 Bristol Water is a WoC based in the South West. It is responsible for the sourcing, treatment and distribution of water,[15] supplying water to over 1.2 million people and businesses. Over 56% of the properties supplied are situated in the urban area of Bristol.[16]

2.3 Bristol Water obtains water from a variety of resources. At different times of the year, the proportion of water taken from each resource category will change reflecting the availability of resources over the year. The main categories, and their average contribution to water pumped into supply, are:

(a) 45% rivers, principally the River Severn via the Sharpness Canal (also the rivers Cam and Frome). 99.4% of the water from rivers is supplied through the Sharpness Canal;[17]

(b) 40% shallow surface water reservoirs in the Mendips; and

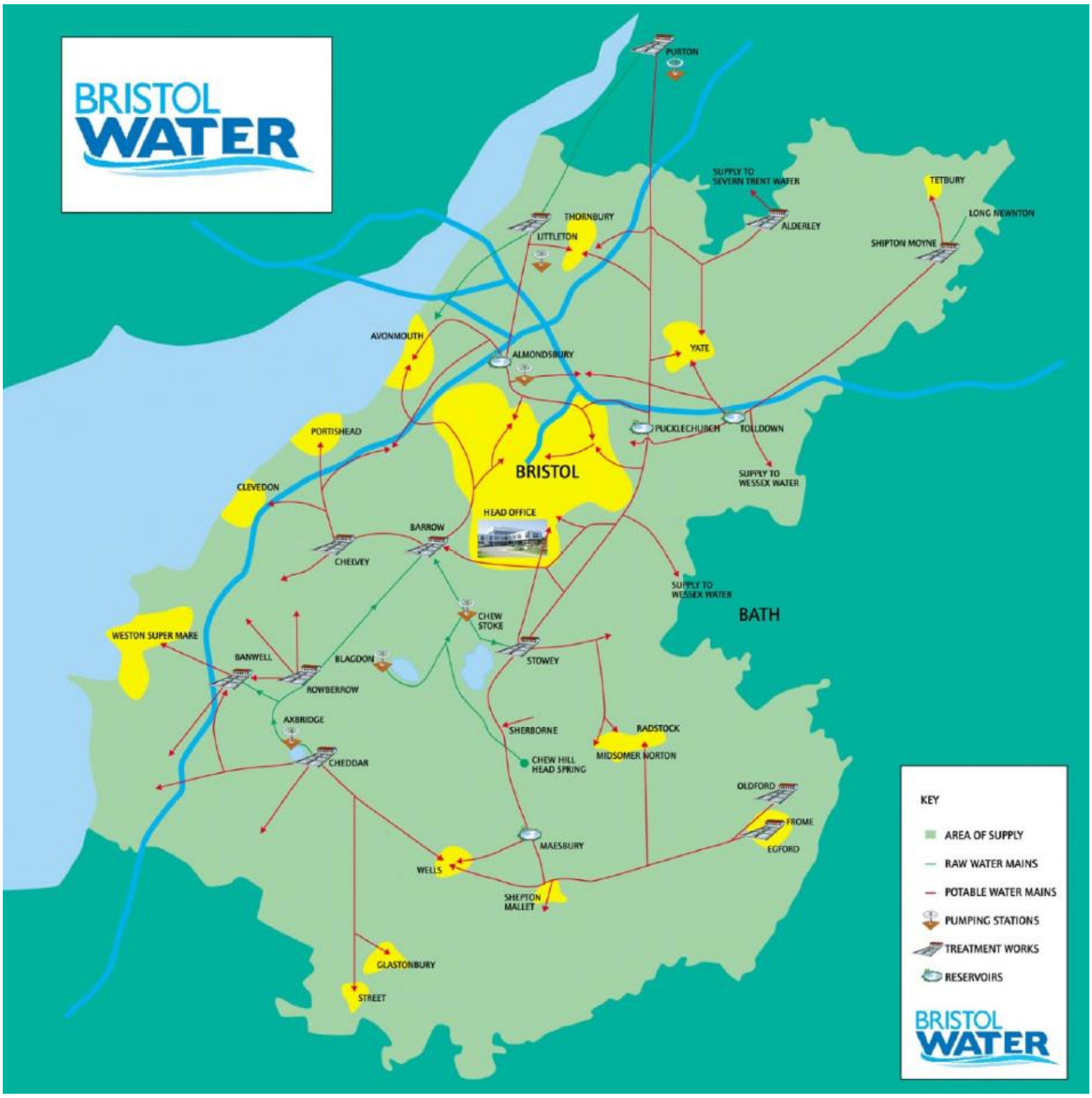
(c) 15% small springs and some boreholes in Jurassic Limestone.[18]

2.4 Bristol Water told us that it considers these resources are sufficient to provide for an average daily demand for water of approximately 300 million litres, based on the probability that restrictions to customers' water use during a period of drought will be required once every 15 years on average.[19]

2.5 Figure 2.1 shows Bristol Water's supply area.

[15] Bristol Water also has a small number of non-regulated activities.
[16] Bristol Water statement of case (SoC), paragraphs 48 & 160.
[17] Bristol Water SoC, paragraph 249.
[18] Bristol Water SoC, paragraph 246 and Figure 9.
[19] Bristol Water SoC, paragraph 247.

Figure 2.1: Bristol Water's supply area (Scale 1:500,000)



Source: Bristol Water SoC, p81.

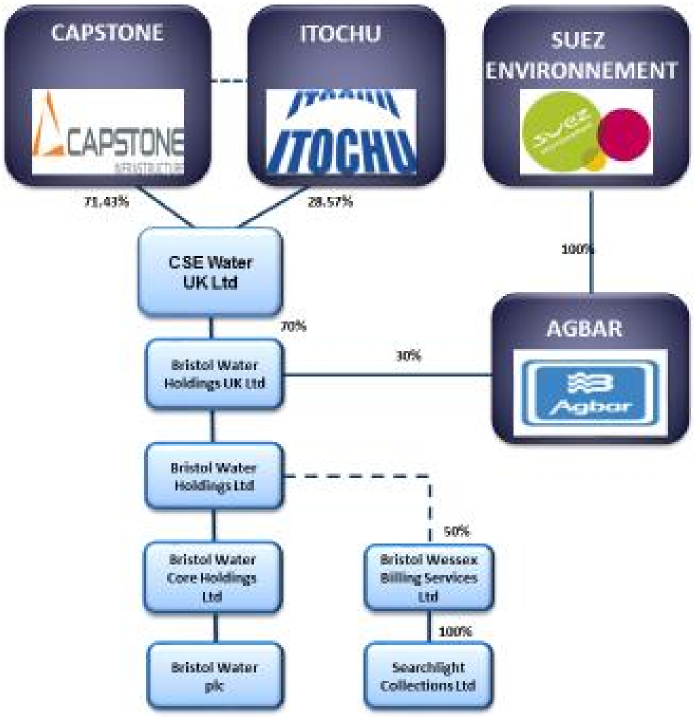
2.6 In terms of the history of Bristol Water, the Bristol Waterworks Company was incorporated as a statutory company by Act of Parliament in 1846. It grew by a mixture of organic growth and acquisition, and 18 local water undertakings, owned by a mixture of local rural and urban councils, were amalgamated into the company between 1952 and 1964.[20]

2.7 In 1989, the water industry was privatised, and on 12 November 1991, the Bristol Waterworks Company became Bristol Water plc, a subsidiary of the newly incorporated Bristol Water Holdings plc.[21] Subsequently, in

[20] Bristol Water SoC, paragraph 171.
[21] Bristol Water SoC, paragraph 172.

June 2006, all of the shares of Bristol Water Group plc were acquired by Agbar.[22,23] Following further transactions Bristol Water is now owned 30% by Agbar, 50% by Capstone and 20% by Itochu.[24] The ownership structure is shown in more detail in Figure 2.2 below.

Figure 2.2: **Bristol Water ownership structure**



Source: Bristol Water SoC, p65, Figure 3.

Statistory framework

2.8 When the water industry in England and Wales was privatised in 1989,[25] existing statutory water companies[26] such as Bristol Water were appointed by the Secretary of State as 'water undertakers'. Each company's Licence specifies the geographic area in which the company is to be a water

[22] Bristol Water SoC, paragraph 174.
[23] Agbar is owned 100% by Suez Environnement Company, S.A. (Bristol Water SoC, paragraph 176).
[24] Bristol Water SoC, paragraph 176.
[25] By the Water Act 1989; the relevant provisions as amended are now consolidated in the WIA 91. Different arrangements apply in Scotland.
[26] For example, any company that was a statutory water company for the purposes of the Water Act 1973 immediately before 1 September 1989: s.219(1) WIA 91.

undertaker[27] (or a water undertaker and sewerage undertaker, as the case may be) and imposes conditions of appointment on the company concerned.

2.9 The post-privatisation provisions for the water industry in England and Wales are consolidated in the WIA 91, which has been amended at various times. Important amendments to the WIA 91 were made by the Water Act 2003, which introduced new regulatory arrangements for the water industry. The Water Act 2014 amended some of the procedural arrangements relevant to this reference, and added a new principal statutory duty to secure resilience, which Ofwat must take into account when making determinations.[28] It also enables Ofwat to set charging rules with which all water companies must comply.[29] A description of the statutory duties is set out below (see paragraphs 2.16 to 2.18).

2.10 Water undertakers have the power to make charges for any services provided in the course of carrying out their statutory functions in relation to water.[30] These charges are regulated. The conditions of appointment of all the water undertakers include a Condition B (charges), which enables Ofwat to carry out periodic reviews and to make price control determinations that are designed to limit the charges levied by the relevant water company and the revenue allowed to that company.

2.11 For all price controls effective up to 31 March 2015, Ofwat set a single price control for water companies (including WaSCs) in England and Wales. Following changes to Condition B, there are now separate price controls for companies' wholesale activities and retail activities.[31]

2.12 For wholesale activities, the price control in Condition B is expressed as a formula, RPI + K, where RPI is the percentage change in the retail price index in the 12 months between November in the year prior to the relevant charging year and November in the preceding year, and 'K' is a value (positive or negative), expressed as a percentage figure as determined in each price review. K limits the company's revenue and reflects what Ofwat considers the relevant company needs to spend to finance its investments

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[27] Water undertakers (which provide water services only) are to be distinguished from the Water and Sewerage undertakers (which provide both water and sewerage services) and from Licensed Water Suppliers, which supply water, taken from an undertaker's water supply system, to non-domestic premises under a s.17A WIA 91 Licence (provisions added by the Water Act 2003, but substituted, as from 1 September 2015, by section 1 of the Water Act 2014).
[28] Section 2(2A)(e) WIA 91, as inserted by section 22(2)(b) of the Water Act 2014.
[29] Section 143 WIA 91.
[30] Section 142 WIA 91.
[31] The wholesale control covers the technical services that the companies provide – such as abstracting, storing and treating water so it is fit to drink, and transporting it through a network of pipes to a customer's property. The retail price control covers household-related services that the companies provide – such as sending customers' bills, and responding to customer enquiries and non-household water supply. See Price review 2014.

and properly provide services to its customers during the period covered by the price review.[32] The wholesale price controls are to be set for five-year periods, with the first wholesale price control starting on 1 April 2015.[33]

2.13 For retail activities, Condition B provides flexibility for Ofwat to determine the price control by reference to what is the appropriate nature, form and level of price controls in respect of these activities, as well as the duration of these controls.[34]

2.14 If the water undertaker disputes Ofwat's determination following a periodic review, it can give notice, within two months of the determination, requiring Ofwat to refer the matter to the CMA for a further determination.[35]

2.15 The CMA must determine the reference in accordance with the same general statutory duties that Ofwat was required to apply when making the disputed determination (see below).[36] As the CMA is making a fresh determination, the CMA considers that it should, in principle, consider any further issues that have arisen since Ofwat made the disputed determination.

The general statutory duties

2.16 The general statutory duties are set out in section 2 of the WIA 91, and consist of five principal duties and five secondary duties (see Appendix 2.1). The principal duties are:

(a) to further the consumer objective, which is to protect the interests of consumers, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the provision of water and sewerage services;

(b) to secure that the company's functions under the WIA 91 are properly carried out;

(c) to secure that the company is able (in particular, by securing reasonable returns on its capital) to finance the proper carrying out of those functions (this is sometimes referred to as the 'financing duty');

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[32] Licence, Condition B, paragraph 8.4.
[33] Condition B 8.6(1).
[34] Licence, Condition B, paragraph 8.3(1).
[35] Condition B 15(3); section12(2)(b) WIA 91.
[36] Section12(3)(b) WIA 91.

(d) to secure that the activities authorised by the company's Licence and any statutory functions are properly carried out; and

(e) to further the resilience objective.[37]

2.17 The secondary duties are:

(a) to promote economy and efficiency on the part of companies holding Licences;

(b) to secure that no undue preference (including for the relevant body itself) or undue discrimination is shown;

(c) to secure that consumers are protected as regards benefits that could be secured for them from the proceeds of any disposal of a company's protected land;

(d) to ensure that consumers are protected as regards any activities of a company which are not attributable to the exercise of its functions under the WIA 91; and

(e) to contribute to the achievement of sustainable development.

2.18 We were guided by these statutory duties, as appropriate, throughout our determination.

The Ofwat 2014 price review

Introduction

2.19 In this section we summarise key aspects of Ofwat's approach to PR14 that are particularly relevant to our determination. We take the following in turn:

- Background to PR14.
- Separate price controls for wholesale and retail activities.
- Customer engagement and the PR14 price control review process.

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[37] The resilience duty is defined for these purposes in section 2(2DA) WIA 91 as: *(a)* to secure the long-term resilience of water undertakers' supply systems and sewerage undertakers' sewerage systems as regards environmental pressures, population growth and changes in consumer behaviour; and *(b)* to secure that undertakers take steps for the purpose of enabling them to meet, in the long term, the need for the supply of water and the provision of sewerage services to consumers, including by promoting: (i) appropriate long-term planning and investment by relevant undertakers; and (ii) the taking by them of a range of measures to manage water resources in sustainable ways, and to increase efficiency in the use of water and reduce demand for water so as to reduce pressure on water resources.

- Ofwat's approach to price control incentives and risk.
- Totex approach for the wholesale price controls.
- Ofwat's PR14 menu scheme.
- Reconciling 2010-2015 performance.
- Performance commitments and outcome delivery incentives.
- Cost of capital.

2.20 We do not seek to cover all elements of Ofwat's PR14 price control framework and final determinations. We describe some more detailed aspects of Ofwat's approach as they arise in subsequent sections of our determination.

Background to PR14

2.21 After Ofwat set price limits for the previous price control (PR09) in November 2009 it began an in-depth review of its regulation.[38] In November 2011, it consulted on proposals for the high-level principles that would guide the further development of price setting.[39] The revised process for PR14 began in May 2012, when Ofwat published a document, 'Future price limits, statement of principles', that set out the high-level principles that Ofwat intended to use to guide it in how it sets price limits in the future. The process continued until final determinations were published for each WoC, or WaSC, in December 2014.

2.22 Ofwat told us that it introduced a game-changing methodology for PR14. Ofwat said PR14 sought to deliver the best possible outcome for customers across England and Wales, the environment and society, now and in the future, ensuring a financially sustainable and resilient sector in the long term.

Separate price controls for wholesale and retail activities

2.23 Following changes to companies' conditions of appointment (paragraph 2.11), Ofwat set four separate types of price control (three for WoCs). These cover:

(a) wholesale water activities;

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[38] Ofwat, Beyond limits – how should prices for monopoly water and sewerage services be controlled?
[39] Ofwat, Future price limits – a consultation on the framework.

(b) wholesale wastewater activities (not relevant to Bristol Water);

(c) retail supply to households; and

(d) retail supply to non-households.[40]

2.24 The development of these separate price controls reflects, in part, a number of legislative and regulatory changes in the water industry in England which are intended to support the development of competition, particularly for the supply of retail water and wastewater services to non-household customers. The Water Act 2014 will enable the lifting of restrictions on non-household customers in England switching their supplier of water retail services.[41] It is intended that this will apply from 2017.

2.25 All of the price controls set by Ofwat are in the form of revenue controls. These do not specify the individual prices or tariffs that companies charge for water services (such as unit charges, standing charges, or business tariffs). Final tariffs that are charged to customers recover costs for both wholesale activities and retail activities. There are separate regulatory processes, policies and rules that apply to companies' decisions on the level of individual tariffs.[42]

Wholesale price controls

2.26 The wholesale price controls set out in Ofwat's FD14 apply for the five-year period from 1 April 2015 to 31 March 2020.

2.27 The wholesale 'price controls' operate as a restriction on a measure of the total charges/revenues attributed to the water company's wholesale activities. As noted in paragraph 2.12, the total allowed revenue attributed to Bristol Water's wholesale activities in a year is determined by Ofwat (or the CMA, in a determination) and is expressed in the formula RPI + K. This means that the level of the wholesale price control is adjusted each year according to the net effect of changes in the RPI and the K factor.

2.28 Ofwat's price control framework for wholesale price controls is based around the RCV.[43] This is a fundamental part of Ofwat's regulatory regime that

[40] The allocation of activities between wholesale and retail is specified in the conditions of appointment, or otherwise determined by Ofwat.
[41] Section 3 of the Water Act 2014 gives the Secretary of State and the Welsh Ministers power to repeal the current threshold in section 17A(3)(b) of the WIA 91 for England and for Wales, respectively, and section 17A will be substituted as section 17A and section 17AA by section 1 of the Water Act 2014 from a day to be appointed.
[42] These tariffs tend to be set annually, subject to the overall constraints from the aggregate revenue control.
[43] Also known as the regulatory asset base or regulatory asset value, particularly in other regulated sectors besides water.

applies to water companies across England and Wales and was not disputed by Bristol Water or other stakeholder submissions to us. The RCV represents a notional value of investment in the business that is used for regulatory price control purposes.[44] At the price control review, Ofwat includes in its calculations an allowance for what it considers to be a reasonable level of profit or return on the RCV, based on the estimated cost of capital over the price control period.

2.29 Under the RCV-based approach, estimates or assumptions of each company's expenditure requirements, over the five-year price control period, are an input to calculation of the wholesale price control. Ofwat seeks to assess what each company's expenditure requirements would be if its spending was in line with that of an efficient company. Ofwat's cost assessment feeds into the calculation of the total allowed wholesale revenue, along with other elements such as allowances for regulatory depreciation and profit on past investment (the cost of capital applied to the RCV, as described below).

Retail price controls

2.30 Ofwat described the household retail control as a total revenue control with annual revenue adjustment factors to reflect differences between actual and forecast customer numbers and meter penetration. It is a five-year price control from 1 April 2015.[45]

2.31 Ofwat's price controls for retail services to non-household customers are actually a series of separate average revenue controls that apply to different types of customers or services. Companies must offer 'default tariffs' for the relevant customer type which comply with these average retail revenue controls. The non-household controls for Bristol Water were set for two years from 1 April 2015.

2.32 We describe the retail price controls in Appendix 2.2.

Customer engagement and the PR14 price control review process

2.33 Ofwat said it wanted companies to take more responsibility for understanding what their customers' priorities were, acting upon them and delivering against expectations in an efficient and sustainable way over the

[44] The RCV reflects the flotation values of the subset of water companies privatised in 1989 and subsequent investments. It is not a measure of the economic value of the water company's assets. Its value changes over time due to RPI indexation, regulatory depreciation and new investment or expenditure added to the RCV.
[45] Ofwat submission, p49.

long term. Ofwat required each company to focus on customer priorities and establish an independent CCG to review and challenge the way companies engaged customers and took customer views into account. Each independent CCG was required to provide assurance to Ofwat about the quality and effectiveness of companies' direct engagement with their customers. In the case of Bristol Water, the CCG was called the Local Engagement Forum (LEF).[46] Ofwat said it also expected each company's board to set out how it had received assurance that their business plan was of a high standard.[47]

2.34 Companies were required to submit business plans to Ofwat by December 2013. Each company's business plan was assessed by Ofwat against objective criteria[48] in a risk-based review, and the companies with plans judged to be of exceptional quality were given 'enhanced status' and benefited from an early draft determination and some financial rewards. The results of the risk-based review were announced in March 2014. Two companies were enhanced companies (South West Water and Affinity Water). Other companies were able to submit revised plans in the light of the Ofwat review. Following this, Ofwat announced its draft determinations for non-enhanced companies in May 2014 and August 2014 and its final determinations in December 2014.

2.35 Ofwat said that it had adopted a more flexible and targeted approach to the price control review process. This reflected Ofwat's views on the quality of each company's business plan and the assurance that the company had carried out itself. For several companies, Ofwat published early draft determinations. For other companies, Ofwat carried out more detailed analysis. For example, in the case of Bristol Water, Ofwat said that in addition to reviewing the material provided by the company, it also carried out its own more intensive assessment of Bristol Water's required expenditure, which was an approach that Ofwat did not take for any other company.[49]

Ofwat's approach to price control incentives and risk

2.36 Across both wholesale and retail price controls, Ofwat's price control framework is a form of incentive regulation. It places emphasis on seeking to develop and establish arrangements that provide financial incentives to

[46] The LEF consisted of members representing customers, local authorities, businesses and environmental groups (including the Consumer Council for Water (CCWater), the Drinking Water Inspectorate (DWI), the Environment Agency (EA) and Natural England).
[47] Ofwat submission, pp2 & 3.
[48] See risk-based review recommendations.
[49] Ofwat submission, p11.

encourage regulated companies to behave in a way that is consistent with Ofwat's duties (see paragraphs 2.16 to 2.17). The price control framework includes financial incentives intended to encourage companies to operate and invest efficiently and financial incentives relating to companies' quality of service.[50]

2.37 Ofwat's price control framework included a range of elements relating to companies' cost efficiency, the services they provide to consumers and the outcomes that they seek to achieve.

2.38 Ofwat said that it had sought to incentivise companies to go beyond average performance and move towards 'frontier efficiency' and service performance,[51] and that by providing such incentives, customers benefit in the long term from a better value service.

2.39 Ofwat said it wanted companies to take ownership for managing risk and to ensure a better allocation of risk and reward between investors, management and companies.[52]

Totex approach for the wholesale price controls

2.40 After PR09, stakeholders were concerned that differences in the way Ofwat assessed, remunerated and incentivised opex compared to capex encouraged a focus on capital solutions (at the expense of potentially more innovative and sustainable solutions). Ofwat said the Cave[53] and Gray[54] reviews recommended it take steps to address this.[55]

2.41 In PR14 Ofwat introduced a totex approach and explained that totex, already used within other regulated sectors, was a key measure introduced to help redress the balance between opex and capex and to incentivise overall efficiency, encouraging companies to develop innovative and low-cost solutions to meeting the needs of their customers.[56]

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[50] In some cases, these incentives may take the form of an explicit incentive scheme or arrangement for financial rewards or penalties. In other cases, they may arise from the combined effect of different parts of the price control framework. The effectiveness of the financial incentives that companies face will also depend on companies' expectations about how the regulator will approach the next price control review and how the price control framework will operate in the future.
[51] Ofwat submission, p4.
[52] Ofwat submission, pp1 & 2.
[53] Independent Review of Competition and Innovation in Water Markets, M Cave (2011).
[54] Review of Ofwat and consumer representation in the water sector, D Gray (2011).
[55] Ofwat submission, p2.
[56] Ofwat (December 2014), Final price control determination notice: policy chapter A3 – wholesale water and wastewater costs and revenues, p2.

2.42 Ofwat's totex approach applied across three related areas of its wholesale price controls, which were:

(a) cost assessment;

(b) cost recovery and the RCV; and

(c) cost sharing incentives.

Totex approach to wholesale cost assessment

2.43 Ofwat adopted a totex approach to cost assessment. It set a single wholesale expenditure allowance covering both opex and capex. Ofwat did not seek to decompose this into separate allowances for opex and capex.[57]

2.44 Ofwat's approach to cost assessment placed emphasis on totex benchmarking analysis.[58] Ofwat used several strands of analysis:

- Econometric benchmarking models which made comparisons of measures of totex between companies.[59,60]
- Econometric benchmarking models which compared measures of base expenditure61 between companies.
- A separate strand of benchmarking analysis focused on enhancement expenditure. This took different categories of enhancement expenditure separately.
- In addition to the benchmarking analysis Ofwat made a series of adjustments for 'special cost factors,' intended to capture specific aspects of companies' characteristics and circumstances that affect their costs materially and which may not have been taken into account in Ofwat's benchmarking analysis.

2.45 In its submissions to us, Ofwat emphasised that its approach to benchmarking analysis and its use of econometric benchmarking models

[57] Ofwat found that some assumptions on the split between opex and capex were necessary in some areas, such as the calculation of allowances for corporation tax and the financing assessment.
[58] Companies were able to submit requests for special cost factors to be taken into account by Ofwat where they considered that the Ofwat models did not reflect their individual circumstances.
[59] The measure of totex for each company for each year in the data sample is a measure of opex attributed to wholesale activities in that year plus average capex attributed to wholesale activities in the last five years.
[60] Ofwat's consultants, CEPA, adopted an approach of 'smoothing' capex over a five-year period before making benchmarking comparisons between companies.
[61] Base expenditure is opex + capital maintenance expenditure (capex required to maintain existing assets) but excluding capex attributed to enhancement projects.

was complemented by the wider process for company-specific analysis and special cost factor adjustments.

2.46 Appendix 2.3 provides greater detail on Ofwat's approach to cost assessment.

Totex approach to wholesale cost recovery and the RCV

2.47 As highlighted above, the RCV represents the regulatory value on which an allowance for profit is calculated. Under Ofwat's previous approach, only the level of capex affected the RCV and regulatory depreciation. A company's RCV grew broadly according to the RPI indexation of the RCV and according to the level of enhancement expenditure.

2.48 Ofwat's new approach had the following features:

(a) A fixed proportion of the wholesale totex allowance (reflecting Ofwat's cost assessment) was remunerated directly through revenues collected during the price control period. This proportion is given by the pay as you go (PAYG) rate. The remainder was treated as post-2015 additions, to be added to the RCV and remunerated over a longer time period.

(b) Regulatory depreciation on the opening value of the RCV at the start of the price control period (1 April 2015) was calculated using a declining balance depreciation policy, with the applicable annual rate of depreciation given by the 'RCV run-off rate'.

(c) Regulatory depreciation on new additions to the RCV from 1 April 2015 was calculated. These post-2015 additions reflect the element of wholesale expenditure allowance that is not remunerated through the PAYG rate under *(a)* above.

2.49 Ofwat's approach gave companies flexibility over these parameters, subject to Ofwat's review and agreement.

Totex cost sharing incentives for the wholesale price control

2.50 Ofwat set a wholesale price control for each company on the basis of a 'wholesale expenditure allowance' for the five-year price control period, and then providing 'cost sharing incentives' for any deviations from it during the price control period as a result of the company's actual expenditure.

2.51 The cost sharing incentive works by setting a proportion of any over- or under-spend against the wholesale expenditure allowance that is retained by the company, rather than being passed through to consumers. It therefore affects the profit incentives on the company to operate efficiently during the price control period, as well as the financial risk faced by the company. A lower rate involves more pass-through of actual expenditure to consumers and will tend to weaken financial incentives. These cost sharing incentives are implemented through financial adjustments to the calculation of the company's allowed revenue in the next price control period.

2.52 For PR14, Ofwat applied the cost sharing rate to totex with no distinction between opex and capex. The totex cost sharing rate set by Ofwat varied between companies – the precise figure was determined by the PR14 menu scheme.

Ofwat's PR14 menu scheme

2.53 Ofwat applied a 'menu regulation' scheme for PR14, which was a development and extension of the capital expenditure incentive scheme (CIS) that it applied to capex at its PR09 review. The CIS that Ofwat introduced at PR09 was, in turn, based on the information quality incentive (IQI) that Ofgem has used as part of its regulation of energy network companies in the UK.

2.54 The purpose of the scheme originally developed by Ofgem was to provide financial incentives for energy network companies to submit more accurate forecasts of their future expenditure requirements within their price control business plans.

2.55 The Ofwat menu scheme affects the cost sharing incentive rate that each company faces and the allocation of a company's allowed wholesale revenues between the coming price control period and subsequent price control periods. Ofwat's assessment of each company's efficient wholesale expenditure requirements is an input to the scheme, alongside a forecast from each company of its expenditure requirements over the price control period.

2.56 Ofwat implemented its PR14 menu scheme differently from the schemes used by Ofgem and from the way it had applied the earlier CIS. The CIS had applied only to capex whereas the Ofwat PR14 menu scheme applied to totex. The PR14 scheme placed greater emphasis on providing each company with flexibility to influence the level of cost sharing incentive that it faced (within a pre-defined range of 44 to 54% set by Ofwat).

2.57 Ofwat's view was that its menu regulation scheme would provide extra incentives for companies to provide accurate expenditure forecasts, allow some extra flexibility in setting totex baselines, provide some additional flexibility in setting cost sharing factors, and allow companies to better manage risks and rewards.[62] Ofwat told us that a further benefit of its menu scheme approach was that it would provide useful information for Ofwat's PR19 price control review.

2.58 We describe Ofwat's menu scheme further in Appendix 2.4.

Reconciling 2010 to 2015 performance

2.59 Part of Ofwat's final determination included a number of financial adjustments to reconcile allowed expenditure with actual historical performance, according to the rules and policies set at previous price control reviews.

Performance commitments and outcome delivery incentives

2.60 Ofwat sought to place greater emphasis on the outcomes that mattered to consumers. It said that historically, regulatory targets for delivery were set with reference to inputs (such as the construction of a length of pipe) or outputs (such as delivery of a particular engineering scheme).[63]

2.61 For PR14, Ofwat went through a process to incentivise outcome performance. This was designed to reduce direct regulatory oversight and give companies flexibility on the approach to managing their resources, while focusing on directly benefiting customers in areas they care about. Ofwat said for PR14 companies were encouraged to set financial incentives (both reward and penalty) directly linked to performance above and below their committed performance level for each outcome and relative to allowed totex. The incentives were directly linked to customer priorities and willingness to pay, to align benefits to customers with rewards for investors.

2.62 The intention behind the design of ODIs was that these should be based on customer research and agreed with the CCGs. Companies were asked to come up with their own list of metrics and targets, based on the customer research, in order to provide broad specified outcomes (eg 'Reliable Supply'). This also included determining the type and size of reward/penalty that was appropriate for exceeding/failing the measure.

2.63 Ofwat chose to intervene in a number of these areas, particularly regarding the target levels of service required. It did this to ensure that customers were

[62] Ofwat (July 2013), Setting price controls for 2015-20 – final methodology and expectations for companies' business plans, p88.
[63] Ofwat submission, p44.

properly protected and where appropriate, companies were targeting upper quartile performance, under the premise that CCGs and customers were not necessarily well placed to understand the level of service that other companies were providing, so could not accurately assess this for themselves.

Cost of capital

2.64 As described in paragraph 2.29, the calculation of the wholesale revenue control includes an allowance for profit, determined by the application of the wholesale WACC to the RCV.

2.65 In its final determinations, Ofwat set a WACC of 3.60%. There were some exceptions:

(a) Enhanced companies[64] were awarded a higher WACC of 3.7%.

(b) Portsmouth Water and Sembcorp Bournemouth Water[65] were allowed a small company uplift on the cost of debt of 0.25%, equating to a 0.15% uplift on the overall cost of capital.

2.66 Ofwat considered that it was not in customers' interests to set the cost of capital based on embedded debt costs of individual companies as this would reduce the incentives for companies to finance themselves efficiently. Instead, it assumed a notional level and cost of debt. Ofwat assumed a notional gearing figure of 62.5%.

2.67 Ofwat did not consider that small WoCs had a higher cost of equity but accepted that on average they faced a higher cost of debt. It considered that a 0.25% adjustment to the efficient notional cost of debt was appropriate as a small company premium on debt costs. However, Ofwat considered that companies had to demonstrate that this allowance was in customers' interests (the benefits test). The benefits test assessed whether the customer benefits from providing the uplift more than offset the incremental financing costs. Ofwat accepted that the other small WoCs, including Bristol Water, had a higher cost of debt (than included in the industry wholesale WACC) but that there was no robust evidence of an offsetting customer benefit.

2.68 For calculating a cost of equity, Ofwat used the capital asset pricing model. This requires estimates for the risk-free rate, and equity market returns, as

[64] South West Water and Affinity Water.
[65] On 16 April 2015, South West Water announced the acquisition of Sembcorp Bournemouth Water. The merger has been investigated by the CMA.

well as requiring a company-specific estimate for 'beta' (the systematic risk). Ofwat estimated these based on:

(a) **risk-free rate** – current gilt yields adjusted for forward-looking expectations, alongside regulatory precedent;

(b) **equity market return** – historic equity returns and dividend growth models, as well as regulatory precedent (controlling for RPI methodology changes); and

(c) **beta** – estimated from the three public WaSCs and applied to all water companies, with no company-specific uplift/small company premium allowed.

2.69 Finally, Ofwat implemented an 'appointee-wholesale' adjustment in order to ensure that companies were not compensated twice for a proportion of their capital – once in the retail margin, and again in the returns from capital. Ofwat stated that, since the retail businesses generate positive margins, these represent a return on the RCV that should be netted off the appointee WACC to give a wholesale water-only WACC. This would ensure that returns on notional retail assets are not included twice.[66]

Bristol Water's reasons for rejecting FD14

2.70 Bristol Water said that while the implementation of PR14 had been recognised as a success, the specific FD14 did not meet the needs of its customers or of the company. It said that it accepted the retail price controls that were part of Ofwat's final determination but rejected the wholesale price control.[67]

2.71 Bristol Water said that for PR14, companies had been asked to place customers at the heart of the process.[68] It said customers had played a fundamental and crucial role in shaping every element of the Bristol Water business plan. As early adopters of Ofwat's CCG through the LEF, Bristol Water said it had ensured that customers' views played a central role in the evolution of its aims, outcomes, performance commitments and proposed packages of activities.[69]

[66] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p34.
[67] Bristol Water SoC, paragraphs 1–2.
[68] Bristol Water SoC, paragraph 5.
[69] Bristol Water SoC, paragraph 10.

2.72 Bristol Water said that the most significant reason for seeking a redetermination from the CMA was the difference between its business plan and FD14 regarding the appropriate level of wholesale costs to deliver the agreed outcomes. It said that Ofwat had concluded that Bristol Water's level of wholesale totex during AMP6[70] should be £409 million, whereas Bristol Water's business plan had proposed expenditure of £537 million. Bristol Water said FD14 was insufficient to deliver the outcomes customers wanted and was an unrealistic assumption of what was required in order to run the business. It said that Ofwat had not considered whether the resulting level of operating costs was achievable in practice, including the immediate reduction in 2015/16 in average household bills from £198 to £162, reducing further to £152 for the remainder of the period.[71,72]

2.73 Bristol Water raised a number of specific concerns with Ofwat's approach to the assessment of wholesale costs:[73]

(a) **Narrow approach with focus on top-down econometrics** – Bristol Water argued that Ofwat used a narrow approach to cost assessment that was too focused on top-down econometric benchmarking models. It said that if Ofwat had taken a wider approach to cost assessment, 'it is more likely that shortcomings or bias in any one of the approaches would be identified, and that in combination a range of approaches would result in a more robust assessment'. It identified potential benefits from more disaggregated forms of benchmarking analysis.

(b) **Econometric models** – Bristol Water argued that Ofwat's benchmarking models were not robust and not appropriate to assess Bristol Water's costs. Bristol Water considered that it had been disproportionately affected by the shortcomings of Ofwat's modelling.

(c) **Treatment of enhancement expenditure** – Bristol Water argued that 'the requirements of companies for enhancement expenditure are disparate reflecting different water quality, growth and reliance risks they face'. Bristol Water considered that the costs of enhancements were not suitable for inclusion within econometric modelling and that the best approach was to carry out an analysis of the need and costs for each enhancement scheme.

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[70] Note: later in this document we also use AMP4 and AMP5. AMP4 refers to the Asset Management Plan for the period 1 April 2005 to 31 March 2010 and AMP5 refers to the Asset Management Plan for the period 1 April 2010 to 31 March 2015.
[71] Bristol Water SoC, paragraphs 12–13.
[72] Note in FD14 Ofwat quote the customer bill in 2014/15 as £191 due to differences in calculation methodology.
[73] Bristol Water SoC, pp386–393.

(d) **Upper quartile efficiency benchmark** – Bristol Water was concerned that Ofwat was using an upper quartile efficiency benchmark within its benchmarking approach,[74] which may result in an efficiency challenge that goes beyond what was reasonable for a company to achieve within the price control period. It identified that some aspects of efficiency may relate to past investments and said that it could take substantial time for a company to catch up any efficiency gap. It also said that, for capex, Ofwat's use of the upper quartile for capex may lead to under investment to the detriment of customers and quality of service.

(e) **Special cost factor process** – Bristol Water said that the process and assessment used by Ofwat to make adjustments to the results from its benchmarking analysis had not been sufficiently robust or transparent to address the weaknesses of Ofwat's cost assessment and modelling. Bristol Water said that Ofwat had not recognised the detailed analysis that supported Bristol Water's own cost assessment.

(f) **Lack of separate estimate of operating costs** – Bristol Water argued that a weakness of Ofwat's approach was that it did not allow for a separate analysis of operating costs. Bristol Water said it was important to consider operating costs separately because it affected the corporation tax paid and the financial metrics used by credit rating agencies, which fed into the financeability analysis.

2.74 Bristol Water also said that it 'would like the CMA to explore a range of alternative approaches which are better able to cope with genuine differences between the operating environments of individual companies, rather than simply replicating the approach taken by Ofwat'.[75] In particular, Bristol Water said it would like the CMA to:[76]

(a) 'incorporate a separate assessment of operating costs and efficiency as a component of the overall totex approach;

(b) assess capital maintenance expenditure using a bottom-up approach supported by appropriate benchmarking;

(c) assess capital enhancement expenditure using a bottom-up approach supported by appropriate benchmarking; and

[74] Ofwat's cost assessment for each company was intended to produce an estimate of the company's expenditure requirements if it operated at a level of efficiency which reflected the upper quartile level of performance amongst the 18 water companies in Ofwat's benchmarking analysis.
[75] Bristol Water SoC, paragraph 1568.
[76] Bristol Water SoC, paragraph 478.

(d) fund schemes with clear customer support'.

2.75 With regard to cost of capital, Bristol Water said that the cost of capital allowed of 3.6% was insufficient to cover the actual financing costs of Bristol Water.[77]

2.76 Bristol Water also said the 23% reduction in bills resulting from the final determination meant that Bristol Water was unfinanceable under FD14.[78]

2.77 Bristol Water also raised two other areas of difference:[79]

(a) **Reconciling 2010-2015 performance** – Bristol Water said that it did not consider that Ofwat's decision to apply a serviceability penalty for performance during 2010-2015 was appropriate, because of underlying events and the test which it argued should have been applied.[80]

(b) **ODI targets** – Bristol Water said that it considered that amendments made during FD14 to three proposed ODIs were unrealistic and would lead to unavoidable performance penalties.

Comments from other parties about the Ofwat PR14 approach

2.78 Submissions from other parties were received from:

(a) Bristol Water's LEF;

(b) CCWater;

(c) DWI;

(d) Two customers of Bristol Water;

(e) Anglian Water;

(f) Dŵr Cymru Welsh Water;

(g) South West Water;

[77] Bristol Water SoC, paragraph 2.
[78] Bristol Water SoC, paragraph 2.
[79] Bristol Water SoC, paragraph 30.
[80] Ofwat chose to intervene in three areas of Bristol Water's wholesale performance targets (out of 15), setting more challenging target levels than Bristol Water had originally proposed.

(h) Thames Water; and

(i) Wessex Water.

2.79 These are summarised in Appendix 2.5.[81]

[81] Responses of third parties to our provisional findings are also summarised in Appendix 2.5.

3. Our approach to the determination

3.1 In this section we set out our approach to the determination and describe how we dealt with key elements of the determination.

3.2 The general statutory duties set out in section 2 of the WIA 91 (see paragraphs 2.16 to 2.17) apply to the CMA's determination.

3.3 In response to our provisional findings Ofwat said it was important that its statutory duties are considered in the round and, in particular, that the duty to secure that water companies are able to finance the proper carrying out of their functions is not considered on a stand-alone basis, but as part of the overall package. Bristol Water said that the financeability assessment carried out in the context of a price control should secure that it is able to finance its functions. It also maintained that the duties must reflect the distinction between the primary and secondary duties and noted that Ofwat's interpretation of the 'financing duty' made efficiency a critical part of its application. Bristol Water said that the 'efficiency duty' was a secondary duty that was subordinate to the primary 'finance and function duty', and whereas the need to promote efficiency had a very important role to play in a price control framework, it had to be progressed within the context of the statutory duties as they are actually written.

3.4 We considered that we were required to apply each of the general duties in accordance with its statutory wording, taking the whole of section 2 into account, and not to apply individual duties (whether principal or secondary duties) in isolation. In the specific context of the financing duty, we considered that this principal duty needed to be balanced against the principal duty to further the consumer objective of protecting the interests of consumers, which would include the interest in having a ready supply of potable water at reasonable prices and the resilience duty. The financing duty also needed to be balanced against the principal duty to secure that the functions and activities of water companies are properly carried out. In our view, these various principal duties were intended to complement, not conflict with, each other, and the principal duties should each be given equal weight. We noted that the further duty on the CMA to perform its duties in this reference in the manner it considers to be best calculated to promote economy and efficiency on the part of water companies was a duty that was subject to, and so subordinate or secondary to, the principal duties mentioned above. Nevertheless, we considered that the duty of securing that the functions and activities of a water company are properly carried out and the duty to further the consumer objective themselves implied that we should consider the need for these functions to be carried out efficiently, irrespective of the further duty to actively promote economy and efficiency.

3.5 The reference to the CMA is a reference for the determination of a new price control for Bristol Water, not an appeal on specific elements of Ofwat's decision. Accordingly, we are able to consider any aspects of the Bristol Water price control. Nevertheless, we considered it important to adopt a proportionate approach and to scrutinise most closely the areas in the determination that would have the largest effect on customer prices and Bristol Water. A key area for our determination was therefore wholesale totex,[82] and we sought to develop an approach to cost assessment that was practical and proportionate and which also satisfied our statutory duties.

3.6 We received extensive material from Bristol Water and Ofwat in relation to this inquiry, including an initial submission from Ofwat,[83] a SoC from Bristol Water,[84] a response from Ofwat to Bristol Water's SoC,[85] and a further response from Bristol Water.[86] We also received substantial responses from Bristol Water and Ofwat to our provisional findings. We reviewed material published by Ofwat concerning FD14 and received responses from Ofwat and Bristol Water to a significant number of further queries we made to them, both before and after provisional findings. We also held hearings with both parties to clarify issues relevant to our determination, held hearings with some third parties,[87] and held response hearings after publication of our provisional findings with Bristol Water and Ofwat.

3.7 We were also conscious that this determination should not be construed as a process that would necessarily lead to an outcome for Bristol Water better than the Ofwat determination. This was a particular concern in relation to wholesale cost assessment, but also applies to other elements of our determination such as the cost of capital. We did not limit our assessment to the specific issues of dispute between Bristol Water and Ofwat. In a number of areas, our assessment was less generous to Bristol Water than Ofwat's original assessment.

3.8 This section sets out the main elements of our approach. It takes the following in turn:

- Retail price controls.
- Wholesale cost assessment.

[82] We also considered other areas including the cost of capital, serviceability and ODIs.
[83] Ofwat submission.
[84] Bristol Water SoC.
[85] Ofwat response.
[86] Bristol Water reply.
[87] Summaries of hearings with CCWater and the LEF.

- PAYG and RCV run-off rate.
- Totex cost sharing incentives.
- Ofwat's PR14 menu scheme.
- Reconciling 2010 to 2015 performance.
- Performance commitments and outcome delivery incentives.
- Cost of capital.
- Other areas.

3.9 We discuss the wholesale cost assessment in more detail as this was a major reason for Bristol Water's rejection of Ofwat's wholesale price control determination, and raised a series of methodological issues for our determination.

Retail price controls

3.10 We considered whether we should re-determine the retail price controls. Bristol Water said that it accepted the retail price controls, and no stakeholders made submissions arguing for changes to the retail price controls. We note that the wholesale price control concerns a much larger part of customers' bills than the retail price controls. For Bristol Water, the revenues associated with wholesale account for around 89% of total allowed revenue, with the remaining 11% attributed to retail.

3.11 We decided not to make changes to the retail price controls for Bristol Water and to focus our work on key aspects of the wholesale price control. We discuss the retail price controls, and our assessment of the case for making changes to them, in more detail in Appendix 2.2. In response to our provisional findings, one stakeholder sought further clarity on the extent to which we had reviewed the details of Ofwat's retail price control methodology, and raised concerns with Ofwat's approach to issues such as the changes over time in input prices affecting retail costs, company-specific factors and regional wage differences.[88] We confirm that we did not review Ofwat's approach to these issues as it was not necessary for the purposes of our determination.

[88] Thames Water response to our provisional findings (see Appendix 2.5).

3.12 The one qualification is that we considered recalculating the household retail price control to take account of any difference in forecast wholesale revenues arising from differences between our own and Ofwat's wholesale price control determination. We decided that we should only make an adjustment to the household retail price control determined by Ofwat if there was a significant difference arising from our wholesale price control determination.[89]

3.13 We found that, given our determination for the wholesale price control, there was no material difference arising from this recalculation, and therefore we did not make an adjustment.

Wholesale totex assessment

3.14 We explained in paragraph 2.47 that Ofwat applied an RCV-based price control framework to water companies in England and Wales. Under this RCV-based approach, estimates or assumptions of each company's expenditure requirements, over the five-year price control period, are an input to calculation of the price control. Our determination has been made using the same framework.

Relevant objectives and risks

3.15 In the light of our statutory duties, there are a number of relevant regulatory objectives and risks which are relevant to our approach to cost assessment. We highlight the following:

(a) **Accuracy of cost assessment** – limitations to the accuracy of cost assessment pose risks that consumers may pay higher charges for water supplies than are necessary, or that companies (and investors) do not have an opportunity to earn a fair return on investment.

(b) **Efficiency incentives** – the approach used for cost assessment needs to incentivise companies to operate and invest efficiently.[90] Ineffective or perverse incentives may, over time, affect customer bills.

(c) **Administrative and data burden** – different approaches to cost assessment place different burdens on regulators and regulated

[89] This adjustment would not involve any change to the household retail price control beyond addressing a potential inconsistency, arising as a result of our determination, in the wholesale revenue forecast that Ofwat used to calculate the household retail control.
[90] For instance, some approaches to cost assessment may distort companies' financial incentives so that they favour capex solutions even where opex solutions would be more efficient.

companies in terms of the resources and time required to do the work and to collect and review the necessary data.

(d) **Transparency** – there are advantages in cost assessments that are understandable to a range of stakeholders and that rely less on unexplained judgements.

3.16 Different approaches to cost assessment may carry different risks. For example, benchmarking analysis may be inaccurate if it does not take proper account of differences between companies (other than efficiency) that affect their costs. On the other hand, reliance on companies' own business plan forecasts of expenditure may be problematic if the business plan forecasts are influenced by companies' expectations that submitting less challenging plans can lead to a better final regulatory settlement.

3.17 There are also likely to be trade-offs between these objectives. For instance, approaches that perform relatively well on accuracy may have a high administrative and data burden. Overall, a degree of judgement is involved in determining the approach.

Our approach to cost assessment

3.18 As described above, Ofwat developed and applied an approach to cost assessment for PR14 that was markedly different from that which it had previously used. Bristol Water challenged Ofwat's approach, particularly the emphasis on results from totex econometric benchmarking models, and asked the CMA to draw on approaches to cost assessment that were more similar to those used by Ofwat in the past. We decided that our approach should build on, but not be unduly constrained by, the analysis already carried out by Ofwat and Bristol Water. We also considered it important that our approach should form part of a coherent overall price control framework for Bristol Water, when taken together with other aspects of Ofwat's wholesale price control determinations for Bristol Water that we accepted for our determination.

3.19 In this context, we adopted the approach set out below.

Benchmarking analysis as the starting point

3.20 Ofwat used benchmarking analysis as the starting point for cost assessment, but recognised that there would be a need to consider other sources of information and to make company-specific adjustments where companies were not captured adequately by the benchmarking models.

3.21 Ofwat told us that the role of its benchmarking models was more to bring a focus on the right questions for the cost assessment, rather than seeking to develop models that capture every company's specific cost drivers. Ofwat said that its approach allowed it to focus its work on areas which it thought were most valuable to consumers and that it allowed for a 'conversation' with companies about company-specific factors that may not be captured so well in its benchmarking models.

3.22 Taken broadly in this context, Ofwat's use of benchmarking analysis had a number of benefits:

(a) It helps to mitigate the concerns identified by Ofwat and others that there was an undue bias towards capex in the water industry that was, at least in part, the result of the differing regulatory treatment of opex and capex. More generally, benchmarking analysis can contribute to a price control framework that provides incentives for companies to operate and invest efficiently.

(b) Used as a starting point for assessment, rather than companies' business plans, it reduces the risk that the cost assessment for a particular company is compromised by expenditure forecasts developed by a company that are over-stated, risk-averse, or which take insufficient account of the opportunities for cost savings through innovation.

(c) It provides a way to help mitigate risks relating to investment deferral that may otherwise arise under a price control framework that emphasises outcomes. Companies have substantial discretion over the timing of their investment, and may be able to defer planned investment projects without facing significant risks to delivery of the outcomes (and corresponding performance commitments) during the immediate price control period. Such deferral may increase costs in future regulatory periods – and these costs may be passed on to consumers through the cost assessment process at future price control reviews. An approach that places emphasis on benchmarking analysis can help to protect customers against the risk that the company's costs have increased because it has inefficiently deferred expenditure.

(d) It has benefits in terms of practicality and proportionality. Ofwat needed to determine 18 wholesale water expenditure allowances and ten wholesale wastewater expenditure allowances.

Detailed review of the benchmarking models used by Ofwat

3.23 We carried out a detailed review of the econometric benchmarking models which Ofwat developed and used for PR14. These models were novel, and designed to address significant problems that had arisen from the more disaggregated approach to cost assessment that Ofwat had previously used (especially in relation to the different treatment of opex and capex).

3.24 We identified some significant concerns with Ofwat's approach. In particular, we note the following:

(a) The type of high-level totex benchmarking models used by Ofwat carry risks of inaccuracy. We considered that these risks could have been reduced if Ofwat had complemented its analysis with either a more disaggregated or granular benchmarking analysis and/or a more detailed review of companies' business plans.

(b) Some specific aspects of the design and specification of Ofwat's totex and base expenditure econometric benchmarking models raised concerns, from both an economic and statistical perspective. For example, Ofwat's models included a relatively large number of explanatory variables to capture the various factors that may affect water companies' costs. We were concerned that, given the size and nature of the data set used by Ofwat, there were significant risks to the accuracy of the expenditure estimates derived from these models.

(c) We did not consider that Ofwat's approach to special cost factors was sufficient to fully mitigate these concerns with its benchmarking analysis. On the one hand, companies may have faced difficulties in making effective special cost factor claims even where warranted. On the other hand, where special cost factor adjustments were made, these mostly acted to increase companies' wholesale expenditure allowances, where Ofwat accepted claims from companies that the estimates from its benchmarking analysis were too low. Only limited downward adjustments to companies' allowances appear to have been made to address the risk that, for some companies at least, the estimates from Ofwat's benchmarking analysis were too high.

3.25 We took account of these concerns, which are detailed in Section 4, in developing our own approach for the inquiry.

Alternative benchmarking models for base expenditure

3.26 In light of our review of the Ofwat models, we developed some alternative models that would bring a different perspective. These models were constrained by the data and time available. We focused these models on base expenditure (ie opex plus capital maintenance), which we considered to be more amenable to benchmarking analysis than totex.

3.27 The type of benchmarking analysis carried out by Ofwat affected the data available to us and the nature of the work that we could build on for our determination. Ofwat's emphasis on top-down econometric modelling and the lack of granular cost data across the regulated water companies placed constraints on the nature of the cost assessment work that we could perform.

3.28 For example, we did not consider it feasible to reproduce the type of unit cost benchmarking analysis for investment projects that Ofwat had done at PR09, and which the Competition Commission (CC) drew on in its August 2010 determination for Bristol Water (CC10).[91] Ofwat's previous approach to the assessment of companies' capex requirements made use of a detailed dataset spanning the main English and Welsh water companies. There was no corresponding dataset for PR14. The more limited data collected by Ofwat for PR14, and its approach to benchmarking analysis and cost assessment, reflected in part the outcome of the Gray review.[92]

Alternative approach to enhancement expenditure

3.29 We did not consider that Ofwat's benchmarking models (together with unmodelled allowances for enhancement expenditure), took sufficient account of Bristol Water's needs and circumstances to enable us to use the resulting allowances for Bristol Water's enhancement expenditure in our cost assessment. Nor did we expect to be able to address fully these issues through the design of our own alternative econometric benchmarking models.

3.30 We therefore estimated enhancement expenditure from a review of the enhancements proposed in Bristol Water's business plan, drawing on Ofwat's review of these enhancements, Bristol Water's advisers' views, and our own further review, assisted by Aqua.

[91] Bristol Water disputed the Ofwat PR09 determination which was referred to the CC in February 2010 (see Bristol Water plc price determination (CC10)).
[92] Review of Ofwat and consumer representation in the water sector, D Gray (2011). The review was critical of the data burden that Ofwat placed on companies, and the review's recommendations included for Ofwat to 'set clear targets and timescales for a reduction in the burden of the price control and compliance processes' (recommendation 4).

More expansive review of Bristol Water's needs and circumstances

3.31 Ofwat's special cost factor process allowed for potential adjustments to be made to the results from its benchmarking analysis to reflect specific company circumstances. We saw merit in this approach, in principle, given the limitations of the benchmarking analysis.

3.32 For Bristol Water we undertook a more expansive review of the case for potential adjustments to the results from the benchmarking analysis than Ofwat had done. In particular, we carried out a targeted review of the expenditure forecasts from Bristol Water's business plan, drawing in part on engineering analysis.

3.33 This was for two main reasons. First, as described above, we were concerned about the ability of the econometric benchmarking analysis to take sufficient account of Bristol Water's needs and circumstances, and did not think that the special cost factor process implemented by Ofwat had fully addressed these concerns. Second, we were concerned that there was a risk that a special cost factor process may act to the detriment of consumers, if it is skewed towards companies' requests for upwards adjustments without considering whether there may be other offsetting areas where a company may have received a higher allowance than necessary. We decided that there would be benefits from a wider review of Bristol Water's plan that went beyond Bristol Water's claims for upwards adjustments to its expenditure allowances.

Targeted review of Bristol Water's business plan for base expenditure

3.34 As noted above, we decided to carry out a targeted review of the base expenditure forecasts from Bristol Water's business plan, drawing in part on our engineering analysis. Given our statutory duties, in particular our financing and resilience duties, we considered this assessment an important element of our determination as it enabled us to test the feasibility of the results from the econometric benchmarking analysis.

3.35 Our review of Bristol Water's business plan involved the following:

(a) A high-level review of the processes and approach that Bristol Water used to develop the cost forecasts in its business plan, to help inform our subsequent judgments on what account to take of Bristol Water's forecasts and arguments.

(b) A targeted assessment of Bristol Water's base expenditure requirements, which included analysis of specific aspects of Bristol Water's expenditure forecasts that seemed potentially over-stated,

drawing in part on comparisons with other companies. This included a separate analysis of Bristol Water's opex requirements and capital maintenance requirements,[93] which were taken separately in Bristol Water's business plan. We focused on the more significant issues and projects. The review of capital maintenance allowed us to understand better the need for specific projects and to form a more general understanding of Bristol Water's approach to planning and costing projects.

3.36 To assist our work, we engaged Aqua to advise on specific aspects of Bristol Water's business plan and to advise us on an overall assessment of Bristol Water's asset management approach.

3.37 Bristol Water said our approach to cost assessment should incorporate a bottom-up engineering approach, validated through the use of benchmarking and econometric modelling.[94] Our targeted review of Bristol Water's business plan went some way towards this, but it was not intended to provide a comprehensive bottom-up assessment or the main basis for our cost assessment. This was for a number of reasons, including that:

(a) there was a lack of data to support a detailed bottom-up review (eg data that would allow comparisons across companies at the granular level of activities and unit costs);

(b) over-emphasising Bristol Water's business plan could distort incentives for water companies to submit accurate plans to Ofwat;

(c) we agreed with Ofwat that there are benefits to strengthening incentives through the use of econometric benchmarking where feasible; and

(d) basing our assessment on Bristol Water's separate modelling and analysis of opex, IRE and MNI would give too little weight to the benefits of a totex approach to cost assessment.

Overall wholesale costs assessment

3.38 We brought together the results of the work described in paragraphs 3.23 to 3.37 above to arrive at our determination of the wholesale cost allowance for Bristol Water for the price control period from 1 April 2015 to 31 March 2020. For base expenditure we used the outcomes of our alternative benchmarking models, with adjustments for special cost factors,

[93] A review of opex is also relevant because the financeability analysis and price control treatment of corporation tax require assumptions on Bristol Water's opex over the price control period
[94] Bristol Water SoC, paragraph 33.

cross-referenced by our assessment of efficient base expenditure from our separate review of Bristol Water's business plan. To this outcome we added our assessment of efficient enhancement expenditure requirements, from our review of the enhancements proposed in Bristol Water's business plan, to produce a total figure for Bristol Water's efficient wholesale expenditure requirements.

Customer engagement

3.39 As noted in paragraph 2.33, Ofwat said it wanted companies to take more responsibility for understanding what their customers' priorities were and delivering against them. Bristol Water said that customers had played a fundamental and crucial role in shaping every element of its business plan (paragraph 2.71).

3.40 Bristol Water conducted customer preference research (also known as Willingness to Pay research), the results of which Bristol Water told us were used to identify the outcomes and performance measures that were most important to customers. Bristol Water said it used this in its optimisation modelling to prioritise its investment proposals. The work was reviewed by an independent expert and received a favourable review, although the review noted that there were some elements that could have been improved.

3.41 Bristol Water also conducted customer research to seek to find a balance between service levels and bills, by asking customers to choose between options that identified different levels of service in return for different customer bills. The research showed that customers did not wish to exchange lower prices for significantly lower levels of service and inadequate maintenance. However, the option of Bristol Water being able to deliver the same level of service for a lower price due to efficiencies was not put to customers. Bristol Water said it believed that market research was not the appropriate tool to assess whether a company should be more efficient.

3.42 We recognised that the customer research was conducted overall to a high standard and was able to identify those aspects of service and quality that customers value and prioritise. However, we considered that it was difficult for customers to comment on whether the cost of delivering a particular level of service were efficient or not since customers did not have the information to inform their decision.

3.43 Bristol Water also said the customer research provided support for certain investment projects. For example, Bristol Water said the customer research showed that there was very strong support for Cheddar 2. It said that 98% of household customers found the proposal 'making sure there is sufficient water in the future to meet population growth and by using water more efficiently' acceptable or very acceptable. An element of the proposal put to customers was 'Bristol Water will start building a new reservoir at Cheddar – to be brought into service by 2025 – to ensure that there is enough water for a growing population'.[95] We did not consider that this provided evidence of specific customer support for Cheddar 2. It is clear that customers will want to ensure there is enough supply to meet demand. However, this does not mean that customers support a specific project at a specific time, such as Cheddar 2.

3.44 We agreed with Ofwat and Bristol Water that customer priorities should form an essential foundation to the plan. In particular, the ODI framework was an area where customer views were fundamental to determining the performance that Bristol Water should be held to account for. Our approach was to use customer preferences where they were clearly applicable to determining how Bristol Water should operate, or the services it should provide, but we considered that it was for the regulators to form a reasonable view of the efficient level of cost for achieving the desired level of service.

PAYG and RCV run-off rate

3.45 As noted in paragraph 2.48, Ofwat's PR14 approach provided companies with flexibility on key parameters such as the PAYG rate and RCV run-off rate, subject to review by Ofwat.

3.46 Bristol Water confirmed that Ofwat's overall approach to depreciation was not an area of its dispute with Ofwat.[96] It did, however, ask us to review Ofwat's decision on its PAYG rate.

3.47 Bristol Water suggested that we should determine the 'natural' PAYG rate in line with the re-determination of totex, based on specific cost categories; and then flex the natural PAYG rate to set bills in line with customer preferences and to resolve issues arising from the financeability analysis.[97,98]

3.48 We had some concerns, in principle, about Ofwat's changes to regulatory depreciation and the RCV and the possibility of unintended consequences

[95] Cheddar 2 was included as part of a package that included: *(a)* sufficient water supply in future to meet population growth; *(b)* a new reservoir at Cheddar; *(c)* no change to likelihood of hosepipe bans and restrictions; *(d)* reduced leakage; *(e)* fitting a water meter when properties change hands; and *(f)* encouraging customers to use less water.
[96] Bristol Water SoC, paragraph 834.
[97] Bristol Water SoC, paragraphs 834 & 2255.
[98] Bristol Water response to our provisional findings, paragraph 1109.

over the longer term. For example, there is a theoretical risk that flexibility given to a water company to choose the PAYG and RCV run-off rates might be used by the company to pursue short-term objectives which could have detrimental effects on consumers in the longer term.[99] In practice, we note that the PAYG and RCV run-off rates were subject to Ofwat review and agreement which provided opportunities to reduce this risk.

3.49 In the context of our inquiry, we noted that there was substantial flexibility within the overall structure of Ofwat's new approach to regulatory depreciation and the RCV to address any specific concerns in the case of Bristol Water. The short-term and long-term effects of Ofwat's new approach on revenues and the RCV will depend critically on the key parameters of that approach: the PAYG rate, the RCV run-off rate and the depreciation on new RCV additions. We decided that, rather than reconsidering Ofwat's introduction of its totex approach to the RCV, we should focus on ensuring that these parameters were appropriate for the specific case of Bristol Water and our determination.

Totex cost sharing incentives

3.50 We considered that Ofwat's approach to totex cost sharing incentives was reasonable, and saw no grounds to adopt a different approach for our determination (apart from in relation to the interactions with the menu scheme, as discussed in paragraphs 3.52 to 3.54 below).

3.51 The cost sharing incentive rate for water companies in FD14 was constrained within the range 44 to 54%. Within this range, the exact rate applicable under Ofwat's final determination was determined by Ofwat's PR14 menu scheme. The application of cost sharing incentive rates of around 50% was in line with the CC's determination of a new price control for Northern Ireland Electricity Limited in 2014, which was, in turn, influenced by regulatory precedent from Ofgem.[100]

[99] Ofwat recognised the PAYG rate and RCV run-off rates were potential tools that could help reduce financing issues over the price control period from 1 April 2015 to 31 March 2020. Bristol Water also identified the potential to use the PAYG rate in this way, although it cautioned that there were limits to its appropriate use in this respect.
[100] Ofgem's most recent price control determination for electricity distribution companies involved significantly higher incentive rates for some companies. Nonetheless, we saw no reason to make a change to Ofwat's approach to provide for an incentive rate for Bristol Water that is as high as those for the electricity distribution in Great Britain. A rate of 50% would already be substantially higher – and imply stronger financial incentives for efficiency and cost control – than the corresponding rate which applied to Bristol Water's capex in the period 1 April 2010 to 31 March 2015 (equivalent to a rate of 15%).

Ofwat's PR14 menu scheme

3.52 We gave an overview of Ofwat's PR14 menu in paragraphs 2.53 to 2.58. We set out further information on the scheme and our analysis of it in Appendix 2.4. We note the following:

(a) The PR14 menu scheme was intended, in part, to provide financial incentives for companies to provide accurate expenditure forecasts. However, we did not identify how this menu scheme would have made an effective contribution to an objective of providing financial incentives for companies to submit more accurate expenditure forecasts to be used for the purposes of the cost assessment process during the PR14 price control review. This was because Ofwat's PR14 scheme applied to forecasts (menu choices) provided by companies after Ofwat had published its final determinations for PR14.

(b) Ofwat told us that the menu choices that companies made subsequent to the publication of its final determinations provided information that would be useful for the purposes of Ofwat's next price control review, PR19. We did not consider that this benefit represented a compelling reason for us to retain the menu scheme for the purposes of our determination.

(c) Ofwat emphasised that its PR14 menu scheme was intentionally different from its PR09 menu scheme and the menu schemes used by Ofgem. This was because, under the PR14 scheme, regulated companies made a menu choice with 'complete information' (ie after the regulator has estimated the efficient cost baseline). Ofwat intended that the PR14 menu scheme would provide companies with the flexibility to make choices, particularly over the level of cost sharing incentive that each company faces. We did not identify why it was important to provide water companies with a choice over their cost sharing incentive rate within the range specified by Ofwat (44% to 54%). Furthermore, the scheme seemed to provide companies with limited choice in practice.

3.53 We recognised that the appropriate role, if any, for the menu scheme in our determination for Bristol Water would not necessarily be the same as that for Ofwat's price control review process covering 18 water companies. We were concerned about the additional complexity that Ofwat's menu scheme would bring, relative to its benefits, for the purposes of our determination. We also considered that the use of the menu scheme raised complications and uncertainty in terms of the approach to financeability assessment.

3.54 We adopted the following approach:

(a) We decided not to apply Ofwat's PR14 menu scheme to Bristol Water.

(b) The wholesale expenditure allowance for Bristol Water, which feeds into our calculation of allowed revenues and RCV for the period 1 April 2015 to 31 March 2020, was based directly on our assessment of Bristol Water's wholesale totex requirements over that period.

(c) We decided that the cost sharing incentive for Bristol Water should be 50% for the price control period from 1 April 2015 to 31 March 2020.

3.55 Bristol Water supported this approach. In response to our provisional findings, Ofwat provided further information on its views on the merits of the menu scheme.[101] Ofwat said that it understood our provisional decision not to apply the menu scheme for the purposes of our determination for Bristol Water. But Ofwat did not agree with the specific arguments that we had put forward to justify our approach.[102] We reviewed Ofwat's submissions and made some refinements to our assessment of Ofwat's scheme. Nonetheless, we considered that the main points from our original assessment remained valid.

Reconciling 2010 to 2015 performance

3.56 Part of Ofwat's final determination for PR14 included the implementation of a number of financial adjustments that applied under the rules and policies set at previous price control reviews (eg adjustments relating to Bristol Water's performance in the period before 1 April 2015). Following submissions from Bristol Water, we considered the following:

(a) **Historic serviceability** – we assessed Bristol Water's performance against the unplanned interruptions >12 hours metric and considered whether Bristol Water's performance warranted the penalty Ofwat applied.

(b) **2009-10 RCV capping** – we reviewed the evidence for the construction output price indices (the inflation metrics used to adjust the capex cap each year), and considered which was the most appropriate series to use.[103]

[101] Ofwat response to our provisional findings, paragraphs 99–121.
[102] Ofwat response to our provisional findings, paragraphs 93–94.
[103] This was complicated by the introduction of a new index during the period in question.

(c) **CIS indexation methodology** – we considered that we had the option to include this in our determination work, or to allow Ofwat to handle it through its pending industry consultation to address the issue. We decided not to intervene. In its response to our provisional findings Bristol Water said it considered this approach to be appropriate.[104]

Performance commitments and outcome delivery incentives

3.57 We considered the overall ODI framework that Ofwat implemented, and the inclusion of rewards for outperformance (with a potential resulting increase in customer bills).

3.58 We reviewed the three areas of Bristol Water's wholesale performance targets where Ofwat had intervened and had set more challenging target levels than Bristol Water had originally proposed and reassessed whether these interventions were appropriate.

3.59 We considered whether our determination had resulted in any ODIs being made unnecessary, or resulted in perverse incentives. We then adjusted any of these ODIs to address these concerns.

Reconciliation rulebook for PR14

3.60 During our redetermination process, Ofwat consulted on and published its PR14 reconciliation rulebook.[105] This sets out the approach to any reconciliation that will be required at the end of the 2015 to 2020 price control to take account of past performance and the various price control incentive mechanisms. For example, the rulebook specifies the financial adjustments to be applied to implement the totex cost sharing incentive and the ODIs, in the light of Bristol Water's outturn expenditure and performance in the 2015 to 2020 period.

3.61 We sought the views of the major parties on the PR14 reconciliation rulebook. Bristol Water confirmed that the approaches included appeared reasonable, while Ofwat stated that it had received a range of responses on the rulebook consultation. Ofwat said other parties had not raised significant policy issues affecting the content of the final rulebook, but it had received a number of responses on its further consultation on wholesale revenue incentives. Ofwat also noted that it had not concluded on the PR09 capital

[104] Bristol Water response to our provisional findings, paragraphs 727–730.
[105] Ofwat (2014), The PR14 reconciliation rulebook.

incentive scheme reconciliation in the final rulebook, pending the CMA's determination of the Bristol Water appeal.

3.62 As a result, and considering the wider consultation undertaken with the rest of the industry, we decided not to intervene in this area in our determination except for any areas (such as inquiry cost awards (see paragraph 12.16) that have arisen from our determination. We note that as the finer detail of the PR14 reconciliation mechanisms are implemented, Ofwat, as the industry-wide regulator, remains in the best position to address any concerns as they arise.

Cost of capital

3.63 We assessed the appropriate cost of capital for Bristol Water through a bottom-up analysis of individual components.

3.64 Using the latest data and our regulatory judgement, we determined appropriate values for each, with the potential for each to increase or decrease.

3.65 We paid proportionally more attention to the key areas of dispute around:

(a) the use of actual or notional costs of debt;

(b) the existence and size of a small company premium/company-specific uplift on debt, and whether including a customer benefits test was appropriate;

(c) Bristol Water's asset beta; and

(d) the need for an appointee-wholesale adjustment to ensure that the company does not receive a return on certain assets twice.

Other areas

3.66 We assumed other areas of the Ofwat determination with respect to the calculation of allowed revenues, which we have not identified above or discussed separately in this determination, remain the same as in the Ofwat determination. These include items such as pension deficit repair allowance, income from other sources, and the assumed capital contributions from connection charges and revenue from infrastructure charges.

3.67 We identified no grounds to change the uncertainty mechanism for business rates set out in Ofwat's final determinations for Bristol Water.

3.68 We identified no grounds to change the designation of wholesale and retail activities set out in Ofwat's final determinations for Bristol Water.

Structure of this report

3.69 The remainder of this report is set out as follows:

(a) In Sections 4 to 6, we consider a range of evidence as part of our approach to assessing wholesale costs for the determination, including the following:

(i) In Section 4, we consider Ofwat's econometric benchmarking models and then set out our own econometric benchmarking analysis, and our assessment of potential special cost factor adjustments, to produce an estimate of Bristol Water's efficient base expenditure requirements.

(ii) In Section 5, we review the wholesale base expenditure forecasts from Bristol Water's business plan.

(iii) In Section 6, we review wholesale enhancement expenditure from Bristol Water's business plan.

(b) In Section 7, we set out our assessment of the efficient level of wholesale expenditure for Bristol Water, in the period 1 April 2015 to 31 March 2020, in the light of the analysis and review from Sections 4, 5 and 6.

(c) In Section 8, we conclude on areas requiring reconciliation from previous price control periods.

(d) In Section 9, we conclude on ODIs.

(e) In Section 10, we set out our determination of a reasonable rate of return on Bristol Water's RCV, derived from our calculation of the appropriate cost of capital for Bristol Water.

(f) In Section 11, we set out our determination on the appropriate level of wholesale revenue for Bristol Water to receive in the period and our findings on the financeability of Bristol Water. The wholesale revenue calculation takes into account our wholesale totex assessment, our approach to the cost of capital, our approach to the menu scheme, and the PAYG and RCV run-off rates to calculate the overall wholesale revenue and K for each year from April 2015 to March 2020. The

indicative impact of our determination on customer bills is also assessed.

(g) In Section 12, we set out our findings, determine the Bristol Water inquiry costs that we should take into account in our determination, and make some concluding remarks.

4. Wholesale cost assessment based on econometric benchmarking analysis

4.1 This section is structured as follows:

(a) We describe Ofwat's top-down econometric benchmarking models, highlight the criticisms that Bristol Water made of these models, and summarise our review of them (paragraphs 4.3 to 4.80).

(b) We present and discuss a series of alternative econometric benchmarking models of base expenditure which we developed in the light of our review of Ofwat's models (paragraphs 4.81 to 4.183).

(c) We consider Bristol Water's disaggregated econometric modelling of base expenditure, which took opex and capital maintenance separately (paragraphs 4.184 to 4.203).

(d) We describe how we built up an estimate of Bristol Water's wholesale base expenditure requirements from the results of our alternative econometric benchmarking models, including the special cost factor adjustments we applied to modelling results (paragraphs 4.204 to 4.263).

(e) We present some final observations on data availability (paragraphs 4.264 to 4.270).

4.2 The analysis in this section forms part of our overall cost assessment. We provide a separate review of aspects of Bristol Water's business plan forecasts in Section 5. We consider enhancement expenditure separately in Section 6. We make our overall findings for wholesale totex in Section 7.

Ofwat's top-down econometric benchmarking analysis

4.3 This section concerns the top-down econometric models that Ofwat used in its calculation of the basic cost threshold for each company.[106]

4.4 These econometric models involve statistical comparisons of measures of companies' expenditure against a series of explanatory variables. The explanatory variables are intended to capture cost drivers relevant to the water companies in England and Wales; they include aspects of companies' water supply, services, characteristics or operating environment that give

[106] We provide further information on how Ofwat's top-down econometric models fed into its overall approach to cost assessment, including Ofwat's use of triangulation and the calculation of the basic cost threshold, in Appendix 2.3.

rise to differences in costs, besides differences in efficiency between companies. Examples of cost drivers include the total length of a company's water mains, the average water consumption per property supplied, and differences in wage rates between the parts of the country that companies operate in.

4.5 The econometric models produce an estimated 'coefficient' for each of the explanatory variables, which is taken as a quantification of the extent to which that explanatory variable affects companies' costs. Ofwat produced estimates of each company's efficient expenditure requirements by combining these estimated coefficients with forecasts of the various explanatory variables, for each company, for the period 2015 to 2020.

4.6 Ofwat's overall cost assessment was made by combining the results based on its econometric models with other forms of cost analysis and a series of company-specific adjustments arising from its special cost factor process.

4.7 This section focuses on Ofwat's top-down econometric models and is structured as follows:[107]

(a) We provide an introduction to the nature of the econometric benchmarking analysis used by Ofwat (paragraphs 4.9 to 4.16).

(b) We provide an overview of the econometric models Ofwat used for its cost assessment (paragraphs 4.17 to 4.24).

(c) We set out Ofwat's estimates from its econometric models for Bristol Water (paragraphs 4.25 to 4.36).

(d) We summarise the criticisms and concerns raised by Bristol Water on these models (paragraphs 4.37 to 4.42).

(e) We summarise Ofwat's explanation of the results of its base expenditure models (paragraphs 4.43 to 4.44).

(f) We summarise our assessment of these models, with a focus on their use for our determination (paragraphs 4.45 to 4.54).

(g) We set out the views of Ofwat and Bristol Water on our assessment of Ofwat's models (paragraphs 4.55 to 4.66) and then set out the views of other parties (paragraphs 4.67 to 4.73).

[107] This section does not consider the simple unit cost models that Ofwat used for its analysis of enhancement expenditure. See Appendix 2.3 for further information on Ofwat's unit cost analysis.

(h) We then set out our conclusions on Ofwat's models (paragraphs 4.74 to 4.80).

4.8 We provide more detailed information on Ofwat's econometric models, and our assessment of these models, in Appendix 4.1.

Nature of the econometric benchmarking analysis used by Ofwat

4.9 Ideally, econometric models could isolate differences in efficiency between companies from all other factors that affect companies' costs (eg differences in their operating environments or the services they provide to customers) and enable us to produce an estimate of each company's expenditure requirements over the coming price control period, if it were to operate efficiently. This is not possible in practice, given the limited amount of data and the numerous complex factors that affect companies' costs. Any econometric model can only be an approximation.

4.10 The type of econometric model used by Ofwat sought to explain variation in costs within the data sample, over time and between companies, according to a number of explanatory variables. The explanatory variables were seen as cost drivers – factors that affected a company's costs besides its efficiency. The estimation of the econometric model drew on correlations in the data to produce estimates of the extent to which variations in costs were attributable to variations in the explanatory variables.

4.11 For instance, one of the explanatory variables in Ofwat's models was the (logarithm of) average water consumption per property supplied by the company. The estimation of the model essentially attributed some of the variation in totex (between companies and over time) to variation in consumption per property (between companies and over time). This was reflected in the estimated coefficient for that explanatory variable. This estimated coefficient could then be interpreted as an estimate of the extent to which greater or lesser water consumption per property would affect a company's expenditure.[108]

4.12 The efficiency differences between companies were inferred from the estimated residuals from the models. The estimated residuals represented differences in expenditure, between companies and over time, that were not 'explained' by the explanatory variables in the model.

[108] This estimate is subject to potential error and inaccuracy resulting from the model specification and statistical issues.

4.13 In Ofwat’s pooled ordinary least squares (OLS) models (discussed further below), the estimated residual for a particular company in a particular year was a measure (positive or negative) of the difference between the company’s expenditure and the sample mean expenditure (across all years and companies) that the model has not attributed to the explanatory variables (eg differences in expenditure attributed to the company having relatively high or low water consumption per property).

4.14 The differences in estimated residuals between companies can be seen to reflect, at least in part, differences in efficiency between companies. In addition, the residuals were likely to reflect factors, besides efficiency differences, that gave rise to cost differences between companies and which had not been fully taken account of in the modelling. This could arise because a relevant cost driver was not captured in the set of explanatory variables in the model or because the relationship between an explanatory variable and costs was inaccurately estimated (or approximated) by the model.

4.15 Since the 1990s, economic regulators in the UK, including Ofwat and Ofgem, as well as the CC, have used this broad type of econometric modelling as part of price control reviews.[109] In particular, econometric models have been used as part of the determination of allowances for regulated companies’ future expenditure requirements over the price control period.

4.16 Under Ofwat’s approach to cost assessment for the PR14 price control review, the estimated expenditure requirements from Ofwat’s models was not an end point in the cost assessment. The results from the econometric models fed into Ofwat’s calculation of the basic cost threshold for each company. Ofwat made significant adjustments to these results as part of its special cost factor process, to try to better capture the circumstances of some companies.

Overview of Ofwat’s econometric models

4.17 We provide an overview of the econometric models in this subsection. We set out a more detailed description of these models, and Ofwat’s model development and selection process, in Appendix 4.1.

[109] The exact modelling approach has varied over time. For example, in the past models used cross-sectional data for a single year rather than panel data and tended to focus on specific categories of spend such as opex rather than totex.

4.18 Ofwat's models used a panel data set constructed from 18 water companies in England and Wales, including Bristol Water, and five years of data spanning the period 2008/09 to 2012/13. The data set consisted of measures of costs and data on each of the explanatory variables, for each company and each year in the sample period. The sample included all of the water companies regulated by Ofwat, apart from a few small water companies that are subject to a different type of economic regulation.

4.19 One of the initial choices in specifying an econometric model is the choice of the dependent variable. What is it that we want to compare across companies and explain, in part, by the various explanatory variables in the model? Ofwat used two types of model:

(a) Models that compared measures of totex between companies. The totex measure captured most of the expenditure of the wholesale water service, but excluded some specific items of spend that Ofwat did not want to include in its benchmarking analysis (eg business rates and pension deficit repair contributions).

(b) Models that compared measures of base expenditure across companies. The base expenditure measure was the part of the totex measure from *(a)* that included capital maintenance expenditure but excluded the capex attributed to enhancement projects.

4.20 The measure of totex for a given year was the sum of opex in that year and a measure of the average capex over the previous five years. Ofwat used this approach in order to smooth the 'lumpy' pattern of observed capex (ie to reduce fluctuations in the capex measure across time). Similarly, the base expenditure measure was the sum of opex plus the average capital maintenance expenditure in the last five years.

4.21 Ofwat's final 'triangulation' process used five top-down econometric models:[110]

(a) A 'full' totex model that had 27 explanatory variables.

(b) Two 'refined' totex models. These models each used the same set of 11 explanatory variables. These two models were the same, except that one was estimated using the pooled OLS estimation approach and the

[110] Ofwat used the term 'triangulation' to describe how it combined the results from different modelling approaches into a single estimate for each company. See Appendix 2.3 for an explanation of Ofwat's approach to triangulation.

other was a random effects model estimated using the generalised least squares estimation approach (GLS).[111]

(c) Two 'refined' base expenditure models. These models each used the same set of 11 explanatory variables as for the refined totex models, and one was estimated using OLS while the other was a random effects model estimated using GLS.

4.22 Ofwat's consultants, CEPA, described the refined models as including only the explanatory variables which CEPA found to be statistically significant or that were important cost drivers from a theoretical perspective.[112]

4.23 Table 4.1, below, shows the explanatory variables from Ofwat's full totex and refined models. In the table, the left hand column briefly describes the explanatory variable and the table also provides the short form names that CEPA gave to the explanatory variable, where this is significantly different or not self-explanatory.

4.24 Ofwat's models used a functional form that it described as 'translog'.[113] CEPA said that the translog model is one of the so-called flexible functional forms and is used routinely in the academic literature.[114] Ofwat's models implemented the translog functional form using the square and cross-product terms of a small subset of the cost drivers it had identified: length of mains; the number of connected properties divided by the total length of mains; and water delivered per connected property. The implementation of the translog approach gives rise to the terms such as 'Length^2' and 'Length * density' in Table 4.1. We mark a 'T' after the short name in the table to identify the translog terms.

[111] See Appendix 4.1 for more information on Ofwat pooled OLS and random effects models.
[112] CEPA (March 2014), *Cost assessment – advanced econometric model*, page viii.
[113] See Appendix 4.1 for more information on the translog approach. Note that the specific implementation of the translog model used by Ofwat does not fully implement the standard translog cost function from economic theory. For example, the interaction and square terms applied were only applied to a small subset of the identified cost drivers. We use the term 'translog' to refer to this aspect of model specification used by Ofwat but recognise that this may differ from other translog models.
[114] CEPA (March 2014), *Cost assessment – advanced econometric model*, page iv.

Table 4.1: Explanatory variables used by CEPA

Summary of explanatory variable	*Short name*	*Inclusion in full model*	*Inclusion in refined models*
Constant term		✓	✓
Ln (total length of mains)	Length	✓	✓
Ln (number of connected properties / length of main)	Density	✓	✓
Ln (potable water delivered / number of connected properties)	Usage	✓	
[Ln (total length of mains (km)] ^ 2	Length^2 (T)	✓	✓
[Ln (number of connected properties / length of main (properties/km)] ^ 2	Density^2 (T)	✓	✓
[Ln (potable water delivered / number of connected properties (Ml/d per property)] ^ 2	Usage^2 (T)	✓	
Ln (total length of mains) * Ln (number of connected properties/length of main)	Length * density (T)	✓	✓
Ln (total length of mains) * Ln (potable water delivered/number of connected properties)	Length * usage (T)	✓	
Ln (number of connected properties / length of main) * Ln (potable water delivered / number of connected properties)	Density * usage (T)	✓	
Time trend		✓	✓
Ln (average regional wage measure)		✓	✓
Ln (regional construction price index)			
Ln (population supplied / number of connected properties) *“Population density”*		✓	✓
Ln (proportion of properties that are metered)		✓	
Ln (total number of water sources / total water input to distribution system)		✓	
Ln (average pumping head * total water input to distribution system)		✓	
Ln (proportion of water input from river abstractions)		✓	✓
Ln (proportion of water input from reservoirs)		✓	✓
Ln (number of new meters installed in year as a proportion of metered customers)		✓	
Ln (length of new mains laid in year / total length of mains at year end)		✓	
Ln (length of mains relined and mains renewed / total length of mains at year end)		✓	✓
Ln (number of properties below reference pressure level/total properties connected)		✓	
Ln (volume of leakage / total water input to distribution system)		✓	
Ln (number of properties affected by unplanned interruptions > 3 hrs / total properties connected)		✓	
Ln (number of properties affected by planned interruptions > 3 hrs / total properties connected)		✓	
Ln (potable water delivered to billed metered households / total potable water delivered)		✓	
Ln (potable water delivered to billed metered non-households / total potable water delivered)		✓	

Source: CMA analysis of CEPA *Cost assessment – advanced econometric model*, March 2014.

Ofwat’s estimates for Bristol Water from its econometric models

4.25 Appendix 4.1 sets out the estimated coefficients and estimated standard errors for each of the five econometric models used by Ofwat. In this subsection, we focus on the implications of these econometric estimation results for Ofwat’s cost assessment for Bristol Water.

4.26 Ofwat produced estimates of each company's efficient expenditure requirements, over the price control period from 1 April 2015 to 31 March 2020, by combining: *(a)* the estimated coefficients from each of its five models; with *(b)* forecasts of each explanatory variable, for each company, over this five-year period.

4.27 This exercise produced an estimate of the company's expenditure requirements, assuming it were to operate at an industry-average level. Ofwat then made an adjustment of 6.53% to produce an expenditure estimate for if the company were to operate at what Ofwat considered to be upper quartile efficiency.[115]

4.28 Ofwat's estimates of companies' expenditure requirements also involved what it called an 'alpha factor' adjustment, which it considered appropriate because its dependent variable was the logarithm of expenditure.[116] This adjustment was relatively minor, of the order of 1%.[117]

4.29 Table 4.2 below shows Ofwat's estimates of Bristol Water's aggregate expenditure requirements, over the price control period from 1 April 2015 to 31 March 2020 before and after the adjustment Ofwat applied for upper quartile efficiency.

Table 4.2: Ofwat's estimated expenditure requirements 2015/16 to 2019/20 for Bristol Water

		£m (2012/13 prices)
CEPA model	*Before upper quartile adjustment*	*After upper quartile adjustment*
WM3: Full totex	365	341
WM5: Refined totex (OLS)	295	276
WM6: Refined totex (GLS RE)	292	273
WM9: Refined base expenditure (OLS)	278	260
WM10: Refined base expenditure (GLS RE)	280	261

Source: CMA analysis of Ofwat's basic cost threshold populated feeder models for Bristol Water final determinations.

4.30 Note that Table 4.2 shows that the differences between the results from the OLS and GLS random effects models were relatively small. In the case of the refined base expenditure models, the difference was less than 1%.

[115] The 6.53% adjustment was itself derived from Ofwat's analysis of the results of CEPA's five econometric models as well as Ofwat's separate unit cost benchmarking analysis for enhancement expenditure.
[116] CEPA considered that, because its benchmarking models used the natural logarithm of expenditure rather than a non-logarithmic expenditure measure, the estimates of expenditure from these models may require an adjustment to avoid a 'log-transformation bias'. CEPA identified a number of possible approaches (including an option of no adjustment). One of the options was the 'alpha adjustment' factor that Ofgem had used in its regulation of electricity distribution company, although CEPA did not find supporting literature for it. For further discussion of the alpha factor see CEPA (March 2014), *Cost assessment – advanced econometric model*, pp39 & 108–109.
[117] See Ofwat basic cost threshold feeder model for Bristol Water draft and final determinations.

4.31 The estimated expenditure from the full totex and refined totex models cannot be compared directly with Bristol Water's business plan forecast of its expenditure requirements. These models concern measures of expenditure that exclude some significant elements of wholesale costs, which Ofwat referred to as policy items (eg business rates and pension deficit repair contributions). Ofwat's allowances for policy items was £29.5 million over the period, and this was not a matter of dispute between Bristol Water and Ofwat.

4.32 Table 4.3 presents the estimated expenditure from Ofwat's models, with the upper quartile efficiency adjustment and the addition of the allowance of £29.5 million for policy items. For the full totex and refined totex models, we compared this to Bristol Water's totex forecast from its business plan over the period 1 April 2015 to 31 March 2020, which was £536.9 million. For the refined base expenditure models, our comparison was with Bristol Water's business plan forecast of its base expenditure requirements over that period, which was £384.6 million.[118]

Table 4.3: Comparison of Ofwat's estimated wholesale base expenditure for Bristol Water with Bristol Water's expenditure forecasts from 2015/16 to 2019/20

		£m (2012/13 prices)	*%*
Ofwat model	*Ofwat modelled expenditure and policy items**	*Comparable Bristol Water business plan forecast*	*Difference in Bristol Water plan compared to Ofwat estimate*
WM3: Full totex	370	537	45
WM5: Refined totex†	305	537	76
WM6: Refined totex‡	302	537	78
WM9: Refined base expenditure†	290	385	33
WM10: Refined base expenditure‡	291	385	32

Source: CMA analysis of Ofwat's basic cost threshold populated feeder models for Bristol Water final determinations and figures from Bristol Water SoC, pp22 & 384.
†OLS.
‡GLS random effects.
*The Ofwat figures are before special cost factor adjustments.

4.33 For each of the five models, the estimates of Bristol Water's expenditure requirements over the period from 1 April 2015 to 31 March 2020 that were derived from Ofwat's econometric models were substantially below Bristol Water's expenditure forecasts. The differences were greater for the totex models that included enhancements than those that only concerned base expenditure.

4.34 The estimates from Table 4.3 above fed into Ofwat's calculation of the basic cost threshold for Bristol Water.

[118] Bristol Water SoC, Table 2.

4.35 The weight Ofwat attached to each of its five models in calculating the basic cost threshold was initially given by Ofwat's triangulation process. However, in the case of Bristol Water, Ofwat carried out further assessment of the modelling results which led, in effect, to Ofwat disregarding the results from the refined totex models for Bristol Water, and instead focusing on the results from its full totex and refined base expenditure models.

4.36 Ofwat's overall cost assessment took the basic cost threshold and made a series of additions, reflecting the outcome of the special cost factor process. In total, Ofwat made an upward adjustment of £27.5 million for special cost factors relating to base expenditure. This reduced the scale of the differences between Ofwat's assessment and Bristol Water's forecasts.

Bristol Water's criticisms of Ofwat's econometric models

4.37 In its SoC, Bristol Water identified a number of criticisms and concerns with Ofwat's econometric modelling.[119]

4.38 Overall, Bristol Water said that the modelling approach used by Ofwat was not robust and did not form a safe basis for assessing the cost requirements of companies, and that Bristol Water has been disproportionately affected due to the omission of certain statistically significant variables.

4.39 Bristol Water made a number of more specific arguments:

(a) **Inconsistency with Ofwat's previous efficiency assessment** – the results from Ofwat's new approach to efficiency analysis were very different compared to those from Ofwat's efficiency assessment at the previous price control review, PR09. Companies that were previously identified as being more efficient at PR09 tended to be regarded as inefficient at PR14. Bristol Water said that it is reasonable to assume some movement in efficiency would occur over time, but the degree of difference implied by Ofwat's analysis was unprecedented. Bristol Water did not consider the implied changes in efficiency to be credible. It argued that this raised serious questions about the accuracy and validity of Ofwat's modelling for PR14.

(b) **The estimated coefficients were unstable** – Bristol Water provided analysis, carried out by its consultants Oxera, which showed that excluding a company from the sample had a considerable impact on estimated coefficients (Bristol Water showed this for three companies – one large, one medium-sized and one small). Bristol Water argued that

[119] Bristol Water SoC, pp393–397.

this indicated a very high risk that the models were not well specified and did not correctly represent a reasonable underlying cost function for the industry and that, as a result, cost estimates for some companies could be appreciably incorrect.

(c) **The estimated coefficients were not consistent with what one would expect on the basis of economics or engineering** – Bristol Water argued that some of the estimated cost relationships implied by Ofwat's models were unexpected and contrary to engineering judgment.

(d) **Statistical shortcomings of the modelling** – Bristol Water reported that its consultants, Oxera, found that the full totex model performed poorly on the majority of statistical tests and that the model ran counter to economic theory. For the refined models, Bristol Water reported that Oxera concluded that these models did not pass the majority of statistical tests and, as these did not include any enhancement cost drivers, their ability to identify differences in enhancement expenditure was questionable.

4.40 On point *(c)* (above), Bristol Water provided the following examples of what it considered to be the unexpected cost relations from the models:

(a) Each additional property would lead to predicted costs being £50 per year lower.

(b) Each additional megalitre of water supplied to customers would result in predicted costs being £83 lower.

(c) Each additional customer being metered would result in predicted costs being lower by £62 per year.

4.41 Bristol Water went on to argue that it was affected disproportionately by the problems with Ofwat's modelling:

(a) Bristol Water argued that there was a high degree of variability between companies in the treatment of enhancement costs, which reflected company-specific and local risks and issues. Bristol Water considered that these make it very difficult to use econometric models to assess the efficiency of companies' totex.

(b) Bristol Water argued that there are explanatory variables missing from the models that have a significant impact on Bristol Water's costs. Bristol Water was concerned that the models do not take account of:

   (i) differences in treatment complexity arising from differences in the quality of raw water;

   (ii) differences between companies in the proportion of upstream assets; and

   (iii) the age of the network.

(c) Bristol Water said that the specific translog model structure used in Ofwat's models introduced modelling errors that applied to Bristol Water but not to the majority of other companies. It said that this was because the complexities of the translog structure, combined with the estimated coefficients, meant that the overall relationship between costs and the explanatory variables varied between companies. Bristol Water said that some estimated coefficients had the wrong sign for Bristol Water, but not all companies, which contributed to its costs being under-estimated. Bristol Water argued that the translog functional form was unstable and the model should be simplified.

4.42 Bristol Water referred to the results from alternative econometric models, which were developed and estimated by its consultants, Oxera. Oxera's analysis included models that used a particular type of stochastic frontier analysis (SFA) estimation procedure and a Cobb-Douglas functional form (rather than the translog) and added additional explanatory variables based on three further cost drivers: a measure of water treatment complexity; a measure of the proportion of upstream assets; and a measure of the age of the water mains network. Bristol Water reported that, using these additional cost drivers, the Cobb-Douglas functional form and the SFA econometrics estimation, Oxera found that the efficient base expenditure benchmark for Bristol Water should be £52 million greater than that estimated by Ofwat.

Ofwat's explanation of the results from its base expenditure models

4.43 We asked Ofwat to provide further information on the intuition for the results from its models for Bristol Water and why the estimated costs for Bristol Water were lower, on the basis of costs per property supplied, than for the average company in the industry. Ofwat provided some further analysis that compared Bristol Water to other companies in the industry. Ofwat made the following arguments in relation to its estimates for Bristol Water's base expenditure, before the special cost factor adjustments:

(a) Bristol Water had below average mains network length per property and below average wage costs, so it had below average cost allowances. Its marginally higher population per property was not sufficient to offset these drivers, and it did not benefit from the extra cost allowances associated with serving very large and dense urban areas.

(b) In terms of its relative position, Bristol Water had similar characteristics and cost allowances to Sembcorp Bournemouth Water, and Sutton and East Surrey Water. Portsmouth Water had significantly lower costs per property. Bristol Water also had a similar cost allowance to United Utilities, Northumbrian Water, Yorkshire Water and Southern Water.

(c) Ofwat did not consider its allowances for costs for Bristol Water to be particularly low or surprising. In Ofwat's view, these allowances simply reflected the costs incurred by other businesses with similar service areas and facing similar operating conditions.

4.44 Ofwat also said that, after adjusting for special cost factors, it provided Bristol Water with an allowance for costs (per property) above the average for other small WoCs, which Ofwat considered to be the most natural and closest comparators.

Our assessment of Ofwat's econometric models

4.45 We set out a detailed review of Ofwat's top-down econometric modelling approach in Appendix 4.1. We considered the results of the models and their statistical and theoretical properties.

4.46 We identified some concerns with Ofwat's overall approach of focusing its benchmarking analysis exclusively on high-level models of totex and base expenditure:

(a) **No disaggregation below wholesale water** – the econometric models that Ofwat used concerned either the totex or base expenditure of companies' wholesale water service. Each model extended across all parts of the wholesale water activity, from raw water abstraction right through to final distribution of treated water to customers. It is ambitious to seek to model the entire wholesale water business through this type of high-level econometric model, which may fail to take proper account of the wide range of factors that affect companies' expenditure requirements. Ofwat's exclusive focus on aggregated models in the calculation of the basic cost threshold for each company seemed to give

insufficient weight to the benefits of more disaggregated models. Disaggregated models or more granular forms of benchmarking analysis may allow a more accurate estimation of the relationship between expenditure and specific cost drivers and allow a greater number of cost drivers to be taken into consideration.

(b) **Timing of investment needs** – Ofwat's models involved comparisons across companies and over time of measures of companies' totex, covering both opex and capex. Capex concerns investment, and companies' investment requirements will vary over time. Differences between companies in their level of total cash expenditure, in a given year or five-year period, may be reflective of differences in their investment requirements at that time and not necessarily indicative of their relative efficiency. Ofwat's models did not include explanatory variables that would capture differences in the timing of companies' investment needs. Ofwat's approach of using a five-year average of capex for the dependent variable in its model mitigates but cannot eliminate issues related to the timing of investment requirements, especially given that the economic lives for water company assets will often be much longer than five years. This type of model may lead to inaccurate estimates of a water company's expenditure requirements in the next five-year period, by giving insufficient account to its investment needs in that specific period of time.

(c) **Totex models that include enhancements** – there were likely to be substantial differences between water companies, and over time, in enhancement expenditure requirements. These differences did not seem to be taken account of sufficiently in Ofwat's totex models. For example, a company's enhancement expenditure will reflect whether increases in (forecast) demand for water can be met through existing capacity or require new capacity to be built, but there was no explanatory variable to capture this in Ofwat's totex models. Furthermore, where companies needed to increase water resource capacity, the costs of doing so may vary substantially between companies depending on local, ecological and environmental factors that determine the feasible options for additional water resources and their costs. Enhancement requirements may also be driven by relatively local environmental concerns, such as over-abstraction from particular sources, which vary across different companies' regions. The totex econometric models used by Ofwat

seemed limited in their ability to take account of differences between companies in their enhancement requirements.[120]

4.47 Appendix 4.1 provides a more detailed discussion of the points at *(a)*, *(b)* and *(c)* above. Across these issues, we appreciated that there were benefits from using benchmarking analysis and from models that take the whole of totex together (see paragraphs 3.20 to 3.22). Our point here is that a totex approach also comes with drawbacks and risks; these need to be considered alongside their benefits and, in our view, raise questions about an approach that places emphasis on high-level totex models without complementing these with other forms of analysis.

4.48 In addition to these issues with the overall approach to benchmarking analysis, we considered the particular model specifications used by Ofwat.

4.49 First of all, we noted that Ofwat had recognised in FD14 that its models did not work sufficiently well for Bristol Water and made two major adjustments. One adjustment was, in effect, to disregard the results from the two refined totex models and change its triangulation process so that its cost assessment gave a weight of two-thirds to its bottom-up modelling work-stream and one-third to the full totex work-stream. The other adjustment was an £18.2 million adjustment for treatment complexity, which Ofwat found to be insufficiently accounted for in its refined totex and refined base expenditure models. Ofwat calculated the adjustment by comparing its results from these models with those from alternative econometric models that Ofwat considered to better capture the effect of Bristol Water's water treatment complexity on its costs. While Ofwat's special cost factor process – and the flexibility it adopted in its overall cost assessment – allowed it take steps to address issues arising in the case of Bristol Water, these steps highlight some limitations in the original econometric models, at least for Bristol Water.

[120] The unit cost models that Ofwat used for enhancement expenditure used additional cost drivers, such as forecasts of the water supply deficits from companies' WRMPs that seem relevant to enhancement expenditure. But these did not feature in the totex and base expenditure models that are the focus of the review in this section.

4.50 We identified a number of specific problems with Ofwat's models:

(a) **Counter-intuitive coefficients** – some of the estimated coefficients from Ofwat's econometric models appeared to us to be counter-intuitive.[121] They implied relationships between costs and the explanatory variables that suggested a lack of precision in model estimation and limitations in these models, which could adversely affect the estimated level of expenditure requirements for specific companies. These were not isolated cases. Indeed, Ofwat's consultant CEPA identified that the results from these models differed from what it had expected, in terms of both the sign (positive or negative) and magnitude of a number of the estimated coefficients.

(b) **Number of explanatory variables relative to sample size** – the econometric models used by Ofwat involved a relatively large number of explanatory variables compared to the sample size of the data set, particularly for the full totex model,[122] but also for the refined totex and base expenditure models. Econometric and statistical analysis have limitations and, to the extent that econometric models can identify and estimate useful estimates of the relationships between cost and the explanatory variables, this must come from inferences drawn from correlations in the data. The small sample size, combined with a large number of explanatory variables – some of which were highly correlated with each other and show little variation over time – contribute to risks of inaccuracy in the results.

(c) **Translog models** – Ofwat used models with a particularly complex model specification, which it described as translog.[123] The models involve relatively complex explanatory variables and it is difficult to interpret the relationships that they imply between costs and explanatory variables in economic or engineering terms. In the context of the relatively small sample size, the translog structure seemed overly ambitious. In practice, it seems to have compromised the results (eg Ofwat's refined base expenditure models implied a form of diseconomies

[121] We use the term 'counter-intuitive' to describe the case where estimated coefficients from the econometric models seemed inconsistent with our expectations, from an economic or engineering perspective, in terms of their the magnitude or sign (ie positive or negative). For the purposes of this report, we use this term regardless of whether or not the estimated coefficient is found to be statistically significant (eg whether the estimated 95% confidence interval for the coefficient excludes zero). Where estimated coefficients are used for the purposes of making estimates of water companies' expenditure requirements, the point value matters to the assessment. A wide confidence interval for an estimated coefficient might help explain why the estimated coefficient has a value that seems counter-intuitive but does not mean that its estimated value is innocuous.
[122] Ofwat's full totex model had 27 explanatory variables and a sample size of 90 observations.
[123] The implementation of the translog model used by Ofwat does not necessarily match the standard translog cost function. We use the term translog to describe this feature of Ofwat's models but recognise the possible view that these models were not properly characterised as full translog models.

of scale with respect to the size of a company's customer base, which we found to be counter-intuitive). Ofwat did not provide a convincing explanation of the economic or engineering rationale for the translog specification and its results.

(d) **Relationships between costs and cost drivers** – all econometric models of water companies' costs must be approximations. The way that the model is specified implies an assumption (explicit or implicit) about the approximate nature of the relationship between expenditure and the cost drivers used for the explanatory variables in the model. In some cases, we found Ofwat's models to be specified in a way that implied a relationship between expenditure and a cost driver that did not make sense (eg taking logarithms of variables expressed as proportions).

(e) **Endogeneity** – some of the explanatory variables used in Ofwat's models of totex and base expenditure represent factors that were, at least in part, under the control of a company's management and cannot be treated as entirely independent of the dependent variable in the model (eg explanatory variables for mains renewal, leakage or various quality of service measures). The results from a statistical analysis of companies' costs and efficiency may be distorted if some of the explanatory variables were themselves reflective of each company's efficiency and working practices. However, we considered that, given limitations in the available data, it may be better, *in some cases*, to include an explanatory variable that carries risks of endogeneity than to fail to take any account of potentially important differences between companies.

4.51 We discuss these concerns in more detail in Appendix 4.1, which also highlights several other issues with Ofwat's models.

4.52 In addition, we found Ofwat's models to be complex. We decided that we should not treat the complexity of Ofwat's models as a problem in itself. It is good practice to guard against unnecessary complexity in price control reviews, but there will be circumstances in which relatively complex models and methods are appropriate.

4.53 However, we considered that Ofwat's approach was deficient in the following way. Having decided to use complex models that it had recognised were difficult to interpret, Ofwat did not then undertake a further step to present the results and implications of its models in a more understandable and intuitive way. Doing so seems important for two reasons:

(a) It might reveal aspects of the models that do not make sense (or at least require further investigation or explanation) which would otherwise be obscured by the complexity of the models.

(b) It would make it easier for water companies and other stakeholders to understand the models and to see the extent to which the estimated expenditure for a particular company reflects adjustments for various explanatory factors and cost drivers. This is important in a context where econometric models are to be used as a starting point for cost assessment, and therefore have a major bearing on the determinations of wholesale price controls. It is also important where special cost factor adjustments are to be used to allow for factors that may not be captured sufficiently by these models.

4.54 For our determination, we found it helpful to draw out the results of our alternative econometric models in a way that showed how the various explanatory factors in these models contributed to an estimate of Bristol Water's base expenditure requirements (see Table 4.10 and discussion at paragraphs 4.167 to 4.173). This is one possible approach and there may be others.

Views of the main parties on our review of Ofwat's econometric models

4.55 During the course of our work, we shared an initial version of our review of Ofwat's econometric models with Bristol Water and Ofwat. We also received comments from Bristol Water and Ofwat on the review of Ofwat's models presented in our provisional findings. We refined our assessment in the light of this input.

4.56 Bristol Water said that it agreed with our view that there were significant risks that Ofwat's cost assessment for Bristol Water had been compromised by its approach and models.[124] Bristol Water agreed with many of the concerns we had raised with Ofwat's models. Bristol Water's view was that the flaws with the Ofwat models, which were identified in Bristol Water's own submissions and in our review, were sufficiently serious that these models should not form part of the evidence for our determination.

4.57 Ofwat provided a detailed response to our initial review of its econometric models. We made a number of revisions to our assessment of Ofwat's

[124] Bristol Water response to our provisional findings, paragraph 65.

models in the light of the comments from Ofwat. We respond to some of the more general points made by Ofwat below. We respond to more detailed issues in Appendix 4.1.

4.58 Ofwat said that the detailed concerns that we had raised about Ofwat's models were not in general supported by evidence, and that where evidence was referred to, it was not representative of all models and did not substantially undermine Ofwat's broad approach to modelling. We sought to refer to evidence where possible, including our own further quantitative analysis, to try to understand the implications of Ofwat's models. We did not consider the issues highlighted at paragraphs 4.45 to 4.54 above were undermined by a lack of evidence.

4.59 Ofwat was concerned that we may have given insufficient attention to the context for its modelling; in particular that, in Ofwat's opinion, its models have been successfully used as part of a wider process that has reasonably explained the historical costs and business plan forecasts of 17 out of 18 companies.

4.60 We recognised that some of the issues with Ofwat's models were mitigated, in part, by Ofwat's approach of using five different models rather than a single model and by Ofwat's special cost adjustment process (which led to significant adjustments for Bristol Water). Nonetheless, our concerns remained.

4.61 At this point, it is useful to distinguish between: *(a)* Ofwat's econometric models; and *(b)* Ofwat's special cost factor process, which allowed for adjustments to the initial modelling results.

4.62 Ofwat's econometric models did not appear to us to work satisfactorily for all companies besides Bristol Water, for example:

(a) In the case of Thames Water's wholesale water service, Ofwat's models led to a basic cost threshold that was 17% higher than Thames Water's business plan forecast.[125] We found this suggestive of problems with the econometric models in respect of Thames Water. Ofwat told us that it carried out further analysis in light of the modelling results for Thames Water and found that its modelling may have overestimated costs because of Thames Water's particular size and pattern of historical investment. Ofwat said that these factors did not have a significant impact on the forecast revenues of other companies and that it adopted

[125] This calculation compares Ofwat's basic cost threshold plus allowance for policy items with the Thames Water business plan forecast, using data from Ofwat (2014), *Final price control determination notice: policy chapter A3 – wholesale water and wastewater costs and revenues,* p35.

a pragmatic approach of capping the model forecasts of Thames Water rather than revising its modelling.

(b) Ofwat found that it needed to make substantial upward adjustments to the model results for Dee Valley Water. Its special cost factors led to an increase of more than 25% on the basic cost threshold. These adjustments were almost entirely for base service rather than enhancements.

4.63 The special cost factor process used by Ofwat provided a useful and important part of Ofwat's overall cost assessment that helped to address the limitations of the econometric modelling. The specific concerns we identified with Ofwat's econometric models were mitigated, to some degree, by the wider process, but that does not mean that any potential problems with the econometric models do not matter. In practice, Ofwat's special cost factors were quite limited across companies for base expenditure.[126] We were also concerned that a special cost factor process would tend to be more favourable to water companies than consumers.

4.64 Ofwat said that our initial review of its models showed a lack of focus on Bristol Water and what its unique characteristics (if any) were that might explain why Ofwat's models understated Bristol Water's costs. We did not accept this comment. Some aspects of our analysis had looked at issues that were particularly relevant to Bristol Water. But we did not consider it appropriate to approach our review solely from the perspective of the unique characteristics of Bristol Water that might explain why Ofwat's models may understate its costs. We considered that general aspects of Ofwat's models could be relevant to the results for Bristol Water and should form part of our review. Furthermore, because of the complexity in interpreting Ofwat's models, we found it difficult to identify why Ofwat's models gave the results for Bristol Water that they did.

4.65 Ofwat provided further comments on the econometric modelling in response to our provisional findings. One of the main points that Ofwat made was that the modelling approach that we took in our determination should be seen within the context of our inquiry, and that alternative approaches may be appropriate in the circumstances of a wider price control review. Ofwat said that, as a minimum, it was important to recognise that a more flexible

[126] For base expenditure, Ofwat only made adjustments for five out of 18 companies and, across all companies, the average adjustment to the base expenditure per property was around a 3% uplift on the basic cost threshold. This calculation treats the full adjustments for the South West Water water treatment works special cost factor as a base expenditure adjustment (it is part enhancement and part base) and does not include the adjustment that Ofwat made to cap Thames Water's wholesale water allowance.

approach to returns to scale may be appropriate when considering a wider set of companies than Bristol Water.[127] Ofwat also said that it did not seem appropriate to reject in principle the use of models which use a richer set of cost drivers or models which involve a degree of multi-collinearity between the explanatory variables.[128]

4.66 Ofwat also said that, in the wider context of a review of 28 wholesale cost business plans, there were clear advantages in continuing to develop the benchmarking of enhancement expenditure. Ofwat highlighted the use of a cost driver (in its unit cost benchmarking for enhancement expenditure) for forecast water supply deficits deriving from Water Resource Management Plans, which it said appeared to be an appropriate cost driver and to reflect the circumstances of individual companies. Ofwat said that it would not be right to infer that benchmarking of enhancement expenditure would be inappropriate in the context of its price control reviews.[129]

Views of other parties

4.67 Towards the start of our inquiry, we received submissions from several water companies that concerned Ofwat's econometric models. We took these submissions in to account as part of our review of Ofwat's models, although our focus was on the appropriate approach for our determination for Bristol Water rather than a wider review of Ofwat's PR14 methodology. We summarise these submissions in Appendix 2.5.

4.68 In its response to our provisional findings, Thames Water made some specific comments on the flexible functional form of Ofwat's econometric models, which were pertinent to our review of those models.[130]

4.69 Thames Water said that it operated in a more densely-populated urban areas than any other company and that it faced higher costs than an equivalent company operating in other urban areas. It said these higher costs arose from a number of factors including substantially increased infrastructure congestion below ground, higher charges and restrictions related to street works, slower traffic speeds and restricted storage space. Its view was that these urban area effects were taken into account through the flexible functional form of Ofwat's econometric models.

4.70 We agreed that there was potential for diseconomies of density, reflecting the higher costs of serving customers in densely-populated urban areas. But

[127] Ofwat response to our provisional findings, paragraphs 39–41.
[128] Ofwat response to our provisional findings, paragraph 43.
[129] Ofwat response to our provisional findings, paragraphs 44–45.
[130] Thames Water response to our provisional findings.

this would not explain the implication of diseconomies of scale with respect to the number of customers.

4.71 Thames Water noted that there are a number of studies that showed diseconomies of scale in the water industry. In addition, it suggested that the diseconomies of scale (rather than density) from Ofwat's econometric models could be reflective of it being both the largest company in the sample and operating in the most densely populated urban area. That seemed to be an argument about estimation error in the econometric models arising from correlations between explanatory factors relating to density and scale, rather than a causal explanation for diseconomies of with respect to customer numbers.

4.72 Thames Water also said that it would welcome clarity in our final determination that our review of Ofwat's cost assessment for Bristol Water should not be understood to confer views on the appropriate cost assessment approach and form of totex modelling for other companies. This is similar to comments we received from Ofwat and we respond to it in our conclusions below.

4.73 South West Water also provided comments in response to our provisional findings.[131] It was not surprised by our provisional findings that simpler base expenditure models, and a separate review of enhancement expenditure, were better for the purposes of our determination than totex models. But it said that there may be limited read across to the challenges that Ofwat will face in the future in assessing the efficiency of company plans where there is a wider variety of opex and capex investment needs (often driven by past investment decisions and local geographic and environmental factors), with the need for the industry to focus on outcomes rather than output variables. It said that standardised outputs were becoming less useful in an industry where maturity means that direct cost comparisons become harder, particularly where best practice suggests companies look to changing external impacts such as land use to improve water quality at source, rather than in end of pipe physical solutions.

Conclusions on Ofwat's econometric models

4.74 We identified a number of concerns with Ofwat's top-down modelling approach and with the specification and results from the econometric models

[131] South West Water response to our provisional findings.

it used. Ofwat’s response to our initial review and to our provisional findings did not fully address those concerns.

4.75 Our concerns were less extensive and less strong, but still significant, in relation to Ofwat’s refined models of base expenditure. Those models used fewer explanatory variables than Ofwat’s full totex model and excluded enhancement expenditure.

4.76 We recognised that no benchmarking analysis or cost assessment method will be perfect, and there will always be vulnerabilities and limitations in any approach. Any method of estimating a company’s future expenditure requirements (if it operates and invests efficiently) over the five-year price control period is likely to raise significant risks of inaccuracy or other problems.

4.77 Furthermore, the development of the type of top-down econometric models that Ofwat used for its cost assessment involves (or reflects) choices over a great many aspects of model specification and estimation. It is not practical to take every conceivable aspect and dimension of model specification and critically examine all reasonable options and alternatives. As a consequence, any model development and selection process will be affected by judgement on which aspects of model characteristics and performance are most important. It is perhaps inevitable that the models resulting from such a process will overlook or give insufficient weight to issues that other parties may consider important.

4.78 We also recognised that Ofwat’s special cost factor process provided companies with opportunities to mitigate, to some degree, the effect on them of possible limitations or inaccuracies in Ofwat’s econometric models. The special cost factor process was an important part of Ofwat’s overall approach to cost assessment, although it had some limitations (see Appendix 3.1 for further discussion).

4.79 Nonetheless, in the light of our review of Ofwat’s models and wider approach to cost assessment, we considered that there were significant risks that Ofwat’s cost assessment for Bristol Water had been compromised by its approach and models. We therefore saw it as important to consider possible alternative econometric model specifications. We also considered it that it was necessary to carry out an assessment of Bristol Water’s costs that was not dependent on econometric models of totex or base expenditure; hence our targeted review of Bristol Water’s business plan forecasts in Section 5, which brought a different perspective.

4.80 Finally, we agreed with Ofwat's view that our assessment of its econometric models should be seen within the context of our determination for Bristol Water, which differs to that for a price control review that needs to determine 18 wholesale water price controls and ten wholesale wastewater price controls. The weight that we gave to the issues we identified, and the approach that we took in the light of these issues, reflected the circumstances of our inquiry. Even so, our view was that the issues we identified with Ofwat's models should be taken into account as Ofwat develops its approach to cost assessment for future price control reviews.

Development of alternative econometric models

4.81 This section presents our work on the development and estimation of alternative econometric benchmarking models. As explained further below, we focused on models of base expenditure rather than models of totex. We consider enhancement expenditure separately in Section 6.

4.82 This section is organised as follows:

(a) We highlight the priority issues that we took into account in the development of alternative econometric models (paragraphs 4.84 to 4.93).

(b) We provide an overview of the alternative models that we used (paragraphs 4.94 to 4.100).

(c) We summarise the main results from our provisional findings (paragraphs 4.101 to 4.111).

(d) We explain two revisions to our approach from that in provisional findings, which reflect submissions from Ofwat and Bristol Water. The first concerns the way that we made estimates using results from the models that used an unsmoothed approach to capital expenditure (paragraphs 4.112 to 4.124). The second concerns a relatively detailed aspect of the specification of the explanatory variables for our linear unit cost models (paragraphs 4.125 to 4.136).

(e) We explain why we used Bristol Water's forecasts for the various explanatory variables feeding in to our estimates for period 1 April 2015 to 31 March 2020, rather than Ofwat's forecasts for these variables (paragraphs 4.137 to 4.145).

(f) We explain how we selected a subset of preferred econometric models, following a review of model estimation results that seemed counter-

intuitive. We reviewed and refined our selection following our provisional findings (paragraphs 4.146 to 4.154).

(g) We set out the estimates of Bristol Water's expenditure requirements from the alternative econometric models that we used for our determination (paragraphs 4.155 to 4.160).

(h) We present further analysis of these estimates, which compares the estimated expenditure for Bristol Water to that for an industry-average company, and shows how the estimate for Bristol Water takes account of the various explanatory variables in our models (paragraphs 4.161 to 4.174).

(i) We discuss some caveats that are relevant to our analysis and some limitations of our alternative econometric models (paragraphs 4.175 to 4.179).

(j) We present our conclusions on the alternative econometric models (paragraphs 4.180 to 4.183).

4.83 Appendix 4.2 provides more detailed and technical information on the development of the alternative econometric models, our response to a number of issues raised by Bristol Water and Ofwat, and a fuller set of model estimation results.

Priorities and approach for development of alternative models

4.84 Our work on alternative models was necessarily constrained given the time and data available. We sought to focus on some priority issues. The models that we developed were intended to mitigate some of the specific issues that we identified with Ofwat's models.

4.85 We focused on benchmarking analysis of base expenditure rather than totex. This reflected the additional level of concern that we identified for Ofwat's top-down econometric models that included enhancement expenditure (see paragraph 4.46*(c)*).

4.86 We took steps to reduce the concerns about the number of explanatory variables in Ofwat's models relative to the size and variation in the data set. We reviewed the explanatory variables used by Ofwat from an economic and engineering perspective to identify a subset of what seemed to be the more important explanatory variables. We also considered additional explanatory variables suggested by Bristol Water and its consultants. The alternative models we developed had fewer explanatory variables than

Ofwat's full totex model, and fewer variables than its refined totex and base expenditure models if we exclude the time dummy variables that we used.[132]

4.87 We did not use the translog elements of Ofwat's models with which we had identified specific concerns.[133] We opted for simpler and more intuitive model specifications.

4.88 We included some models that involved comparisons of measures of expenditure per customer (ie per property supplied), rather than aggregate expenditure, between companies. This approach can bring benefits in terms of the economic intuition of the models. For example, it allows for assumptions on the relationship between expenditure and cost drivers which may make more sense from an economic perspective than the relationships implied by Ofwat's models. It also helps to reduce statistical problems arising from correlations between explanatory variables in the models where such correlations are primarily driven by differences between companies in their scale of operations.

4.89 For the expenditure per property models, we explored models in which the dependent variable was expressed as a natural logarithm and linear models in which the dependent variable was not expressed as a natural logarithm. This followed some consideration of how we might approximate relationships between expenditure and the identified cost drivers. We also reviewed the explanatory variables used by Ofwat to see whether these were defined in a way that made sense for our models.

4.90 We specified models that did not use the smoothed approach to capex that Ofwat's models used for the dependent variable, and which allowed for a longer time period for the panel data set.

4.91 Overall, we developed a range of different models and refined these drawing on feedback from Bristol Water and Ofwat and our own further analysis.

4.92 We recognised that these alternative models were imperfect. We did not seek to fully address every aspect of potential model specification that emerged from our own analysis and from the feedback we received from Bristol Water and Ofwat. For instance, it may be possible to develop a further set of alternative models that perform better in statistical terms than the models we used, while also maintaining features that we considered

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132 We used the time dummy variables to try to control for industry-wide year-to-year changes in costs. We did not consider that the number of time dummy variables carried the same risks to the model results as the number of explanatory variables for cost drivers.

133 Ofwat's implementation of the translog model does not resemble the standard translog cost function. We use the term translog to describe this feature of Ofwat's models but recognise the possible view that these models are not properly characterised as translog.

important (eg models that make intuitive sense). Furthermore, the set of alternative models that we used did not exhaust the set of plausible or reasonable models, even on the data available to us.

4.93 We decided that it was not proportionate to carry out an extensive econometric model development process. We considered that the range of models that we had developed, and the further sensitivity analysis that we carried out, was sufficient for our findings given: *(a)* the time and resource implications of further econometric model development work; *(b)* our own consideration of special cost factor adjustments (Appendix 4.3); and *(c)* our separate work-stream involving a targeted review Bristol Water's business plan forecasts for base expenditure (Section 5), which provides an additional source of information for the cost assessment that does not rely on our econometric models.

Overview of alternative models

4.94 We explored a range of alternative models that varied in three main dimensions, which are:

(a) whether the dependent variable is aggregate base expenditure or base expenditure per property and, if the latter, whether it is expressed as a natural logarithm;

(b) whether the expenditure measure used for the dependent variable is calculated using a measure of 'smoothed' capex and a related decision about the sample period of data used; and

(c) the specification of explanatory variables in the model.

4.95 Table 4.4 below provides an overview of the different options we explored, along these three dimensions.

Table 4.4: Overview of options explored for initial model development

Dimensions of model specification	*Options explored for initial model development of alternative models*
Logarithmic or non-logarithmic dependent variable and use of unit cost measures	We used 3 types of model: • **Logarithmic unit cost models** in which the dependent variable is the natural logarithm of the measure of expenditure per connected property. • **Linear unit cost models** in which the dependent variable is a measure of expenditure per connected property, without taking the logarithm. • **Logarithmic aggregate cost models** in which the dependent variable is a measure of aggregate wholesale (base) expenditure.
Treatment of capex in dependent variable and related question of data period used	We used 2 different approaches: • **Base expenditure smoothed (5-year)** – expenditure measure each year based on sum of opex in that year plus capex moving average over five-year period. Uses same five-year data sample as Ofwat. • **Base expenditure unsmoothed (7-year) –** expenditure measure each year based on sum of opex and capex, without averaging or smoothing, and using a longer data period than Ofwat (7 years).
Explanatory variables	We used a number of alternative options and combinations for the group of explanatory variables included in the model. These are described in Table 4.5 below. In addition, each model included a constant term and a series of time dummy variables to help control for industry-level changes and fluctuations in costs between the years in the data period.
Estimation technique/specification of error term in the model	Pooled OLS technique.

Source: CMA analysis.

4.96 As indicated in Table 4.5, we produced results for three different groups of explanatory variables, which we label EV1, EV2 and EV3. The way that it made sense to specify explanatory variables is linked to the specification of the dependent variable. Table 4.5 shows the explanatory variable groups that we used.

4.97 We chose these sets of explanatory variables following a review of the explanatory variables used in Ofwat's models, some additional explanatory variables suggested in submissions from Bristol Water and comments from Bristol Water and Ofwat after we shared an initial set of models with them. We also made a refinement to the linear unit cost models following Bristol Water's response to our provisional findings. Appendix 4.2 provides further information on the explanatory variables.

Table 4.5: Groups of explanatory variables used in alternative models

	Logarithmic unit cost model	*Linear unit cost model*	*Logarithmic aggregate cost models*
EV1	• Constant term • Time dummy variables for all years in data sample except 2012/13 • Ln (water delivered per property) • Ln (regional wage measure) • Ln (mains length per property) • Proportion of distribution input from rivers • Proportion of distribution input from reservoirs • Ln (average pumping head)	• Constant term • Time dummy variables for all years in data sample except 2012/13 • Water delivered per property • Regional wage measure • Mains length per property • Proportion of distribution input from rivers multiplied by water delivered per property • Proportion of distribution input from reservoirs multiplied by water delivered per property • Average pumping head multiplied by water delivered per property	• Constant term • Time dummy variables for all years in data sample except 2012/13 • Ln (water delivered per property) • Ln (regional wage measure) • Ln (total mains length) • Ln (total connected properties divided by total mains length) • Proportion of distribution input from rivers • Proportion of distribution input from reservoirs • Ln (average pumping head)
EV2	As for EV1 plus: • Proportion of water consumption by metered non-household customers	As for EV1 plus: • Proportion of water consumption by metered non-household customers	As for EV1 plus: • Proportion of water consumption by metered non-household customers
EV3	As for EV2 but with rivers and reservoirs variables removed and replaced by: • Proportion of distribution input subject to W3 or W4 treatment	As for EV2 but with the rivers and reservoirs variables removed and replaced by: • Proportion of distribution input subject to W3 or W4 treatment multiplied by water delivered per property	As for EV2 but with rivers and reservoirs variables removed and replaced by: • Proportion of distribution input subject to W3 or W4 treatment

Source: CMA.

4.98 In total we had 18 models, which comprised three variations for the dependent variable (logarithmic unit cost, linear unit cost and logarithmic aggregate cost models) combined with three alternative approaches to the explanatory variables (EV1 to EV3) and two alternative approaches to the treatment of capex (smoothed and unsmoothed models).

4.99 We focused on the pooled OLS technique and did not use the GLS (random effects) approach that Ofwat had used alongside its OLS models. In our development of alternative models, we considered it more important to examine other aspects of model specification than the choice between random effects and OLS models, and focused on the simpler OLS approach. For Bristol Water at least, the differences in Ofwat's model results between the pooled OLS and GLS (random effects) approaches were relatively small (around 1% of estimated expenditure).

4.100 We decided not to use the type of SFA models that Bristol Water's consultants Oxera used. We discuss this aspect of model specification further in Appendix 4.2. Nonetheless, we recognised the concerns raised by Bristol Water that Ofwat's approach may overstate the efficiency differences between companies if the totality of estimated residuals are treated as efficiency differences which are subject to an upper quartile efficiency adjustment. We considered this issue further in our assessment of what efficiency benchmark to use (paragraphs 4.205 to 4.245).

Summary of results from econometric models used for provisional findings

4.101 In our provisional findings, we first sought to make comparisons between the results from the alternative econometric models we had developed and the results from Ofwat's models of base expenditure. In order to enable a more like-for-like comparison with Ofwat's models we took the following steps:

(a) We calculated the estimates for Bristol Water by taking the estimated coefficients from each model, and making a forecast of expenditure over the price control period by combining these coefficients with forecast explanatory variables for Bristol Water over that period. We used Ofwat's forecasts for all explanatory variables other than those involving the W3/W4 treatment complexity variable, which did not feature in Ofwat's models. We used the Bristol Water forecasts for these variables.

(b) We applied a downward adjustment of 6.53% to the level of costs predicted by each econometric model. This was the same adjustment that Ofwat applied to the results from each of its models, to implement an upper quartile efficiency benchmark. The adjustment of 6.53% that Ofwat used for upper quartile efficiency was derived from the results from Ofwat's totex and base expenditure models, as well as Ofwat's separate unit cost analysis for enhancement expenditure.

4.102 For these model results – and our benchmarking analysis more generally – we did not seek to implement the 'alpha factor' adjustment used by Ofwat.[134] This adjustment added complexity to the analysis and we were not convinced it was necessary. While it featured in Ofwat's approach, it seemed to have a small effect on the results for Bristol Water: less than 1% on average across Ofwat's five models. We did not consider it proportionate to review the case for the alpha adjustment. In any event, the alpha adjustment would not be an issue for the linear unit costs models that we used, for which the dependent variable is not expressed as a logarithm.

4.103 We presented results in 2012/13 prices and the estimates from our models made no adjustment or allowance for general inflation, input price inflation or productivity improvements over the price control period (we consider these issue further at paragraphs 4.205 to 4.245). Our econometric models used a

[134] See paragraph 4.28.

series of time dummy variables and did not feature a time trend. This represented a significant difference in model specification compared to Ofwat's models and is one factor that meant that the estimates were not entirely on a like-for-like basis.

4.104 Table 4.6 shows the estimated level of base expenditure for Bristol Water, in the period 1 April 2015 to 31 March 2020, derived from the alternative econometric models that we used for our provisional findings.[135]

Table 4.6: Estimates from provisional findings of base expenditure for Bristol Water using Ofwat's upper quartile efficiency adjustment and using Ofwat's forecast explanatory variables

£m (2012/13 prices)

	Base expenditure smoothed (5-year)			*Base expenditure unsmoothed (7-year)**		
Explanatory variables	*Logarithmic unit cost model*	*Linear unit cost model*	*Logarithmic aggregate cost model*	*Logarithmic unit cost model*	*Linear unit cost model*	*Logarithmic aggregate cost model*
EV1	287	277	282	312	301	308
EV2†	294	286	289	323	314	319
EV3	287	280	283	315	308	311

Source: CMA analysis.
*The approach to making estimates from unsmoothed models was different to that we used for our final determination.
†The specification of these models differed to the EV2 models we used for our final determination.

4.105 Looking across the estimates from the 18 models we considered for our provisional findings, the largest difference in estimates arose from the choice between smoothed and unsmoothed approaches to capital expenditure, which we consider in more detail below (paragraphs 4.112 to 4.124). The average from the unsmoothed models was around 10% higher than the average from the smoothed models.

4.106 There was also sensitivity to the other aspects of model specification. For example, the models that use the W3/W4 treatment complexity variable proposed by Bristol Water (the EV3 explanatory variables) produced systematically lower estimates than the comparable models with EV2 variables that allow for variations in raw water quality using explanatory variables relating to the proportion of distribution input from rivers and reservoirs.

4.107 We compared the results from these models with the estimates from Ofwat's models of base expenditure. Ofwat had two base expenditure models; one was an OLS model, and the other a GLS random effects model. Both models produced similar estimates for Bristol Water and these averaged £261 million, before policy items and special cost factors. All of the

[135] Note that the measure of base expenditure used for the econometric models does not cover the totality of companies' base expenditure for wholesale water. It excludes what Ofwat referred to as policy items, which include business rates and pension deficit repair.

alternative models set out above provided estimates of Bristol Water's expenditure requirements that were significantly greater than the corresponding figure of £261 million from Ofwat's models.

4.108 In terms of model specification, the most similar model to Ofwat's refined base expenditure models was the logarithmic aggregate cost model with the smoothed treatment of base expenditure and explanatory variable set EV1. This model provided an estimate for Bristol Water that was around £20 million higher over the five-year period than the estimate from Ofwat's refined base expenditure models. The differences in model specification between our models and Ofwat's models had a material effect on the estimates.

4.109 In its response to our provisional findings, Ofwat emphasised that for Bristol Water it had made a special cost factor adjustment for treatment complexity of £18.2 million and that, when this is taken into account, the estimates from its modelling were similar to those from the models we used for our provisional findings that used the smoothed approach.[136] After its £18.2 million special cost factor adjustment for treatment complexity, which Ofwat calculated using alternative versions of its original econometric models that included the W3/W4 treatment complexity measure as an additional explanatory variable,[137] Ofwat's implied estimate for Bristol Water's base expenditure would be £279 million.

4.110 The figures considered above concern the analysis that we had carried out to compare the estimates from our econometric models with the estimates from Ofwat's models, on a reasonably like-for-like basis. When it came to using our alternative econometric models to make estimates for Bristol Water's base expenditure requirements for our provisional findings, we made two further changes to the approach used by Ofwat:

(a) We did not make the 6.53% upper quartile efficiency adjustment used by Ofwat or make any other upper quartile adjustment. We explain this aspect of our approach at paragraphs 4.205 to 4.245.

(b) We used Bristol Water's forecasts for explanatory variables, rather than Ofwat's forecasts for the explanatory variables. We explain this aspect of our approach at paragraphs 4.137 to 4.145.

4.111 For our provisional findings, we focused on the estimates for a subset of ten out of the original 18 models, having excluded some models following a

[136] Ofwat response to our provisional findings, paragraph 12.
[137] For further information on this adjustment see Appendix 4.3, paragraph 59.

review of model estimation results which seemed counter-intuitive. The average estimate for Bristol Water, for the period 1 April 2015 to 31 March 2020, from these ten models was £307 million, on the basis of an estimated industry-average level of efficiency. This would correspond to a figure of £287 million if the Ofwat 6.53% upper quartile adjustment were to be applied.

Revisions to estimates from the unsmoothed econometric models

4.112 Our alternative models used two different approaches to the treatment of capex. One followed the approach from Ofwat's models, of taking the average capex over the last five years in the calculation of the base expenditure measure used for the dependent variable, and using a five-year data set. The other did not smooth or average capex across years and we used a seven-year data period for this unsmoothed approach.

4.113 Ofwat maintained its view that the smoothed approach was appropriate. In its response to our provisional findings, Ofwat said that the main differences in the allowances for base expenditure between Ofwat's assessment and our provisional findings appeared to be driven by our use of econometric models that used the unsmoothed approach as well as the special cost factor adjustments we made for regional wages and mains renewal. Ofwat said that we should either significantly modify or abandon the use of the unsmoothed models.[138]

4.114 In contrast, Bristol Water favoured the unsmoothed models and its response to our provisional findings argued that we should give more weight to the estimates from unsmoothed models. Our provisional findings had drawn on the estimates from six smoothed models and four unsmoothed models in producing an estimate of Bristol Water's base expenditure requirements. Bristol Water said that we should consider weighting the results from different types of models more appropriately.[139]

4.115 We review the submissions from Ofwat and Bristol Water on the smoothed versus unsmoothed models in more detail in Appendix 4.2. We focus below on the revisions we made to our approach following our provisional findings.

4.116 In considering the use of smoothed and unsmoothed models, we found that it was important to distinguish between two parts of the overall methodology:

[138] Ofwat response to our provisional findings, paragraphs 47 & 50.
[139] Bristol Water response to our provisional findings, paragraphs 81–82.

(a) The specification of the econometric models to be applied to the historical data on water companies' expenditure.

(b) The method used to take the results (estimated coefficients) from the econometric models from *(a)* and produce an estimate of Bristol Water's expenditure requirements in the period from 1 April 2015 to 31 March 2020.

4.117 For the econometric model specification under *(a)*, we considered that it was appropriate to use both smoothed and unsmoothed approaches. There are benefits and drawbacks of each approach, which we explain further in Appendix 4.2. We did not wish to place full reliance on either of these approaches to the exclusion of the other. The main benefit of the smoothed approach is that it may reduce distortions to the econometric results arising from year-to-year fluctuations in capital expenditure, especially where these relate to the five-year price control. The benefits of the unsmoothed models compared to the smoothed models included a larger panel dataset to use for the econometric analysis and avoiding an inconsistency that the smoothed approach introduces between the financial years applicable to the dependent variable in the models (five years) and the financial years applicable to the explanatory factors (a single year).In the light of further analysis following our provisional findings, we considered that it was necessary to make a change to the way that we used the results from the unsmoothed models to produce estimates for Bristol Water's expenditure under *(b)* above.

4.118 In our provisional findings the estimates we produced from the unsmoothed models were systematically higher for Bristol Water than the estimates from corresponding smoothed models (see Table 4.6 above). We carried out analysis to produce estimates for the other 17 water companies in our sample. We found that, across these other companies, the estimates from the unsmoothed models were systematically higher than for corresponding smoothed models.[140]

4.119 In its response to our provisional findings, Ofwat had raised concerns that the unsmoothed models placed undue weight on the historical spending in years within the five-year price control cycles that had relatively high levels of expenditure. Ofwat said that there were peaks in the middle of the price control periods, with lower spend in the first and last years.[141] Ofwat's

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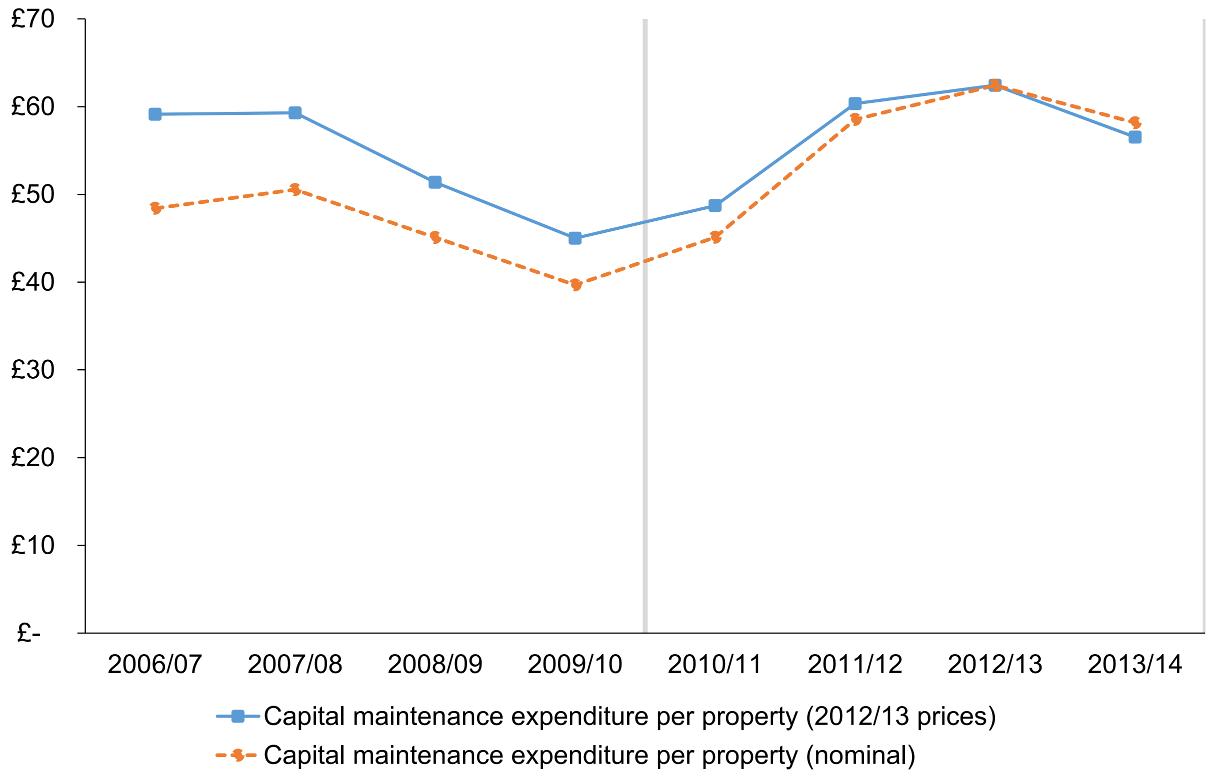
[140] See Appendix 4.2, paragraphs 172 to 180.
[141] Ofwat response to our provisional findings, paragraph 55.

submissions highlighted the need to take account of the time profile of water companies' expenditure during the five-year price control periods.

4.120 Base expenditure comprises opex and capital maintenance (capital maintenance is the sum of IRE and MNI). Capital maintenance expenditure shows more variation over time than opex, which reflects the greater discretion or flexibility that water companies have over the precise timing of capital maintenance expenditure compared to opex. Figure 4.1 below shows measures of the average capital maintenance expenditure per property supplied, across the 18 water companies in our sample, over the period 2007/08 to 2013/14. The vertical line in the chart marks a separation between the price control period that ran from 1 April 2005 to 31 March 2010 (AMP4) from the price control period that ran from 1 April 2010 to 31 March 2015 (AMP5).

Figure 4.1: Time profile of industry-average capital maintenance per property



Source: CMA analysis.

4.121 Figure 4.1 illustrates that the profile of capital maintenance has not followed a steady trend between 2006/07 and 2013/14. It was at its lowest level towards the middle of this period, in 2009/10, which was the last year of AMP4. This was consistent with Ofwat's view that the mid-period of a price control cycle (eg 2007/08, 2008/09, 2012/13 and 2014/15) tended to have higher expenditure than the start and end years (eg 2009/10, 2010/11). In the light of Figure 4.1, and Ofwat's submissions, it would not seem appropriate to simply extrapolate from water companies' expenditure levels in 2012/13 in order to make a forecast of expenditure requirements for the period 2015/16 to 2019/20.

4.122 On further review, we identified that a major factor contributing to the estimates from the unsmoothed models from our provisional findings being higher than the estimates from the corresponding smoothed models was the combination of the following:

(a) The estimates from the unsmoothed models placed greater weight on water companies' capex in 2012/13, whereas the smoothed models (by construction) placed greater weight on companies' average capex over the period 2008/09 to 2012/13.[142]

(b) Industry-wide expenditure was relatively high in 2012/13 compared to previous years, and this reflected relatively high capex in 2012/13.

4.123 In this light, we did not consider it appropriate to use the unsmoothed models in the same way for our final determination as for our provisional findings. To do so would seem to give undue weight to water companies' expenditure in 2012/13, which did not seem likely to be representative of expenditure over an entire five-year price control period.

4.124 We did not need to alter the econometric model specification for the unsmoothed models. Instead, we revised the way that we used the model estimation results to produce an estimate of Bristol Water's expenditure requirements in the period 1 April 2015 to 31 March 2020.[143] The purpose of our revised approach was to give similar weight to the level of industry-wide expenditure in each year from 2008/09 to 2012/13 (adjusted for RPI inflation) in calculating an estimate for Bristol Water over the period from 1 April 2015

[142] This reflects the time dummy variable in the econometric models. We had taken 2012/13 as a reference year and specified time dummy variables for each of the previous years in the dataset. Our estimates for Bristol Water for the period 2015-2020 did not give effect to the coefficients for the time dummy variables for these previous years, which meant that these estimates were heavily influenced by the value of the dependent variable in 2012/13 (ie the value in 2012/13 of the expenditure variable used for the dependent variable).

[143] We retained the same time dummy variables in the econometric model specification as for provisional findings. This meant that we had time dummy variables for all years except 2012/13, which we treated as a reference year. The estimated coefficient for each year's time dummy represents an estimated difference in industry-level costs compared to 2012/13. In making estimates for the period 1 April 2015 to 31 March 2020, we took account of the estimated coefficients for the time dummy variables in the following way. We applied the coefficient for the financial year 2008/09 (the penultimate year of the 2005-2010 price control period) in making our estimate for 2018/19 (the penultimate year of the 2015-2020 price control period). We applied the coefficient for the financial year 2009/10 (the final year of the 2005-2010 period) to our estimate for 2019/20 (the final year of the 2015-2020 price control period). We applied the coefficient for the financial year 2010/11 (the first year of the 2010-2015 price control period) in making our estimate for the financial year 2015/16 (the first year of the 2015-2020 period). We applied the coefficient for the financial year 2011/12 (the second year of the 2010-2015 price control period) for our estimate for the financial year 2016/17 (the second year of the 2015-2020 price control period).

to 31 March 2020. This change brought the estimates from the unsmoothed models more in line with the estimates from the smoothed models.

Refinement of explanatory variables for the linear unit cost models

4.125 For the linear unit cost models that we used for our provisional findings, the models used the following explanatory variables for water source type, treatment complexity and pumping head:

(a) A measure of the volume of distribution input per property from river sources (this is equivalent to the proportion of distribution input from river sources multiplied by total distribution input and divided by the number of properties supplied).

(b) A measure of the volume of distribution input per property from reservoir sources (this is equivalent to the proportion of distribution input from reservoir sources multiplied by total distribution input and divided by the number of properties supplied).

(c) A measure of the volume of distribution input per property subject to W3/W4 treatment processes (this is equivalent to the proportion of distribution input from river sources multiplied by total distribution input and divided by the number of properties supplied).

(d) A measure of average pumping head multiplied by the total distribution input and divided by the number of properties supplied.

4.126 Distribution input is a measure of the average amount of water that is put into a water company's potable water distribution system (in Ml per day). The difference between distribution input and the estimated volume of potable water delivered to customers is the estimated level of leakage from the potable water distribution system.

4.127 In our provisional findings, we had identified that Bristol Water has relatively low distribution input per property (in part because of relatively low leakage), which meant that it needed to abstract and treat less water than the average company to meet the same level of demand per property. This suggested that its higher-than-average treatment costs for Bristol Water were likely to be offset, to some degree, by a lower required distribution input.[144]

4.128 In its response to our provisional findings, Bristol Water argued that we had not taken into account the additional ongoing costs that Bristol Water incurs

[144] Provisional findings, paragraphs 4.425–4.426.

to achieve lower levels of leakage, and in turn, lower levels of distribution input. Bristol Water said that our models penalised Bristol Water in the cost assessment because these models allowed for the benefits to Bristol Water from a lower volume (distribution input) but not the additional costs to achieve lower leakage (and hence lower distribution input).[145]

4.129 Bristol Water's comments on distribution input and leakage were only relevant to the linear unit cost models that we used. We reconsidered the specification of these models.

4.130 We first briefly recap on our approach to this aspect of the model used for provisional findings. For our logarithmic models, we had followed Ofwat's approach of including explanatory variables for the proportion of distribution input from rivers and the proportion of distribution input reservoirs (and the proportion of distribution input subject to W3/W4 treatment, which Ofwat used for its special cost factor adjustment). If river water is, on average, more costly to treat than water from other sources, this suggests consideration of an explanatory variable related to river water sources.

4.131 For the linear unit cost models, we were more concerned about the use of proportions in the specification of the explanatory variable. In a linear unit cost model, if the explanatory variable is specified as the proportion of distribution input from rivers, this implies that the effect of using river water sources on a company's costs depends only on the proportion of water from rivers and not the total volume of water it requires from rivers. The estimated monetary effect (in pounds) for a company that needs a relatively high volume of water per property supplied would be assumed to be the same as that for a company that needs a relatively low volume of water per property supplied if they have the same proportionate use of rivers. This did not seem a good assumption.[146]

4.132 Given this issue, for provisional findings we specified linear unit cost models that used the volume of distribution input from rivers divided by the number of properties supplied as an explanatory variable rather than the proportion. Similarly, we used the volume of distribution input from reservoirs per property and the volume of distribution input subject to W3/W4 treatment per property.

[145] Bristol Water response to our provisional findings, paragraphs 113–120.
[146] This issue did not apply in the same way for the logarithmic models. For these models, the explanatory variable is specified to have a proportionate effect on expenditure and so the effect of a given change in the river source variable would be greater for a company that has a higher average consumption per property than for a company with a lower average consumption per property (provided that consumption per property is included as an explanatory variable in the model and the estimated coefficient for this variable is positive).

4.133 However, Bristol Water was correct to identify the potential problems of using the volume of distribution input for the explanatory variables. Bristol Water's relatively low levels of distribution input per property reflect its efforts to tackle leakage: Bristol Water has relatively low level of leakage as a proportion of distribution input. The efforts to achieve relatively low levels of leakage give rise to leakage control costs that may be overlooked by the linear unit cost models from our provisional findings.

4.134 For our final determination, we refined our linear unit cost models and used the following explanatory variables:

(a) A measure of the volume of water delivered using water from river sources divided by the number of properties supplied (this is equivalent to the proportion of distribution input from river sources multiplied by average water delivered per property).

(b) A measure of the volume of water delivered using water from reservoir sources divided by the number of properties supplied (this is equivalent to the proportion of distribution input from reservoir sources multiplied by average water delivered per property).

(c) A measure of the volume of water delivered using water subject to W3/W4 treatment processes divided by the number of properties supplied (this is equivalent to the proportion of distribution input subject to W3/W4 treatment processes multiplied by average water delivered per property).

(d) A measure of average pumping head multiplied by the average volume of potable water delivered per property supplied.

4.135 This revised approach takes account of the effects of differences in demand or consumption patterns between companies in the estimation of the additional costs (if any) associated with different water source types or treatment requirements. It does not overlook the additional costs of achieving lower levels of leakage, which was the concern raised by Bristol Water with the models used for our provisional findings.

4.136 We included four linear unit cost models in the preferred set of models that we used for our provisional findings. The effect of the change described above was to increase the estimate for Bristol Water's expenditure requirements by £4.5 million on average across these four models.[147] This

[147] This comparison is on a like-for-like basis after having made the separate revision to the way that we made estimates from the unsmoothed models.

change did not affect the estimates we made using the logarithmic unit cost and aggregate cost models.

Forecasts of explanatory variables

4.137 To use the results from the econometric models to estimate Bristol Water's expenditure requirements over the five years from 1 April 2015 requires forecasts of the explanatory variables for Bristol Water over that period.

4.138 In drawing comparisons above between the estimates from Ofwat's econometric models and from our alternative models, we used Ofwat's forecasts to allow for a more like-for-like comparison.

4.139 Bristol Water produced its own forecasts of the explanatory variables used for the econometric models. These differed from Ofwat's forecasts. We summarise the forecasts of the data that feed in to our explanatory variables in Table 4.7 below.

Table 4.7: Comparison of Ofwat and Bristol Water forecasts of data for Bristol Water used for explanatory variables: averages over 2015/16 to 2019/20

	Ofwat forecasts	*Bristol Water forecasts*
Total mains length (km)	6,828	6,789
Total number of connected properties	532,271	545,777
Total mains length per connected property (m)	12.8	12.4
Average potable water delivered per property (m^3/year)	162	155
Total distribution input (Ml/d)	276	267
Regional wage measure	15.3*	15.3*
Average pumping head (m.hd)‡	156	158
		%
Proportion of distribution input from rivers	42	43
Proportion of distribution input from reservoirs	41	40
Proportion of distribution input from other sources (eg boreholes)	17	17
Proportion of distribution input with W3/W4 treatment	99†	99
Proportion of potable water consumption by metered NHHs	21	23

Source: CMA analysis.
*The value for 2012/13 is applied across the period, rather than a Bristol Water forecast.
†Ofwat did not use or forecast this variable and so we used the Bristol Water forecast.
‡Average pumping head is measured as the weighted average height in metres that water is pumped from abstraction to supply.

4.140 We considered which forecasts to use for our determination.

4.141 Ofwat's forecasts of explanatory variables had been prepared by its consultants, Jacobs. Jacobs' forecasts were not based on any detailed consideration of the circumstances of each specific water company. Jacobs used a relatively simple method for many of the explanatory variables used in Ofwat's models, such as an extrapolation based on the change in a variable between 2006/07 and 2012/13 or the average value of the variable over that period.[148]

4.142 Bristol Water urged us to base our analysis on the Bristol Water forecasts of the explanatory variables. It said that these forecasts were consistent with the other elements of the Bristol Water business plan and had been independently reviewed and audited.

4.143 We examined the sensitivity of the results from our models to the forecasts. We found that the average estimate across all 18 models was 2% lower if we used the Bristol Water forecasts rather than the Ofwat forecasts. The average of the estimates using the Bristol Water forecasts was 3% lower if we focused on our seven preferred models (discussed in the subsection below).

4.144 We decided to use Bristol Water's forecasts for our findings. We did not consider it proportionate to carry out a detailed review of the reasons for the differences between the Bristol Water and Ofwat forecasts. Bristol Water's forecasts should make greater allowance for Bristol Water's circumstances than the forecasts produced for Ofwat by Jacobs. There was a possible concern that Bristol Water's forecasts might have been selected by Bristol Water in such a way as to overstate its future expenditure requirements, but in practice we found that using Bristol Water's forecast gave a lower estimate of expenditure requirements than using Ofwat's forecasts.

4.145 Note that for the forecast explanatory variables we did not make forecasts for wage inflation or other input price changes over the price control period. We carried out our analysis in 2012/13 prices (using the RPI as the price base). For the regional wage variable in the period 2015 to 2020, we used the wage variable data from the year 2012/13. The estimates we report are, in effect, estimates of Bristol Water's expenditure requirements in the period 2015 to 2020, before consideration of changes over that five-year period in wages, other input prices and productivity. We consider input prices and productivity growth separately at paragraphs 4.205 to 4.245.

Models with counter-intuitive estimated coefficients

4.146 We use the term 'counter-intuitive' to describe an estimated coefficient from an econometric model of base expenditure that seemed inconsistent with our expectations for that coefficient from an economic or engineering perspective, in terms of the magnitude or the sign (ie positive or negative) of

[148] Jacobs (24 March 2014), *PR14 Forecast explanatory variables: summary report*.

the coefficient. The finding of such a coefficient might reflect, for example, cases where the confidence interval for an estimated coefficient is relatively wide, indicating a lack of precision in the econometric estimation. Because we use the estimated coefficients from the econometric models to assess Bristol Water's efficient expenditure requirements over the period 1 April 2015 to 31 March 2020, the precise values of these estimated coefficients matter to our assessment.

4.147 Some of the estimated coefficients from the alternative models we investigated seemed counter-intuitive and, in some cases, raised similar issues to some of the estimation results from Ofwat's models.

4.148 In our provisional findings, we decided that we should exclude from our preferred set of models any models that had one or more of the following results:

(a) A negative coefficient for:

(i) the regional wage variable;

(ii) the average consumption per property supplied variable;

(iii) the mains length per property variable;

(iv) the number of properties divided by mains length variable;

(v) the variables relating to average pumping head; or

(vi) the W3/W4 treatment complexity variable.

(b) A coefficient of more than one for the regional wage variable, in the case of models with a logarithmic dependent variable.

4.149 This process led to the exclusion of eight out of 18 models, and a preferred set of ten models for our provisional findings. We found the estimation results for the regional wage variable and the average consumption per property to be problematic in terms of the estimated coefficients.

4.150 We had chosen the exclusion criteria above to avoid reliance on models for which the results seemed to be clearly counter-intuitive, while retaining a variety of modelling approaches.

4.151 Following our provisional findings, we carried out analysis which highlighted two further issues:

(a) The aggregate expenditure models that we had used for our provisional findings produced results that would imply a form of diseconomies of

scale, such that increases in the number of properties supplied (holding mains length per property and average consumption per property constant) would increase the estimated expenditure requirements per property. We had also identified in our provisional findings that the estimated coefficients for the mains length variable in these models seemed higher than we would have expected.

(b) The estimated coefficient for the explanatory variables for the proportion of consumption by metered non-household properties seemed unexpectedly high relative to the estimated coefficients for the average consumption per property variable. We expected this coefficient to be negative, as this would be in line with Bristol Water's views (and charging policy) that non-household customers tend, on average, to have lower costs per cubic metre to supply. However, the magnitudes of our estimated coefficients seemed to imply that, if non-household consumption increased (and household demand was constant), average expenditure per property would remain the same or fall slightly as the negative effects on costs from the non-household consumption variable offset the positive effects from the average consumption per property variable.

4.152 On point *(a),* we identified that we could tackle this concern by restricting the preferred set of models that we used for our final determination to also exclude aggregate expenditure models that implied such diseconomies of scale. This lead to seven preferred models. In taking this decision, we recognised that this exclusion had an effect of less than 0.1% on the average estimate for Bristol Water's expenditure requirements in the period 2015-2020 from the preferred set of models.

4.153 The issue at point *(b)* was not something that could readily be addressed by excluding a subset of our models from our benchmark for Bristol Water, because the results for this variable were similar across the set of models we had used for our provisional findings. We also tried some alternative model specifications,[149] but we did not identify models that produced estimated coefficients relating to household and non-household consumption that seemed entirely satisfactory.

4.154 To investigate further, we estimated alternative versions of our models that excluded the two explanatory variables relating specifically to consumption: average consumption per property supplied and the proportion of

[149] For example, models that used separate explanatory variables for metered non-household consumption per property and other consumption (eg household consumption) per property rather than the variables for average consumption per property and the proportion of consumption by metered non-household properties.

consumption by metered non-household customers. We found that these changes had an effect of less than 1% on the average of the estimates for Bristol Water from the seven models that remained after the exclusions described at paragraphs 4.148 to 4.152. This suggested that we would not obtain a substantially different estimate for Bristol Water if we had taken the alternative view that the imperfections in the model estimation results relating to non-household consumption meant that we should exclude the consumption variables altogether.

Estimates for Bristol Water from alternative econometric models

4.155 Table 4.8 below presents estimates for Bristol Water's expenditure requirements from our set of alternative econometric models. The estimates from our seven preferred models are indicated with an asterisk. To recap, all of these estimates are on the following basis:

(a) They reflect our revised approach to making estimates from the unsmoothed models (paragraphs 4.112 to 4.124) and the refinements to the specification of linear unit cost models following comments from Bristol Water (paragraphs 4.125 to 4.136).

(b) They use the Bristol Water forecasts for the explanatory variables in the period 1 April 2015 to 31 March 2020.

(c) They are in 2012/13 prices and before consideration of input price inflation and productivity improvements in the period to 31 March 2020.

(d) They do not include any upper quartile efficiency adjustment.

Table 4.8: Estimates of Bristol Water's expenditure requirements using Bristol Water forecast variables, at industry-average efficiency, 2015/16 to 2019/20

£m (2012/13 prices)

	Base expenditure smoothed (5-year)			*Base expenditure unsmoothed (7-year)*		
Explanatory variables	*Logarithmic unit cost model*	*Linear unit cost model*	*Logarithmic aggregate cost model*	*Logarithmic unit cost model*	*Linear unit cost model*	*Logarithmic aggregate cost model*
EV1	313	303	306	314	304	309
EV2	*307	*299	301	*309	*303	305
EV3	*297	*291	294	302	*295	297

Source: CMA analysis.
* Estimates from preferred set of models for final determination.

4.156 We decided to combine results from the seven preferred models through a simple average, as we had no reason to give greater weight to some of these models compared with others. Taking an average of the results across a number of models helps to reduce the risk that the cost assessment is adversely affected by any specific weaknesses and limitations of any particular model or approach. Ofwat recognised this same argument in its approach to triangulation.

4.157 The average of the estimates for Bristol Water across the seven preferred models was £300 million over the period 1 April 2015 to 31 March 2020.

4.158 The average across the models most closely corresponding to the ten preferred models from our provisional findings was also £300 million. The average across all 18 models was only slightly higher, at £303 million.

4.159 These estimates were not directly comparable with the figure of £261 million from Ofwat's econometric models of base expenditure. This is for three main reasons:

(a) The figure applied after Ofwat's 6.53% upper quartile adjustment. The estimates presented above from our alternative models do not involve any adjustment of this nature.

(b) It was calculated in a way that included the effects of the estimated coefficients for the time trend in its econometric models, over the period to 31 March 2020. The time trend is intended to capture changes over time in industry-wide costs (relative to the RPI). In contrast, the estimates from our alternative models did not involve any time trend and should be seen as estimates in 2012/13 prices before consideration of the effects of input price inflation and productivity improvements over time.

(c) It is before Ofwat's £18.2 million special cost factor for treatment complexity. Ofwat calculated its treatment complexity special cost factor adjustment by comparing estimates for Bristol Water from its original econometric models with estimates for Bristol Water from alternative versions of these models that included the W3/W4 treatment complexity variable. We considered that the estimates used by Ofwat for Bristol Water's base expenditure requirements would be more comparable with the estimates from our econometric models if we included this £18.2 million adjustment.

4.160 Re-stating Ofwat's estimates from its base expenditure models for Bristol Water to adjust for these three factors provided a figure of £293 million.[150]

[150] We calculated this figure by recalculating the estimate for base expenditure from Ofwat's basic cost threshold feeder model for Bristol Water's draft and final determinations, with the time trend variable for each year from 2015/16 to 2019/20 set to its level in 2012/13 (to remove the effect of the estimated time trend), before the adjustment of 6.53% for upper quartile efficiency and with the addition of £19.5 million for treatment complexity. This figure of £19.5 million is the Ofwat special cost factor adjustment of £18.2 million with Ofwat's 6.53% upper quartile adjustment reversed (Ofwat's special cost factor adjustment was on an upper quartile basis).

This was £7 million less than the figure of £300 million from the average of our seven preferred models.

Decomposition of the modelled expenditure estimates for Bristol Water

4.161 To help improve our understanding of the results from the preferred models above, and to provide a check on the reasonableness of the results, we found it useful to examine what was driving the specific estimates for Bristol Water.

4.162 We considered estimates of the level of Bristol Water's expenditure requirements, as implied by the models above, on the basis of expenditure per property supplied. This allows for a meaningful comparison with other companies.

4.163 Ofwat did not present its analysis in terms of expenditure per property, but the implied figure used by Ofwat for its cost assessment for Bristol Water was around £105 per property per year for base expenditure, before Ofwat's adjustment for the upper quartile efficiency benchmark (excluding policy items and before any special cost factors).[151] On a comparable basis, the average expenditure per property per year implied by the average of our seven preferred models was £110.

4.164 For a further reference point, we looked at the simple average of base expenditure per property supplied across the 18 water companies in the sample. Our calculations using the Ofwat dataset indicated that, across these companies, the average base expenditure was £113 per property over the five-year period from 2008/09 to 2012/13.[152]

4.165 We were particularly interested in the extent to which the estimated base expenditure for Bristol Water was explained by specific features, circumstances and characteristics of its supply that make it different from other companies in the industry.

4.166 To help with this analysis, we defined a hypothetical industry-average water company as a point of comparison. This is a hypothetical company that has characteristics and outputs which are the average across the companies in our data sample. We took each of the explanatory variables used in our

[151] This figure is calculated using Ofwat's forecast customer numbers, for consistency with Ofwat's overall estimates.
[152] For consistency, this average base expenditure per property measure includes the expenditure covered by the benchmarking analysis and excludes the items of base expenditure that Ofwat excluded from its benchmarking analysis (ie it excludes the costs that Ofwat referred to as policy items).

econometric models and calculated the average value over the 18 water companies over the sample period from 2008/09 to 2012/13.

4.167 Table 4.9 shows the assumed characteristics for our hypothetical average company and compares them to Bristol Water. The data for Bristol Water varies between years. For this comparison, we used the average of the Bristol Water forecasts of the data used to calculate our explanatory variables over the five-year period from 1 April 2015 to 31 March 2020.

Table 4.9: Comparison of hypothetical average company and Bristol Water

	Hypothetical average company	*Bristol Water forecasts*
Total number of connected properties	1,377,589	545,777
Total mains length (km)	18,814	6,789
Total mains length per connected property (m)	13.7	12.4
Average consumption per property (m^3/year)	176	155
Regional wage measure	16.3	15.3*
Average pumping head (m.hd)	135	158
		%
Proportion of distribution input from rivers	37	43
Proportion of distribution input from reservoirs	22	40
Proportion of distribution input from other sources	41	17
Proportion of distribution input with W3/W4 treatment	85	99
Proportion of water consumption by metered NHHs	26	23

Source: CMA analysis.
*The value for 2012/13 is applied across the period, rather than a Bristol Water forecast.

4.168 This hypothetical industry-average company was a useful reference point to help understand the results from the econometric model estimation. We were able to calculate the level of expenditure per property predicted by the econometric models for the hypothetical average company, compare this to the level of expenditure predicted by the models for Bristol Water, and to identify the sources of any differences.

4.169 Table 4.10 provides such an analysis. This analysis starts with the level of expenditure predicted by the econometric model for the hypothetical average company, before any adjustment for upper quartile efficiency. We used the average figure across our seven preferred models. The subsequent rows show the adjustment calculated from the model estimation results for the various explanatory variables in the model (again, on average across the seven models). The calculation of the adjustment for each explanatory variable for each model was made by combining the estimated coefficients for that variable with the difference in the value for that variable between Bristol Water and the hypothetical average company and then calculating the effect in pounds per property supplied. We first calculated each adjustment at the level of each of the seven preferred econometric models and then took the average value of the adjustment across these models. This analysis involved some approximations so the calculated aggregate base expenditure estimate for Bristol Water may not match exactly that calculated more directly from the econometric models.

4.170 Table 4.10 shows the estimated effect relating to the variables based on the proportion of distribution input from rivers and reservoirs together as a single effect of variation in the nature of raw water sources and treatment complexity. Taking these two together makes sense as the use of proportions in the explanatory variable introduces inter-dependencies. We also included in this calculation the estimated effect of the W3/W4 treatment variable.

Table 4.10: Decomposition of model estimates for Bristol Water – average across seven preferred models

	£m (2012/13 prices)	
	Base expenditure per property supplied	*Aggregate base expenditure*
1. Hypothetical average company (at average efficiency)	111.1	303.2*
2. Adjustments for BW characteristics		
Average mains length per property	(4.4)	(12.1)
Regional wages	(2.2)	(5.9)
Average potable water consumption per property	(3.9)	(10.7)
Proportion of consumption by metered non-households	3.1	8.3
Average pumping head	1.9	5.1
Nature of raw water sources and treatment complexity	4.5	12.3
Net adjustments in total	(1.1)	(3.1)
3. Estimate for Bristol Water (at average efficiency)	110.0	300.1

Source: CMA analysis.
*This is calculated for a company of Bristol Water's number of connected properties, but before the model adjustments for other differences such as length of mains relative to number of properties.

4.171 The estimated expenditure from the models for the hypothetical industry-average company is around £111 per property. This figure is similar to, but a little below, the simple averages of historical expenditure across the 18 companies in our sample of £113 per property.[153] This comparison suggests that the starting point of £111 per property was a reasonable guide to the expenditure for an average company in the industry.

4.172 Table 4.10 shows that the net effect of the various adjustments was that the estimated expenditure per property for Bristol Water, over the period 1 April 2015 to 31 March 2020, was similar to that for the hypothetical industry-average company. There were three downward adjustments:

(a) An adjustment relating to the length of mains and number of customers. For the unit cost models, this adjustment reflected Bristol Water's lower

[153] See paragraph 4.164.

length of mains per property than the hypothetical industry-average company.

(b) An adjustment for regional wages, which reflected the regional wage variable for 2012/13 being lower than the average regional wage variable across all 18 companies and the five- or seven-year sample period. This, in turn, reflected two effects. First, the regional wage variables have generally decreased between the start of the sample period and 2012/13 (both the expenditure data used in the models and the regional wage data have been deflated by the RPI and the wage variables have tended to fall relative to the RPI). Second, Bristol Water's wage variable for 2012/13 was lower than the industry-average for 2012/13.

(c) An adjustment relating to consumption per property, which reflected Bristol Water's forecast consumption per property being around 12% lower than the hypothetical average company across the sample period.

4.173 Table 4.10 shows that the econometric models also made upward adjustments that mostly, but not fully, offset these downward adjustments:

(a) Bristol Water forecast a lower proportion of its potable water supply (in volumetric terms) to metered non-household customers, relative to the hypothetical industry-average company. An upward adjustment was consistent with the view that, on a pounds per cubic metre basis, non-household customers tend to be less costly to supply than households. This view was reflected in water companies' tariffs, which provided lower volumetric rates for some larger customers. The upward adjustment for supply to non-household customers had the effect of offsetting, to some degree, the downward adjustments made for Bristol Water's relatively low consumption per property.

(b) Bristol Water's relatively high average pumping head and associated greater level of pumping costs.

(c) The nature of Bristol Water's raw water sources and the complexity of its treatment processes. These adjustments reflected the average effect across the models that use explanatory variables for specific water source type (rivers and reservoirs) and the models that use the W3/W4 treatment complexity variable.

4.174 This analysis suggested that, with the exception of the regional wage adjustment, which we examine further in our assessment of special cost factors, the allowances or adjustments feeding in to our econometric estimates of Bristol Water's expenditure requirements made intuitive sense.

Caveats and limitations

4.175 Our development of alternative models sought to mitigate some of the issues with Ofwat's models that we considered most important. We were able to draw on the work carried out by Ofwat and its consultants, and by Bristol Water and its consultants, and submissions received during the course of our inquiry.

4.176 These alternative models provide approximations of the factors that drive differences in costs between water companies (besides efficiency) and of the relationships between cost drivers and expenditure. They do not take full and precise account of all the differences between water companies that affect their expenditure requirements.

4.177 We recognised that there were a series of limitations and potential weaknesses in the alternative models. The principal issues seemed to be as follows:

(a) **Number of explanatory variables relative to sample size** – we considered that, compared to Ofwat's models, our alternative models were likely to be less vulnerable to estimation issues arising from the number of explanatory variables relative to the size and nature of the data sample and to the related issues of correlations amongst explanatory variables. Nonetheless, we remained concerned about the small sample size and considered there to be risks of inaccuracy in the estimation of the relationships between expenditure and the cost drivers used for the explanatory variables.

(b) **Input data** – we identified a number of concerns relating to the input data to the models, which will be subject to some inaccuracy and measurement error. As an example, the W3/W4 treatment complexity variable was not up to date.

(c) **Statistical significance** – Ofwat highlighted that our models had fewer coefficients that were statistically significant at the 95% confidence level than its base expenditure models (though the majority of the coefficients for the explanatory variables in Ofwat's base expenditure OLS model were not statistically significant at this level either). We set out our response on this issue in Appendix 4.2 (paragraphs 206 to 216). We remained comfortable with the approach we had taken, which prioritised the economic and engineering intuition for the models over statistical significance. But, as highlighted at points *(a)* and *(b)* above, we recognised that there were limitations to the accuracy of the models

arising from the small sample size, available data and complexity of the factors affecting water companies' base expenditure requirements.

(d) **Counter-intuitive and unstable coefficients** – in some cases, the estimated coefficients for an explanatory variable were not stable across different model specifications, and there were instances of counter-intuitive coefficients. Ofwat's models showed similar issues in relation to the regional wage and consumption variables. The counter-intuitive coefficients reflect the high standard error or variance for some of the estimated coefficients, which also fed through to the findings on statistical significance under *(c)*. We addressed some of the issues by excluding models from our preferred set, but some residual concerns remained, particularly with the variables relating to water delivered (consumption) per property and regional wages.

(e) **Sensitivity to aspects of model specification**. The estimates of Bristol Water's expenditure requirements were sensitive to a number of aspects of model specification. We sought to mitigate this concern by considering a range of different models. The average estimate from our preferred set of seven models was similar to the average across the wider set of 18 models. Nonetheless, the set of alternative models we used does not exhaust the set of plausible or reasonable models that could be considered, and the emphasis placed on different types of models or approach would affect the estimates obtained.

4.178 We expand on a number of these points in our more detailed review of the alternative econometric models in Appendix 4.2.

4.179 In addition, while our focus on base expenditure addressed the concern we had raised with the inclusion of enhancement expenditure in Ofwat's totex models, our alternative models did not tackle the issues relating to the timing of investment needs and the lack of disaggregation below wholesale water supply.[154]

Conclusion on alternative econometric models

4.180 The alternative models set out above mitigated a number of the concerns that we had identified in our review of Ofwat's models, though they did not resolve all of them.

4.181 For the purposes of the cost assessment, we considered whether to build up estimates of Bristol Water's wholesale expenditure requirements based on

[154] Paragraphs 4.46(a) and 4.46(b) above.

the results from Ofwat's benchmarking models, our alternative models, or some combination of the two.

4.182 We decided to base our assessment on our preferred set of alternative models rather than Ofwat's models. We found that both sets of models had weaknesses and limitations. However, we considered that, on balance, the use of the estimates from our alternative models were more likely to contribute to the accuracy of our overall cost assessment. Our view reflected a judgment in the light of the issues discussed above and, in particular, at paragraphs 4.45 to 4.54 and 4.175 to 4.179.

4.183 On that basis, we took the figure of £300 million, which was the average from our seven preferred econometric models, as an input to our estimate of Bristol Water's base expenditure requirements.

Bristol Water's disaggregated econometric models

4.184 In addition to our development of econometric models of base expenditure for wholesale water supply, we saw potential benefits, in principle, from the development of more disaggregated models that took different parts of the wholesale water value chain separately (eg separate models water abstraction and treatment and for treated water distribution) and from more granular forms of benchmarking analysis. However, the data available for our inquiry was not readily amenable to this type of analysis and Ofwat told us that the disaggregated data from regulatory accounts was unlikely to provide a robust basis for modelling and had not been assured with such use in mind.

4.185 We decided that work to try to develop a dataset and models for disaggregated benchmarking was not a priority for our development of alternative econometric models, given *(a)* the data limitations and *(b)* our decision to carry out a separate review of Bristol Water's business plan forecasts for base expenditure which considered Bristol Water's costs at a more disaggregated level than our econometric models of base expenditure.

Bristol Water's submissions on its disaggregated econometric models

4.186 In its response to our provisional findings, Bristol Water agreed with our view that there were significant merits in disaggregated modelling. It recognised that we needed to prioritise our efforts but considered that the lack of disaggregated modelling in our provisional findings contributed to the cost allowance for Bristol Water being too low.[155]

4.187 Bristol Water referred us to the following strands of disaggregated analysis which it considered to support its view that it was not inefficient:[156]

(a) Its disaggregated modelling suggested that a reasonable central estimate of its capital maintenance expenditure was £196 million, which compared to £131 million in our provisional findings.

(b) Oxera's disaggregated modelling for Bristol Water indicated a range for capital maintenance expenditure of £147–£168 million (using Ofwat's regional wage measure, which may lead to under-estimation of its costs).

(c) Oxera's disaggregated opex modelling identified efficient operating costs of £225 million (upper quartile) using an SFA approach (which Bristol Water treated as a post special cost factor basis).

(d) Bristol Water also said that, at PR09, Ofwat's disaggregated modelling showed that Bristol Water's operating costs were relatively efficient (between 5% and 10% from the frontier and in line with the upper quartile).

4.188 Bristol Water said that it was important that we did not disregard the evidence from Bristol Water's disaggregated benchmarking analysis simply because we had not been able to carry out our own disaggregated analysis. Bristol Water said that a disaggregated approach to benchmarking would show that its proposed special cost factor adjustments were appropriate, particularly in relation to the direct costs of water treatment and to infrastructure maintenance.[157]

The nature of Bristol Water disaggregated econometric models

4.189 The type of disaggregated benchmarking analysis that we saw most value in was benchmarking analysis that took different parts of the water value chain (eg water treatment or water distribution) or different activities (eg pumping activities) separately, but still addressed concerns about trade-offs and cost allocation between opex and capex by taking these together in the analysis. In contrast, the analysis provided by Bristol Water was disaggregated between different categories of expenditure but not by activity. It took opex

[155] Bristol Water response to our provisional findings, paragraph 84.
[156] Bristol Water response to our provisional findings, paragraphs 86–87.
[157] Bristol Water response to our provisional findings, paragraphs 88–89.

separately from capital maintenance and, in some models, distinguished between different categories of capital maintenance.

Oxera's disaggregated econometric models

4.190 In its SoC, Bristol Water highlighted estimates from Oxera's econometric modelling, built up from separate models of opex, and infrastructure capital maintenance and non-infrastructure capital maintenance. Bristol Water reported that Oxera's SFA models produced an overall estimate for Bristol Water's base expenditure of between £373 million and £388 million (including policy additions and allowing for special cost factors). Oxera's OLS models produced estimates of £378–£393 million and its random effects models produced estimates of £364–£398 million. These estimates were all provided on an upper quartile efficiency basis.[158]

4.191 These estimates were substantially higher than the corresponding base expenditure estimate from the econometric analysis in our provisional findings, including policy additions and special cost factors, of £346 million.

4.192 The estimates from the OLS and random effects models included £20 million adjustment for opex special cost factors. This included an £8 million adjustment for additional costs at Purton and Littleton treatment works, which we did not accept in our assessment of the appropriate special cost factor adjustments for Bristol Water (see Appendix 4.3). Excluding this would provide a range from these models of £354 million to £390 million.

4.193 We had concerns with the SFA approach used by Oxera, which we discuss in more detail in Appendix 4.2. We did not consider that the estimates from these SFA models would provide a reliable additional to the evidence base for our determination.

4.194 The levels of capital maintenance estimated by Oxera's OLS and random effects models were in the range of £156–£180 million. This range seemed high, for example in comparison with Bristol Water's own forecasts for AMP6 (£156 million) and the estimates based on our review in Section 5 of Bristol Water's business plan (£117–£131 million).

4.195 We identified limitations with Oxera's capital maintenance models:

(a) These models included a number of explanatory variables which we had significant concerns with. Oxera's core model for IRE used an explanatory variable for the proportion of water distribution infrastructure

158 Bristol Water SoC, p310.

MEAV in condition grade 4 and 5. The data for this variable was from 1997/98. We would not expect differences in asset condition between companies to be stable over such a long period of time. We also had concerns about the data used for explanatory variable for average age of distribution mains, which was out-of-date.[159] We were also concerned about the use of the proportion of upstream assets, since a higher *proportion* could either imply more upstream assets or fewer downstream assets.

(b) The main explanatory variables in Oxera's total capital maintenance and non-infrastructure models were booster pumping station capacity, distribution input and average pumping head. This seemed quite a narrow range of variables to use in the benchmarking analysis, especially for the models covering total capital maintenance expenditure.

(c) It was not clear that Oxera's total capital maintenance models would take sufficient account of factors that would (all else equal) tend to reduce Bristol Water's costs per property supplied. In particular, Bristol Water serves a relatively densely-populated supply area, which means that it requires a lower-than-average length of water distribution mains per property supplied. We found that mains length per property was an important variable for our models of base expenditure. Oxera's total capital maintenance models did not take account of the relative length of mains or measures of the density of customers in its supply area.

4.196 More generally, the type of econometric model used for the disaggregated models (and for our own base expenditure models) tends to be sensitive to model specification. Variations in the explanatory factors and functional form used can have significant effects on the results. We noted that Oxera's OLS models for base expenditure had produced estimates for Bristol Water of £329–£340 million, before policy additions and special cost factors, which were well outside the comparable range from the 18 alternative econometric models that we had developed for base expenditure (£291–£314 million).[160] There was a risk that elements of the design of Oxera's disaggregated models had erred on the side of over-estimating rather than under-estimating Bristol Water expenditure requirements. Although Oxera's report included some sensitivity analysis for its disaggregated modelling, we did not consider that this was sufficient to address this risk.

[159] See Appendix 4.2, paragraphs 79 to 80.
[160] See Table 4.8 above.

Bristol Water's econometric models of capital maintenance

4.197 We also had concerns with Bristol Water's own econometric models of capital maintenance.

4.198 Bristol Water's econometric model of infrastructure renewals expenditure, which fed into its estimates of capital maintenance, used data on the age of mains – and we had identified significant problems with the available mains age data.[161] This model also used the proportion of upstream infrastructure assets as an explanatory factor, and we had identified problems with the use of the proportion variable in this way.[162]

4.199 Bristol Water's econometric model of non-infrastructure capital maintenance expenditure (per head of population) only used two explanatory variables, one of which was non-infrastructure MEAV per head. We were concerned about the weight placed on the MEAV variable, given the limitations with the available MEAV data.[163]

4.200 Oxera had reviewed Bristol Water's disaggregated econometric modelling. Oxera said that this modelling 'could be taken as a starting point and developed further'.

Conclusions on disaggregated econometric models

4.201 We recognised that the estimates from the disaggregated benchmarking models provided by Bristol Water produced estimates for its base expenditure requirements that were significantly higher than those implied by the econometric models from our provisional findings (and those used for our final determination). But we had a number of significant concerns with these models, and recognised that the results were likely to be sensitive to detailed aspects of model specification.

4.202 We did not consider that the evidence from the disaggregated modelling provided by Bristol Water was sufficient to justify using a higher number for the estimate of Bristol Water's base expenditure requirements than that arising from our own econometric models of base expenditure.

4.203 Nonetheless, we considered that Bristol Water's disaggregated modelling did contribute relevant information. Following our provisional findings, we carried out further analysis of the special cost factor adjustments proposed by Bristol Water. This included further review of the disaggregated

[161] See Appendix 4.2, paragraphs 79 to 80.
[162] See Appendix 4.2, paragraph 148.
[163] See Appendix 4.3, paragraph 245.

benchmarking analysis that Bristol Water had referred to in support of its proposed adjustments for water treatment complexity and the costs at Purton and Littleton treatment works, for distribution mains renewal, and for the costs of upstream infrastructure maintenance.

Build up from benchmarking models and special cost factor adjustments

4.204 This section draws on the results from the econometric benchmarking models, and further analysis, to produce an estimate of Bristol Water's aggregate wholesale base expenditure requirements over the five-year period from 1 April 2015 to 31 March 2020. It is organised as follows:

(a) We discuss our approach to the efficiency benchmark, and assumptions on costs trends relative to RPI (reflecting productivity and efficiency improvements and input price inflation) over the five-year price control period.

(b) We consider the expenditure allowances for what Ofwat called policy additions, which form part of Bristol Water's aggregate wholesale expenditure requirements but which are not included in the benchmarking analysis.

(c) We present the findings from our assessment of a series of potential special cost factor adjustments, intended to take better account of Bristol Water's characteristics and circumstances, drawing on Ofwat's special cost factor process and on our own further analysis.

(d) We draw on *(a)* to *(c)* above to produce estimates of Bristol Water's aggregate wholesale expenditure requirements over the five-year period from 1 April 2015.

Efficiency benchmark and assumed cost trend for price control period

4.205 In this subsection, we consider two interrelated issues. First, we consider which efficiency benchmark to use in applying the results from the econometric models. Second, we consider which cost trend over time (relative to RPI, which was used to index the wholesale price control) we should assume for Bristol Water's wholesale expenditure, due to the combined effects of input price inflation/deflation (relative to RPI) and productivity improvements over time.

4.206 Ofwat's approach used an upper quartile efficiency benchmark as part of the application of the results from its econometric models. Ofwat applied a 6.53% downward adjustment to the estimates from its models following analysis that, across its totex, base expenditure and enhancement unit cost modelling, an upper quartile efficiency performance implied costs that were 6.53% below the average.

4.207 Ofwat did not carry out any separate strand of analysis for the evolution of costs over time. Instead, its econometric models included a time trend as one of the explanatory variables. Its estimates of expenditure for each company over the period from 1 April 2015 to 31 March 2020 took account of the estimated coefficients for the time trends from its models. Across Ofwat's five econometric models of totex and base expenditure, using the same weights as for its triangulation process, the weighted average coefficient on the time trend was 0.0038. This implied an annual change in costs of around RPI+0.4% per year.

4.208 We take the following in turn:

(a) Bristol Water's views on the efficiency benchmark.

(b) Ofwat's submissions on the efficiency benchmark.

(c) The choice of the efficiency benchmark in the context of our models.

(d) Ofwat's implied cost trend for totex.

(e) The approach to the efficiency benchmark and cost trend in our provisional findings.

(f) Bristol Water's responses to our provisional findings.

(g) Ofwat's response to our provisional findings.

(h) Conclusion on the efficiency benchmark and cost trend

Bristol Water's submissions on the efficiency benchmark

4.209 Bristol Water was concerned that Ofwat used an upper quartile efficiency benchmark, which it considered may result in an efficiency challenge that went beyond what was reasonable for a company to achieve within the price control period. It identified that some aspects of efficiency may relate to past investments, and said that it could take substantial time for a company to catch up any efficiency gap. Bristol Water argued that Ofwat had not considered Bristol Water's ability to meet the targets proposed in the implied timescales, and contrasted this with approaches that allowed a longer period for regulated companies to deliver efficiency improvements.

4.210 Bristol Water also argued that the appropriate efficiency benchmark to use would vary across different categories of expenditure, according to differences in risks between these categories. It said that companies had more scope to defer required capital maintenance than other areas of expenditure and that, as a result, for capex, 'short-term policies can lead to lower costs at the expense of longer-term deterioration of assets', and Ofwat's use of the upper quartile for capex may lead to under investment to the detriment of customers and quality of service.[164] In contrast, Bristol Water said that an upper quartile approach may be more appropriate for opex.

4.211 Bristol Water also argued that an appropriate glide path from a company's level of costs needed to be applied that reflected the company's actual ability to reduce its cost. Bristol Water said that Ofwat's approach for PR14 was effectively to give a weight of 100% in the cost assessment to its model results and 0% to the water company's actual costs. Bristol Water said that this contrasted strongly with Ofwat's approach at PR09 and previous reviews, where operating costs were set using a roll-forward approach, together with an efficiency catch-up based on removing 54% of the modelled inefficiency compared to the frontier by the end of the review.

4.212 We disagreed with Bristol Water's view that Ofwat's approach for PR14 was effectively to give a weight of 100% in the cost assessment to its model results and 0% to the water company's actual costs. This ignores the totex-sharing incentives that Ofwat applied to both opex and capex. The effect of the totex cost-sharing incentives was that Bristol Water's actual costs will have a substantial influence on the level of its wholesale revenue controls, albeit with an implementation delay until the subsequent price control period.

4.213 We did not consider Bristol Water's views on the merits of setting different efficiency benchmarks for different categories of expenditure to be relevant to our analysis in this section. This section concerns estimates of Bristol Water's expenditure requirements that are built up from the results of econometric models of base expenditure. We did not take opex separately from capital maintenance.

4.214 We did not accept the implication drawn by Bristol Water that, because of its opportunities to defer capex, at least in the short term, we should err on the side of a wholesale expenditure allowance that was too high rather than too low.

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[164] Bristol Water SoC, pp390–392.

4.215 Regardless of how we form an assessment of Bristol Water's efficient expenditure requirements over the price control period from 1 April 2015 to 31 March 2020, and what level of assumed expenditure we use in our determination, it will be for Bristol Water to decide how much money to spend, overall and in different categories of expenditure. Bristol Water will need to deliver the outcomes that form part of the price control package and comply with its various statutory obligations. We would expect Ofwat to take steps at future price control reviews (including the use of benchmarking analysis as part of its cost assessment) to provide a safeguard against the risks that Bristol Water may expose customers to additional costs that arise as a consequence of any short-term and inefficient deferral of investment.

4.216 We consider as part of our assessment below the more general concern raised by Bristol Water that an upper quartile efficiency benchmark may result in an efficiency challenge or adjustment that goes beyond what was reasonable for a company to achieve within the price control period.

Ofwat's submissions on the efficiency benchmark

4.217 Ofwat told us that, in considering alternatives to its use of the upper quartile efficiency benchmark, it would expect us to consider the use of a frontier efficiency benchmark and/or how efficiency might be expect to improve over time. Ofwat considered it important to consider all options, including those that might reduce rather than increase the cost allowance for Bristol Water.

4.218 Ofwat said that one of the reasons that it adopted upper quartile rather than frontier efficiency was to explicitly recognise that model efficiency scores might include an element of unobserved heterogeneity driven by the company's specific operating circumstances, as well as relative efficiency. Ofwat said that it had already recognised the possibility of models overstating the scope for sector-wide efficiency improvements.

The choice of the efficiency benchmark in the context of our models

4.219 We did not consider it appropriate to directly apply the Ofwat upper quartile adjustment of 6.53% to the results of the alternative models. This adjustment was largely based on econometric models that we decided not to use directly for our cost assessment.

4.220 We considered whether we should calculate a corresponding upper quartile adjustment for our econometric models of base expenditure.

4.221 Besides Ofwat's approach to PR14, there is regulatory precedent from Ofgem, as well as the CC's Northern Ireland Electricity price determination in

2014, for an approach that sets price control expenditure allowances on a basis that requires a greater level of efficiency than industry-average efficiency. Ofwat's PR14 price control framework, including its approach to the cost of capital, was developed in this context.

4.222 The regulatory precedent from Ofgem and the CC has also recognised that a less demanding benchmark than the upper quartile may be appropriate in cases where there was less confidence in the modelling results. The effect of modelling error and limitations will tend to mean that an upper quartile benchmark will require levels of efficiency that are, in practice, greater than the upper quartile.

4.223 The CC considered the link between the accuracy of the benchmarking model and the choice of efficiency benchmark in its determination for Northern Ireland Electricity:[165]

> Weaknesses or limitations in the econometric models and any errors or inconsistencies in the data set we used will contribute to the variance in costs across the 15 companies in the sample. We would expect this to have an effect on the statistical properties of the cost benchmarks. We would expect this variance to introduce a bias that overstated the relative performance of companies ranked better than the median level of performance and understated the relative performance of companies ranked worse than the median. Where we see a company that has performed relatively well in the benchmarking analysis we would expect that, on the balance of probability, its performance or rank has been improved (to some degree) by modelling limitations and data issues.
>
> In the presence of modelling limitations and data error, we expect that our choice of the fifth company for the benchmark means that, on the balance of probability, NIE would need to be more efficient than the fifth company if its costs are to match our estimated cost benchmark. An effect of modelling limitations and data issues was that the cost benchmark was more demanding than it might appear.

4.224 We were concerned that an efficiency benchmark based on an upper quartile efficiency concept would be overly demanding if applied to the results of the econometric models that we used. This was a judgment in the

[165] CC (26 March 2014), Northern Ireland Electricity Limited price determination, paragraphs 8.135–8.136.

light of the issues we had identified both from our review of Ofwat's econometric models and from our development of alternative models.

4.225 We also had concerns that, to apply the upper quartile (or another benchmark besides the industry average) properly, it would be appropriate to: *(a)* make adjustments for known company-specific special cost factors for all 18 water companies before calculating the relative efficiency scores and upper quartile efficiency adjustment; and *(b)* produce estimated levels of expenditure for each of the 18 water companies from each of our seven preferred models. This would involve a further round of analysis for all companies to identify adjustments that should be applied to the benchmarking analysis sample period, drawing on Ofwat's allowances for forward-looking special cost factors for the five years from 1 April 2015. We did not consider this analysis to be proportionate.

Ofwat's implied cost trend for totex

4.226 While we considered the use of the upper quartile benchmark to be too demanding if applied to our base expenditure econometric models, given the degree of modelling issues, we also considered Ofwat's implied cost trend of RPI+0.4% to be overly generous.

4.227 This trend implied a higher rate of cost inflation than other regulatory recent precedent,[166] and was higher than some of Bristol Water's own forecasts.

4.228 We considered that Ofwat's estimated cost trend was likely to reflect inaccuracies arising from the assumption of a log-linear trend in its econometric models, from the limitations of the econometric estimation given the small data sample, and from Ofwat's use of capex smoothed over five years for the dependent variable, which made it difficult for the model to identify the changes in costs from one year to the next.

4.229 Ofwat's assumed cost trend was higher than that implied by Bristol Water's business plan for opex, which was based on an assumed cost trend of RPI–0.9%. This was composed of an assumption of input price growth (relative to the RPI) of 0.6%, a frontier productivity growth of 1% per year and an additional 0.5% per year improvement for catch-up of relative efficiency differences (based on opex benchmarking analysis carried out by its consultant).

[166] See paragraph 4.240 below.

The approach from our provisional findings

4.230 For our provisional findings, we recognised that what mattered, overall, was the combined effects of the efficiency benchmark applied to the econometric benchmarking results and the assumed cost trend over time relative to the RPI (Bristol Water's wholesale price control was subject to annual RPI indexation).

4.231 Table 4.11 takes a hypothetical company for which the base expenditure benchmark at an average level of efficiency would be £60 million in 2012/13 (the last year of our benchmarking sample period) and illustrates the implications of a series of hypothetical assumptions for the efficiency benchmark and the cost trend relative to RPI. From Table 4.11, we can see that Ofwat's approach of making the 6.53% adjustment from the start of the period, combined with the RPI+0.4% per year cost trend from 2012/13, gives a total of £286 million over the five-year period.

Table 4.11: Illustration of alternative approaches to the efficiency benchmark and cost trends

£m (2012/13 prices)

Hypothetical approach	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*5-year total*
Average-efficiency benchmark; RPI+0 cost trend	60	60	60	60	60	300
Ofwat 6.53% adjustment and RPI+0% cost trend	56.1	56.1	56.1	56.1	56.1	280.4
Ofwat 6.53% adjustment and RPI+0.4% cost trend	56.8	57.0	57.2	57.4	57.7	286.1
Average-efficiency benchmark; RPI–0.5% cost trend	59.1	58.8	58.5	58.2	57.9	292.6
Average-efficiency benchmark; RPI–1% cost trend	58.2	57.6	57.1	56.5	55.9	285.3
Average-efficiency benchmark; RPI–1.5% cost trend	57.3	56.5	55.6	54.8	54	278.2

Source: CMA analysis.

4.232 The illustration in Table 4.11 shows that it is possible to set more, less or similarly demanding expenditure allowances for the five-year period than Ofwat's upper quartile approach by adopting an industry-average efficiency benchmark as the starting point and then varying the cost trend over time.

4.233 For our provisional findings, we decided to adopt the following approach:

(a) We first used an average-efficiency benchmark to produce estimates of Bristol Water's wholesale expenditure from the econometric models over the period to 31 March 2020.

(b) We then made an adjustment to apply a cost trend of RPI–1% per year from 2012/13, to capture the combination of input price inflation (or deflation) and productivity improvements in the period to 31 March 2020.

4.234 An approach of starting at the average level of efficiency and then applying a relatively demanding cost trend of RPI–1% per year was consistent with the aim of requiring a significantly greater level of efficiency, on average across the five-year price control period, than industry-average efficiency. As shown in Table 4.11, this approach also gave a very similar outcome, over the five-year period, to Ofwat's approach (though the annual profile differs).

4.235 We noted the following:

(a) Our approach reflects our judgment in the light of general concerns about the risks of inaccuracy in benchmarking analysis that compares measures of totex or base expenditure between companies and specific concerns about inaccuracy in our econometric models and those used by Ofwat.

(b) Our determination and approach was for a single company, Bristol Water, whose recent levels of base expenditure (eg in 2012/13, which was the last year for our historical benchmarking analysis) were substantially higher than the estimates implied by our models. There may be a different set of issues to consider when setting price controls for other companies, some of which have costs below the level suggested by the models for an averagely-efficient company. We did not assess whether the approach that we used would be optimal or even feasible for Ofwat's periodic reviews of the price controls for all 18 water companies.

(c) Our approach uses a similar cost trend to Bristol Water's business plan for opex, which was based on an assumed cost trend of RPI–0.9%. While these figures were not directly transferable to the results from benchmarking analysis of base expenditure, we considered them a relevant guide to a reasonable approach.

(d) Our approach would allow for more of a 'glide path' of efficiency improvements than an immediate upper quartile adjustment, which was something that Bristol Water had sought.

Bristol Water response to our provisional findings

4.236 In its response to our provisional findings, Bristol Water agreed with our overall approach to the efficiency benchmark and cost trend, subject to two qualifications:[167]

(a) Bristol Water said that it was important that the point estimate in the range was considered carefully, taking in to account the balance of risk for customers and the evidence of companies' actual costs. Bristol

[167] Bristol Water response to our provisional findings, paragraphs 93 & 101–102.

Water argued that we should give some weight to its actual costs in setting an efficiency benchmark.

(b) Bristol Water said that, given current expectations for input price inflation, we should use a cost trend assumption of RPI–0.5% per year. Bristol Water said that in its SoC it had assumed input price inflation of 0.6% relative to RPI for opex and 0.7% for capex. It said that inflation expectations had subsequently fallen compared to the estimates of likely cost increases. It referred us to an updated report by its consultant First Economics that produced revised forecasts of input price inflation, relative to the RPI, of 0.9% for opex and 1% for capex.

4.237 On the first point, we sought to make a reasonable central estimate of Bristol Water's base expenditure requirements, using the estimates from our econometric models and our special cost factor assessment. We did not identify grounds to err on the side of a high estimate or a low estimate. We took account of Bristol Water's actual (and forecast) expenditure in our review of Bristol Water's business plan expenditure forecasts (Section 5) and, where relevant, as part of our assessment of potential special cost factors. We did not consider that it was appropriate to seek to combine or weight the estimates from benchmarking analysis explicitly with Bristol Water's actual costs. When taken together with 50% pass-through of totex, such an approach could undermine the efficiency incentives of the price control framework by creating too strong a link between Bristol Water's remuneration under the price control period and its actual level of costs.

4.238 We reviewed Bristol Water's proposal for a cost trend of RPI–0.5%, but were concerned that using this would lead to us over-estimating Bristol Water's efficient expenditure requirements over the period to 31 March 2020.

4.239 We discuss Bristol Water's revised input price forecasts for opex in Section 5 (paragraphs 5.66 to 5.72). We noted the uncertainties in forecasting input prices and conflicting available short-term data. We were not persuaded that the updated forecasts were an improvement on the original forecasts.

4.240 We also considered two recent price control determinations which involved a regulatory assumption or estimate on cost trends relative to RPI, which reflect the combined effects of input price inflation (relative to RPI) and potential productivity of efficiency improvements:

(a) Ofgem's RIIO-ED1 final determinations for price controls for the slow-tracked electricity distribution companies in November 2014 was based on assumptions for the input price changes for totex relative to RPI (RPEs) of 0 in 2013/14, –1.4% in 2014/15, –0.3% in 2015/16 and 0.6%

for the period from 2016/17 to 2022/23. Ofgem combined this with the companies' forecasts of ongoing productivity improvements, which varied across companies in the range 0.8% and 1.1% per year.[168] Our period of interest was 2012/13 to 2019/20 and Ofgem's ED1 assumptions for RPEs implied a compound annual average change for totex RPE's of 0.2% over this period. Combined with its ongoing productivity assumptions, this would imply an average annual cost trend of –0.6% to –0.9% per year relative to RPI. Ofgem applied this to the results from its totex benchmarking analysis which included upper quartile efficiency adjustments.[169]

(b) In its price control determination for Northern Ireland Electricity, the CC considered RPEs and productivity separately for opex and capex, over the period between 2010/11 and 2017/18. For opex it used figures for the combined effect of RPEs and productivity improvements that ranged between –2% and –0.2% relative to the RPI. For capex it used combined figures that ranged between –2.5% and –1.4%.[170] Over the period from 2012/13 to 2017/18 the implied compound annual average rate was 0.9% for opex and 0.8% for capex. The CC applied these cost trends to NIE's opex and capex, part of which was based on estimates from econometric benchmarking of indirect costs that was more demanding than industry-average efficiency (the CC used a benchmark based on the company ranked 5th out of a sample of 15 companies).

4.241 The figures above applied to electricity network companies and not to water companies, but they still provided indicative information. Our view was that these comparisons were more supportive of an assumption of RPI–1% than RPI–0.5%, especially given that both Ofgem and NIE's figures were combined with efficiency benchmarks that were more demanding than the industry-average level of efficiency.

Ofwat's response to our provisional findings

4.242 Ofwat did not raise any objections to the approach to the efficiency benchmark and cost trend from our provisional findings. It noted that the effect of our approach was broadly the same over the five-year period as

[168] Ofgem RIIO-ED1: Final determinations for the slow-track electricity distribution companies: overview, November 2014, p30.
[169] Ofgem RIIO-ED1: Final determinations for the slow-track electricity distribution companies: overview, November 2014, p24.
[170] CC (26 March 2014), Northern Ireland Electricity Limited price determination, p11–18.

that from Ofwat's upper quartile adjustment and the cost trend it derived from the historical data.[171]

4.243 Ofwat responded to Bristol Water's proposal to use an RPI–0.5% cost trend rather than RPI–1%. It referred to Ofgem's recent work for electricity distribution price controls, which it said combined an upper quartile benchmark and an RPI–0.5% per year assumption for efficiency improvement.[172] Ofwat said that, given this precedent, taking the average efficiency and applying RPI–1% appeared to be a reasonable target and that there was no substantial evidence that it was too severe. Ofwat said that for PR14, it set all 28 wholesale cost baselines using an upper quartile efficiency target, which was broadly equivalent to the CMA's approach, and that these were accepted by 17 out of 18 companies.

Conclusion on the efficiency benchmark and cost trend

4.244 In the light of our discussion and further review above, we did not consider that Bristol Water's submissions called for a change to the approach from our provisional findings. Ofwat supported the approach from our provisional findings.

4.245 We used an industry-average efficiency benchmark combined with an assumed cost trend for base expenditure – reflecting the combined effects of productivity improvements and input price changes relative to RPI – of RPI–1% per year.

Policy additions

4.246 Ofwat did not include all of companies' wholesale expenditure within its totex and base expenditure benchmarking analysis. Some items of expenditure were excluded, typically where Ofwat considered that future allowed expenditure was not best determined by reference to historical industry trends.[173] Ofwat referred to the excluded costs as policy additions or policy items. In setting allowances for wholesale totex, Ofwat made adjustments to allow for policy items, drawing on companies' submissions and on its own analysis.

[171] Ofwat response to our provisional findings, paragraph 64.
[172] The figure Ofwat quoted from RIIO-ED1 differed from that which we calculated above. The figure quoted by Ofwat seemed more of an approximation.
[173] Ofwat (December 2014), *Final price control determination notice: policy chapter A3 – wholesale water and wastewater costs and revenues*, p26.

4.247 Our alternative models cover the same scope of wholesale water expenditure as Ofwat's models, and therefore also exclude policy items.

4.248 The policy items for Bristol Water are set out in Table 4.12 below.

Table 4.12: Policy item totals for 2015/16 to 2019/20

		£m (2012/13 prices)
Item	*Bristol Water business plan*	*Ofwat FD allowance*
Local authority rates and cumulo rates	22.4	22.4
Pension deficit repair	1.64	1.6
Third party costs	5.1	5.1
Open Water costs	N/A	0.4
Total	29.1	29.5

Source: Ofwat.
Note: This table uses information provided by Ofwat. The N/A reported for Bristol Water's business plan forecast of Open Water costs reflects Bristol Water's original view that these costs should be treated differently in the price control so that Bristol Water was protected against uncertainty as to their level.

4.249 The Open Water costs are costs associated with the Open Water programme which is developing market systems, processes and rules to support the development of retail competition to supply non-household customers. Cumulo rates are a form of taxation based on water company profits.

4.250 The value of the policy additions was not disputed between Ofwat and Bristol Water. We did not consider it proportionate to review these and have used Ofwat's figure of £29.5 million in our findings.

Special cost factors

4.251 Ofwat's final determination for Bristol Water included significant adjustments to the results from its benchmarking models. We use the term 'special cost factor' to refer to all types of adjustment considered by Ofwat, including modelling adjustments, but excluding the policy additions considered above.

4.252 The purpose of special cost factors was to take account of specific characteristics of a water company's services or features of its operating environment that affected its expenditure requirements and which may not be adequately captured by the econometric benchmarking analysis.

4.253 The special cost factor adjustments Ofwat applied to its modelling results for Bristol Water would not necessarily be appropriate to apply to the results from our models. Our use of alternative models requires reconsideration of what special cost factor adjustments (if any) apply. Nonetheless, we could draw on Bristol Water's special cost factor claims, and Ofwat's special cost factor assessment, as a source of information because our models share similarities with Ofwat's models.

4.254 We provide our detailed assessment of special cost factors for Bristol Water in Appendix 4.3. We provide an overview below of the special cost factors that we considered, before setting out our findings.

Overview of special cost factors reviewed

4.255 We considered special cost factor adjustments for the following:

(a) **Canal and River Trust payments** – Bristol Water obtains around 45% of its raw water from river sources. Over 99% of its river water is from the River Severn, which Bristol Water receives via the Sharpness Canal. The River Severn is located outside Bristol Water's area of appointment.[174] Bristol Water told us that, under a long-term bulk supply agreement, it was contractually obliged to pay an annual maintenance fee of £1.67 million to the Canal and River Trust, which it expected to continue until the end of AMP6 in real terms. Bristol Water sought a special cost factor adjustment for these payments.

(b) **Treatment complexity: W3/W4 treatment processes** – in its submissions to Ofwat as part of the PR14 process, Bristol Water had argued that Ofwat's econometric models did not take adequate account of the additional costs that Bristol Water faces as a result of needing to treat a relatively high proportion of water with relatively complex treatment processes. It considered that it had a relatively high proportion of water that was treated at works categorised as W3 or W4 works. We considered the case for a special cost factor adjustment due to Bristol Water's relatively higher reported use of W3/W4 treatment works, while also taking account of the differences in our econometric models compared to those used by Ofwat.

(c) **Additional water treatment costs at Purton and Littleton** – Bristol Water argued that, in addition to the point at *(b)* above, the nature of the water that it took from the Sharpness Canal was such that the complexity and cost of treating this water at its Purton and Littleton treatment works were much higher than the costs of treating water from a more typical river abstraction that would require a W3 or W4 level of treatment complexity.

(d) **Congestion in Bristol** – Bristol Water said that the city of Bristol, where over half of its customers were located, had considerable problems with congestion and that this increased its costs by requiring greater travel

[174] Bristol Water SoC, pp89–90.

time between jobs. Bristol Water provided analysis to compare the traffic speeds in Bristol with a number of other cities in England.

(e) **Regional wage data for Bristol Water** – our econometric models used a regional wage variable calculated by Ofwat, which was intended to take account of regional differences between water companies in the wage levels that they face. We agreed with the logic of seeking to include a measure of relative wages in the models, but there were a number of concerns, particularly in relation to the treatment of Bristol Water. We considered whether a special cost factor adjustment would be appropriate to address the concerns we identified with the econometric model estimation results for Bristol Water.

(f) **Mains renewal programme** – as part of our development of possible econometric models, we considered the use of mains age as an explanatory variable, which Bristol Water had advocated. Bristol Water had argued that it has relatively high expenditure requirements in for mains renewal due, in part, to its water distribution mains being relatively old. We decided not to include explanatory variables relating to mains age or mains renewal rates in our econometric models, but that we would instead consider whether a special cost factor adjustment was appropriate for Bristol Water's mains renewal programme.

(g) **Upstream maintenance expenditure** – Bristol Water proposed that we should include an additional special cost factor adjustment for upstream maintenance infrastructure. Its upstream assets include aqueducts, raw water mains and raw water reservoirs. Bristol Water argued that it had a greater number of these assets relative to the number of customers that it serves and that it was therefore likely that it would incur higher maintenance costs per customer than other companies.

(h) **Bedminster reservoir** – Bristol Water suggested a special cost factor adjustment for the Bedminster service reservoir. Bristol Water argued that if we were to agree with its position that there was a need for the service reservoir in the AMP6 period, we should also make a special cost factor adjustment to allow for the expenditure on the service reservoir. Bristol Water said that its proposed expenditure for the Bedminster service reservoir should be treated as a lumpy item and that the expenditure would not be expected to be predicted by the econometric models.

4.256 All of these factors concern potential upward adjustments to the estimate of Bristol Water's expenditure requirements from our econometric models.[175] This reflected Ofwat's overall process for special cost factor adjustments, which involved submissions from water companies seeking upward adjustments to the estimates from econometric models. We were concerned about the risks of an undue emphasis on upward adjustments in favour of Bristol Water. We sought to address these concerns as follows:

(a) We reviewed the special cost factors that Ofwat allowed in FD14 for other water companies to see if these suggested areas where Bristol Water's operating conditions or service characteristics were more favourable than suggested in our econometric models. We did not identify any areas.

(b) Our review of Bristol Water's base expenditure business plan in Section 5 provided an additional perspective on Bristol Water's expenditure requirements, which reduces the risk that the process used for special cost factor was asymmetric to the benefit of Bristol Water and to the detriment of customers.

Findings on special cost factor adjustments

4.257 We decided that a special cost factor adjustment of £8.10 million was appropriate in respect of the payments that Bristol Water needs to make to the Canal and River Trust.

4.258 We decided that a special cost factor adjustment of £3.65 million was appropriate in respect of the additional costs that Bristol Water faced as a consequence of the relatively slow traffic speeds in the city of Bristol, which we did not consider likely to be captured in the estimates from our econometric models.

4.259 We decided that there was no case for a special cost factor for the Bedminster service reservoir.

4.260 We found there to be more uncertainty as to whether an adjustment was appropriate (or how much it should be) in the following areas:

(a) We decided that a regional wage adjustment for Bristol Water was appropriate, and decided that an adjustment of £5.93 million was

[175] In response to our provisional findings (Ofwat response to our provisional findings, paragraphs 57–60), Ofwat argued that the adjustment for regional wages should be downward rather than upward, but this was not reflective of the original rationale for considering an adjustment.

reasonable. We could see an argument that this adjustment may be too high, but were reluctant to make an arbitrary deduction to it.

(b) There was some specific qualitative and quantitative evidence from Bristol Water that suggested that the water treatment requirements at Purton and Littleton relating to the water from Sharpness Canal may give rise to an efficient level of expenditure that was relatively high compared with other water sources. However, this evidence was limited and other evidence cast doubt on Bristol Water's case for an adjustment.

(c) More generally, we identified some concerns that the estimates from the econometric analysis may not have taken full account of differences in Bristol Water's expenditure requirements, relative to the rest of the industry, arising from its mix of water sources (eg its relatively high use of rivers and reservoirs) and the quality of its raw water. However, we did not find clear evidence that the models disadvantaged Bristol Water and required an adjustment.

(d) There was uncertainty in relation to the adjustment for Bristol Water's mains renewal programme, but on balance we considered that there was a reasonable case for an adjustment of £8.64 million.

4.261 We made the adjustments of £5.93 million for regional wages and £8.64 million for mains renewal and no further adjustments for water treatment costs or upstream reservoir assets. We considered this to be a reasonable approach overall, given the uncertainty across these four areas.

4.262 The total special cost factor adjustments we made were £26.3 million. This represented an increase of 9% from the estimates of Bristol Water's base expenditure from the econometric models (before policy additions). We decided that it was appropriate that the RPI–1% cost trend (paragraph 4.245) should apply to our estimates of Bristol Water's expenditure requirements after having taking account of these factors. We identified no reason to exclude them from this high-level cost trend assumption.

Findings on base expenditure from benchmarking analysis

4.263 Table 4.13 presents our calculation of Bristol Water's base expenditure requirements, for its wholesale activities, from the results of our alternative econometric models, addition of policy items and assessment of special cost factors. Our estimate from this calculation was £340.0 million over the period from 1 April 2015 to 31 March 2020. The table also provides a comparison against Ofwat's assessment for Bristol Water's wholesale base expenditure.

Table 4.13: Wholesale base expenditure build up for Bristol Water 2015 to 2020

		£m (2012/2013 prices)
	Ofwat FD	*CMA analysis*
Base expenditure from benchmarking models (at average efficiency)	279.2	300.17
Adjustment for upper quartile efficiency	(18.2)	
Adjustment for treatment complexity (further to allowance in models)	18.2	
Adjustment for Canal and River Trust payments	6.3	8.10
Adjustment for Bristol City congestion	3	3.65
Adjustment for regional wage measure		5.93
Adjustment for mains renewal programme		8.64
Adjustment for RPI–1% cost trend (efficiency and input price inflation)		(15.98)
Policy items (eg business rates and pension deficit repair)	29.5	29.50
Aggregate wholesale base expenditure estimate	318	340.0

Source: CMA analysis.

Observations on data availability

4.264 Our focus in this section has been on the cost assessment requirement to determine the wholesale price control for Bristol Water. Nonetheless, in the course of our work we came across issues that seemed relevant to decisions about the approach to future price control reviews in the water industry. Data availability was a recurring theme.

4.265 In Section 3, we expressed support for an approach to cost assessment that takes benchmarking analysis as a starting point. However, we were concerned that the emphasis that Ofwat sought to place on benchmarking analysis was impeded by its approach to data collection and regulatory reporting.

4.266 We recognised that the Gray review of Ofwat and consumer representation in the water sector had made recommendations on the regulatory burden of the price control review processes.[176] Since that review, Ofwat has developed and implemented some major changes to its approach to price control reviews. There may be merit in reconsidering data collection in this light.

4.267 A greater degree of comparative data across companies could bring benefits in a number of ways including:

(a) enhancing the information that any totex or base expenditure econometric models can draw on;

(b) allowing for more detailed and granular benchmarking analysis; and

[176] Review of Ofwat and consumer representation in the water sector, D Gray (2011), pp26–28.

(c) providing comparative information that water companies and other stakeholders can draw on in making special cost factor submissions.

4.268 We provide three specific examples from our inquiry to illustrate this point:

(a) In several cases, we used data items that Ofwat had previously collected but which it no longer collects. A particularly relevant example was the W3/W4 treatment complexity variable. Even though the data for this variable had not been updated since 2008/09, we used this variable for some of our models. Ofwat also used this variable in FD14 to make an £18.2 million special cost factor adjustment for Bristol Water, which it calculated by adding the W3/W4 variable to its econometric models. There will not be the same opportunities to use data from 2008/09 at the next price control review. We did not have a view on the future use of this specific variable, but we did consider that comparative information relating to the nature and quality of companies' raw water sources would be a valuable addition to the data that Ofwat collected on companies' relative use of water source types such as rivers and reservoirs.

(b) In our assessment of Bristol Water's claim for a special cost factor for the additional costs at the Purton and Littleton treatment works, we faced limitations in the information available to enable comparison of these treatment works against those operated by other companies. We wondered whether a better understanding of the extent to which water abstraction and treatment costs are affected by factors such as source type and the nature of raw water inputs could be obtained from benchmarking analysis using information at the level of individual water resources or treatment works. That would allow for a larger sample size for comparative analysis and may bring out the effects of the relevant cost drivers out more clearly.

(c) We identified in our assessment of Ofwat's models that there may be merit in econometric models that look at specific parts of the value chain separately (eg models that focus on water abstraction and treatment base expenditure separately from treated water distribution base expenditure). Ofwat requires a large amount of disaggregated data from companies for their regulatory accounts. Bristol Water's 2014/15 regulatory accounts report wholesale costs separately for water resources, raw water distribution, water treatment and treated water distribution, and Ofwat has also required companies to provide it with even more detailed cost information on a trial basis.[177] Ofwat's regulatory accounting guidelines already provide detailed guidance to companies on how to allocate costs for the purposes of regulatory reporting. It would seem a relatively small incremental step to collect this data in a way that would facilitate base expenditure benchmarking for the disaggregated categories used for the regulatory accounts.

4.269 Although additional data requirements from companies could add to the annual regulatory burden, we considered this would be offset to some degree by reducing the difficulties faced when addressing arguments and concerns with limited comparative data at the price control review.

4.270 It did not seem to us to be sufficient to rely on water companies using a special cost factor process to resolve limitations in the data collected by Ofwat. It may be difficult for water companies to obtain and share comparative information on a reasonably consistent basis. Water companies do not have the same powers that regulators have to collect data for the purposes of price control reviews. Furthermore, a special cost factor process may work less well for customers than for water companies; companies are better placed than customers to take steps to mitigate the limitations in the data collected and analysed by Ofwat. Our biggest concern with a high-level approach to benchmarking analysis and data collection was that the customers of some companies could pay too much.

[177] See the trial 'upstream services' reporting requirements for the 2014/15 regulatory accounts, which require information for the following wholesale water categories: abstraction licences; raw water abstraction; raw water transport; raw water storage; water treatment; trunk treated water distribution and local treated water distribution.

5. Review of base expenditure from Bristol Water's business plan

Introduction

5.1 In this section we review the base expenditure in the Bristol Water business plan. Base expenditure consists of the sum of opex and the capex required to maintain the operating capability of Bristol Water's existing assets (capital maintenance).[178] Capital maintenance is broken down into IRE[179] and MNI.[180]

5.2 In its SoC, Bristol Water amended its estimated base expenditure from £389 million[181] to £385 million. Ofwat had allowed £318 million in its final determination (as shown in Table 5.1 below).

Table 5.1: Base expenditure summary

	£m (2012/13 prices)			
	Opex	*IRE*	*MNI*	*Total*
Bristol Water SoC	228	76	80	385
Ofwat final determination*	188	63	67	318
Difference	40	9	17	66

Source: CMA analysis.
*Ofwat apportionment indicative as modelling was carried out at a total base level.

5.3 Bristol Water, in its SoC, asked us to undertake a bottom-up engineering review.[182] Bristol Water also said it would like the CMA to consider the level of base expenditure by making use of an engineering assessment of the needs, solutions and costs of the Bristol Water business plan.[183] We have not done a comprehensive bottom-up review, for the reasons explained in paragraphs 3.34 to 3.37. Instead, the purpose of our bottom-up review is to test the findings of our econometric analysis. Reflecting this objective, we have focused on the more material assumptions within the Bristol Water business plan.

[178] Other capex is associated with enhancement projects. This is dealt with separately.
[179] Infrastructure is mainly below-ground or underground assets, such as water mains and sewers, and dams and reservoirs that last for a long time. A distinction is drawn between infrastructure and non-infrastructure assets because of the way the appointed water companies manage, operate and maintain them.
[180] Non-infrastructure is mainly above-ground assets, such as water and sewage treatment works, pumping stations, company laboratories, depots and workshops.
[181] All costs are stated in 2012/13 prices unless stated otherwise.
[182] Bristol Water SoC, paragraph 33.
[183] Bristol Water SoC, paragraph 1127.

5.4 The remainder of this section is set out at follows:

- *(a)* First, we set out our approach to base expenditure (paragraphs 5.5 to 5.11).
- *(b)* Next, we briefly summarise our provisional findings and then set out the views of the parties on our provisional findings (paragraphs 5.12 to 5.29) and the response of Bristol Water and its consultants to the approach and findings of our advisers, Aqua Consulting (Aqua).[184]
- *(c)* We then set out our assessment of operating expenditure. We discuss Bristol Water's business plan and then our estimate of an appropriate allowance for an efficient company (paragraphs 5.30 to 5.92).
- *(d)* We then set out our assessment of the appropriate allowance for Bristol Water's capital maintenance expenditure (paragraphs 5.93 to 5.226), comprising separate assessments of IRE (paragraphs 5.100 to 5.153), and MNI (paragraphs 5.154 to 5.226).
- *(e)* Finally, we set out our findings with respect to base expenditure (paragraphs 5.227 to 5.232).

Our approach

5.5 The purpose of our review of base expenditure was to apply a cross-check to our econometric assessment of Bristol Water's efficient base expenditure. We were concerned about the risk that the econometric benchmarking analysis might not be able to take sufficient account of Bristol Water's needs and circumstances. We considered that the special cost factor process implemented by Ofwat did not fully address these concerns and we decided that there would be benefit from a wider review that went beyond Bristol Water's claims for upwards adjustments to its expenditure allowances. Given our statutory duties, in particular our financing and resilience duties, we considered it important to test the feasibility of the results of the econometric analysis.

5.6 This does not, however, mean we gave equal weight to our review of Bristol Water's business plan and our econometric modelling. As discussed in paragraph 3.37, we agree with Ofwat that there were benefits to strengthening incentives through the use of econometrics where feasible. Were we to base our assessment on a company's business plan, this could, in principle, distort incentives. However, we also considered that the actual

[184] Aqua's findings are in Appendix 5.1.

costs that Bristol Water had incurred were a relevant reference point for what Bristol Water may incur in the future.

5.7 This review of Bristol Water's base expenditure from its business plan sits between Ofwat's approach and Bristol Water's proposal for our review. Ofwat focused on totex benchmarking, adjusted for special cost factors. It did not review the base expenditure within Bristol Water's business plan, other than the special cost factor applications. We have carried out a targeted review of the Bristol Water business plan for base expenditure to gain assurance that it gives a valid reflection of the costs needed to deliver the required outcomes for consumers.

5.8 In undertaking this exercise we reviewed evidence from Bristol Water's business plan on the efficient level of its base expenditure requirements over the period from April 1 2015 – March 31 2020. We also obtained supporting evidence from our engineering consultants, Aqua Consulting (Aqua) and assessed certain aspects of Bristol Water's business plan in the light of Bristol Water's previous expenditure, in order to understand why costs may be higher or lower than in the past. This is particularly relevant for opex, where previous costs are likely to provide useful information for the next AMP.

5.9 We considered the following evidence:

(a) **Level of recurring costs** – certain costs are likely to recur over time, and therefore represent an appropriate baseline for forward-looking costs.

(b) **Efficiency adjustments** – baseline costs may not be efficient. We review the evidence as to whether efficiency adjustments are appropriate to the baseline.

(c) **Cost inflation** – projected costs will vary to historic costs based on relevant cost inflation.

(d) **Trends in activity over time** – capital costs in particular will change over time, for example due to changes in asset conditions.

5.10 We conducted a separate assessment of an appropriate level of expenditure for each of opex, MNI and IRE. These are set out in the relevant subsections below.

5.11 In determining our approach we considered Bristol Water's historic expenditure (over AMP5)[185] per head of population[186] for the three categories of expenditure. Table 5.2 sets out this analysis for Bristol Water. It shows the industry average expenditure per customer and Bristol's relative position out of 18 water companies. This analysis was not considered determinative as to an efficient level of expenditure but was used to provide context as to the relative level of expenditure incurred by Bristol Water compared with other companies.

Table 5.2: Average Bristol Water AMP5 base expenditure cost per head

Cost per head of population	*Opex*	*MNI*	*IRE*	*Total*
Bristol Water (£)	37.55	12.82	20.08	70.44
Position (out of 18, 1 being lowest cost)	15	9	18	16
Average (£)	32.44	13.82	10.97	57.22

Source: CMA analysis.
Note: Based on AMP5 data to 2014/15 (some of which is forecast) and population at 2013/14.

Our provisional findings

5.12 In our provisional findings:

(a) we found that it was reasonable to assume that Bristol Water could achieve additional efficiencies and/or scope reductions relative to its plans;

(b) on opex, we used an updated baseline, as we considered some costs that Bristol Water had assumed were recurring should be avoidable in future years;

(c) on IRE, we considered that Bristol Water was likely to be able to achieve efficiencies, either on unit cost or potentially on scope reduction; and

(d) on MNI we identified a lack of evidence on efficient levels of expenditure. However, where we had been able to review Bristol Water's plans, they appeared to be at a higher cost than necessary and suggested a potential ability to implement material reductions in scope.

5.13 From the above, our assessment was that an appropriate range of total base expenditure was between £329 million and £359 million.

185 Due to timing and availability of data this included an element of forecast expenditure.
186 Calculated using a population estimate for 2013/14.

Views of parties on our provisional findings

5.14 Ofwat agreed with supporting checks for benchmarking results where it was appropriate to do so, but emphasised that it should be for companies to demonstrate their efficiency and not for regulators to demonstrate the feasibility of their benchmarking.[187] Ofwat considered that there was likely to be scope for significantly greater savings in opex than we had identified in our provisional findings.[188] Ofwat said that customers' interests would be best protected by making conservative assumptions on mains replacement as this would incentivise Bristol Water to ensure its processes were robust and fit for purpose.[189]

5.15 Ofwat supported the more robust assessment associated with the lower end of our estimates for MNI.[190] Ofwat stated that, to protect customers, where Bristol Water had not provided sufficient evidence we should make challenging assumptions with respect to costs. It said any resulting shortfalls from such an approach should be a matter for shareholders and not customers.[191]

5.16 Ofwat said that our provisional low case forecast for base expenditure (£329 million) was inappropriately generous to Bristol Water and that £318 million (Ofwat's final determination) was the largest allowance we should make.[192]

5.17 Bristol Water responded in detail to our provisional findings[193] and we discuss specific points as appropriate in the relevant subsections below. In this subsection we set out Bristol Water's high-level comments.

5.18 Bristol Water supported our approach of a 'bottom-up' review in conjunction with an econometric assessment.[194]

5.19 With respect to our assessment of opex Bristol Water said that our assessment was closer to an appropriate range than Ofwat's determination but included a number of inappropriate reductions not supported by

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[187] Ofwat response to our provisional findings, paragraph 66.
[188] Ofwat response to our provisional findings, paragraph 68.
[189] Ofwat response to our provisional findings, paragraph 71.
[190] Ofwat response to our provisional findings, paragraph 72.
[191] Ofwat response to our provisional findings, paragraph 73.
[192] Ofwat response to our provisional findings, paragraph 74.
[193] Bristol Water response to our provisional findings, pp43–97.
[194] Bristol Water response to our provisional findings, paragraph 224.

analysis.[195] Bristol Water said that we should take greater assurance from Oxera's disaggregated modelling.[196]

5.20 With respect to our assessment of IRE, Bristol Water supported our provisional view on the appropriateness of the overall scale of mains replacement but challenged our interpretation of its modelling process.[197] Bristol Water said that there was insufficient evidence to support additional efficiency challenges.[198]

5.21 With respect to our assessment of MNI, Bristol Water said that it was not reasonable to assume that it could achieve additional efficiencies.[199] Bristol Water said that it was inappropriate to conclude, based on Aqua's findings, that it had not forecast its investment needs correctly[200] and disputed that its plans were conservative.[201]

5.22 In our provisional findings, we highlighted that our analysis was limited by a lack of information in respect of how Bristol Water had determined its MNI in particular. In response, Bristol Water provided more extensive submissions on its approach of asset led models (ALM), including the approaches to asset lives that are used in predicting the point at which assets will need replacing.

5.23 Bristol Water asked CH2M to review our approach, which drew on Aqua's findings (discussed further below). CH2M said that Bristol Water had used the ALM 'models to show expected future investment in specific processes at specific treatment works (£14.1 million in AMP6). This is a useful output as these "modelled" needs can in future be compared with actual needs and this will help validate and calibrate the model. The forecast highlights spending peaks at Purton WTW and Banwell WTW; it would be useful to have some site specific commentary and evidence to help verify or re-inforce the model predictions especially because the investment is large proportion of the plan.'

5.24 The CH2M review suggested that while there was confidence that the modelling methodology was robust, the estimates of typical asset life are based on expert panel judgement. We have not been presented with evidence that these estimates are robust. CH2M said that due to the step

[195] Bristol Water response to our provisional findings, paragraphs 207–208. These largely related to issues around the use of AMP5 opex as a base level.
[196] Bristol Water response to our provisional findings, paragraph 208.
[197] Bristol Water response to our provisional findings, paragraph 212.
[198] Bristol Water response to our provisional findings, paragraphs 213–215.
[199] Bristol Water response to our provisional findings, paragraph 217.
[200] Bristol Water response to our provisional findings, paragraph 218.
[201] Bristol Water response to our provisional findings, paragraph 219.

change in treatment works related MNI investment from AMP5 to AMP6 (£22.4 million increasing to £34.1 million) there was therefore an added burden of proof.

5.25 CH2M additionally identified that the process for establishing need was, in its opinion, sufficient and the models were good practice, enabling a risk-based and optimised plan to be produced. However, CH2M said that it had not seen the evidence that substantiated the assumptions that fed the models and could not, therefore, conclude that the estimate was correct. It also said that the validation evidence needed to help justify the need should be robust, eg historical data, condition and survey information.

Bristol Water's response to Aqua's findings

5.26 We engaged Aqua Consulting to review six specific areas of Bristol Water's base expenditure to support our targeted review. The work carried out was focused on specific issues where we identified the need for specialist expertise.

5.27 Following our provisional findings Bristol Water commissioned a number of consultants to respond to Aqua's findings:

(a) CH2M made a number of observations on the Aqua review, the categories against which Aqua considered the investment,[202] and the limited information seen by Aqua.

(b) KPMG said there were a number of defects in the process. In particular it said:

(i) Aqua had questioned the Bristol Water approach to business planning, but these approaches were accepted industry practice; and

(ii) Aqua had over-simplified a complex set of conditions and drivers for the six areas that they reviewed.

(c) KPMG said that only data and information included within the Aqua report was used in its review. The limited time available in the KPMG review meant that no account or assessment had been made by KPMG of the quality or accuracy of the data provided to, or used by, Aqua.

[202] CH2M said that an assessment based on need, optioneering, timing and efficiency differed to the approach adopted by Ofwat.

5.28 We consider the other specific comments that Bristol Water received from various consultants they had used, on specific parts of the Aqua report and we comment on these in the relevant sections below.

5.29 We noted that some of the observations and criticisms of Aqua's approach and findings made by Bristol Water and its consultants arose as a result of the brief that we gave Aqua, which was limited in scope and time. We took account of this in both our provisional findings and in this report.

Operating expenditure

5.30 In this subsection we set out our review of operating expenditure, which is non capital expenditure incurred in the day-to-day operation of Bristol Water's network.

5.31 Our approach to assessing opex for Bristol Water, was in part informed by the following considerations:

(a) Most opex is of a recurring nature. In principle, Bristol Water had strong incentives to minimise opex over AMP5, although this will be mitigated to the extent that Bristol Water could have had the reasonable expectation that its future allowances would be linked to its actual costs.

(b) However, there are fluctuations in opex, for example due to weather events, and therefore opex in any individual year may not be a good reflection of the future.

(c) Opex interacts with other factors (eg enhancement capital expenditure).

(d) Some opex is subject to specific input price pressures (eg power, pension costs).

5.32 Our assessment of opex in this subsection is structured as follows:

(a) First, we review Bristol Water's business plan to understand its approach to opex in its business plan (paragraphs 5.33).

(b) Next, we set out our assessment of an appropriate level of opex. This was structured by considering a series of factors:

(i) A review of Bristol Water's opex in AMP5 to establish a potentially efficient level of recurring costs (paragraphs 5.45 to 5.55).

(ii) An assessment of anticipated additional opex arising in AMP6 (paragraphs 5.56 to 5.65).

(iii) An assessment of the expected level of cost inflation (paragraphs 5.66 to 5.72).

(iv) An assessment of the potential for efficiency over AMP6 relative to AMP5 (paragraphs 5.73 to 5.82).

(c) Finally, we set out our findings on operating expenditure (paragraphs 5.83 to 5.92).

Bristol Water's business plan

5.33 In this subsection, we set out our review of Bristol Water's business plan to understand Bristol Water's approach to opex.

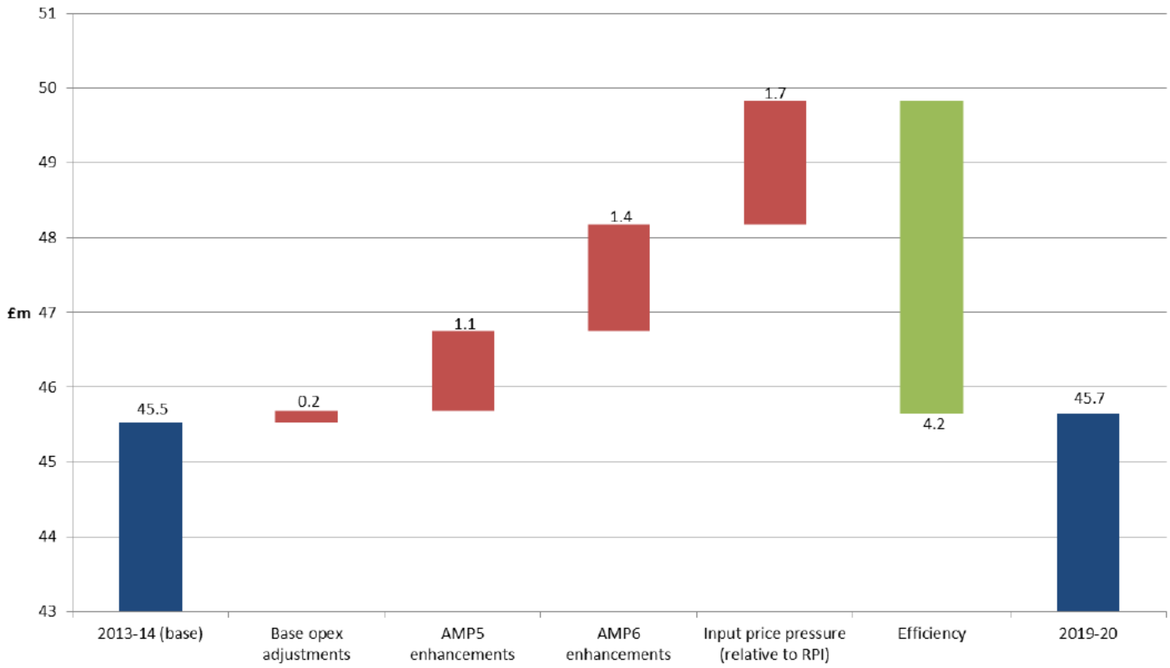
5.34 In the Bristol Water business plan, AMP6 opex was forecast to be £228 million. This reflected a small increase from AMP5 total opex (£3 million) before consideration of extraordinary costs (around £5 million) that were not expected to recur in AMP6.

5.35 Bristol Water's opex estimate was derived by selecting a base year (2013/14) and projecting forward annual expenditure, adjusted for anticipated changes in expenditure over the AMP6 period.

5.36 Bristol Water's overall approach can be understood by considering the level of forecast opex for 2019/20 relative to 2013/14. This is shown graphically in Figure 5.1 below, which shows the composition of incremental changes in annual opex between the base year (2013/14) and the final year of AMP6 (2019/20).[203]

[203] The relative movements vary in each of the five years of AMP6.

Figure 5.1: Bristol Water 'opex Bridge' 2013/14 to 2019/20 (2012/13 prices)



Source: Bristol Water SoC, Figure 53.

5.37 Bristol Water said that it chose 2013/14 as a base year because:

(a) it considered this to be the most up-to-date position available at the time of preparing its business plan;

(b) it considered this to be consistent with the CC10 determination; and

(c) the level of expenditure allowed by the CC for AMP5 was based on factors that would continue in AMP6.[204]

5.38 Bristol Water said that it had experienced favourable operating conditions in 2013/14[205] and noted that there was always the possibility of unexpected one-off costs. It said it had not included an allowance for such costs in AMP6.

5.39 Bristol Water then estimated the changes to opex it anticipated over AMP6 (an increase of some £4.6 million in total over the five years relative to 2013/14).[206]

[204] Bristol Water SoC, paragraph 894.
[205] Which resulted in less expenditure being incurred than might have been anticipated.
[206] Additions to opex are set out in detail in Table 7 (base additions) and Table 8 (additions arising from enhancement) of Appendix 5.2.

5.40 Bristol Water then estimated a feasible level of efficiency savings (0.9% per year, net of inflation), which it calculated would reduce opex in AMP6 by £8.5 million in total.[207]

5.41 The other items that fed into the calculation of total opex were pension costs and an adjustment to recharge an element of wholesale costs to the retail part of the business. These areas were not disputed by the parties and we have not reviewed them as part of our base expenditure assessment.

5.42 Bristol Water's planned level of opex in AMP6 is set out in Table 5.3.

Table 5.3: Bristol Water forecast wholesale opex (2012/13 prices)

						£m (2012/13 prices)
	2015/16	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*Total*
Opex	46.0	45.7	45.5	45.4	45.7	228.3

Source: Bristol Water SoC, Figure 52.

Our assessment

5.43 We have reviewed the evidence presented by Bristol Water supporting the level of opex in its business plan and have sought clarification where necessary. We have assessed the approach used by Bristol Water in building its forecast and consider the individual elements in turn below.

5.44 Ofwat drew attention to the need to ensure the base starting opex was efficient relative to other companies. Ofwat also highlighted the risk that base year costs were inflated. We have had regard to these comments in our assessment of Bristol Water's business plan.

The efficient level of recurring costs

5.45 We first considered whether Bristol Water had chosen an appropriate base year for its opex forecast. Bristol Water told us that it considered 2013/14 was an appropriate year on which to base future opex forecasts (paragraph 5.35). We examined the level of expenditure in 2013/14 and observed that this year showed a £2.2 million (5.5%) increase from 2012/13 as shown in Table 5.4.[208]

[207] This represents a total efficiency target of £14.0 million (equivalent to 1.5% per year) offset by price inflation (measured using RPI), which we refer to as Real Price Effects (RPEs) of £5.6 million (0.6% per year). Bristol Water SoC, paragraph 908. The basis of this calculation is set out in Table 2 of Appendix 5.2.
[208] All figures are in 2012/13 real values, and adjusted from whole business costs to wholesale costs.

Table 5.4: Bristol Water wholesale opex in AMP5 (2012/13 prices)

Year	*2010/11*	*2011/12*	*2012/13*	*2013/14*	*2014/15*
Opex (£m)	44.0	42.8	43.3	45.5	49.8
Change year on year (%)		–2.7	1.1	5.5	9.2
Cumulative change (%)		–2.7	–1.7	3.7	13.2

Source: CMA analysis.

5.46 We considered the levels of opex over AMP5 to establish whether 2013/14 represented a reasonable level of recurring costs. Opex in 2010/11 was £44 million, which included £1.5 million relating to the CC referral. Excluding this item, 2013/14 was 7.3% above the 2010/11 level and 6.3% above the average for the first three years.

5.47 We noted that there was a further, larger, increase in opex in 2014/15. Bristol Water provided additional evidence on the cause of the increase in opex for 2013/14 and 2014/15 relative to 2012/13. In our review of these we focused on what might be considered atypical cost changes.[209] The items we considered are shown in Table 5.5.

Table 5.5: Changes in opex from 2012/13 that may be considered non-recurring

		£m
	2013/14	*2014/15*
Large bursts	0.9	1.7
Capitalisation	0.2	0.2
Regulatory costs	0.6	0.6
EA refund		-0.4
Restructuring		2.0
CMA appeal		1.4
Total	1.7	5.5

Source: CMA analysis.

5.48 Of these items, Bristol Water advised us that:

(a) the burst rate in 2013/14 was below observed average AMP5 levels and should be seen as recurring;

(b) regulatory costs were £0.4 million above the average AMP5 level; and

(c) Bristol Water said that the number of staff (FTE) employed rose from March 2012 to March 2014 by 41 (around 10%), due to an increased capital programme.

[209] For example, we excluded increases to energy costs.

5.49 Our review of the evidence presented by Bristol Water indicated that:

(a) the 2013/14 burst rate was in line with observed average levels;

(b) regulatory costs were of the order of £0.4 million above the average;[210]

(c) there were specific circumstances relating to the capitalisation and restructuring costs totalling £0.4 million and £2 million respectively that meant they would not be recurring.[211]

(d) there were a number of other 'one-off' items of expenditure that would not be recurring;[212] and

(e) we did not consider that the costs of a regulatory appeal should be taken as a normal activity and instead should be treated as a non-recurring item.

5.50 In reaching our provisional findings we:

(a) used an updated baseline, as we considered some costs that Bristol Water assumed were recurring should be avoidable in future years;

(b) used an adjusted average of the AMP5 period rather than 2013/14 as a single base year as used by Bristol Water; and

(c) disallowed some additions where we did not feel these had been justified.

5.51 In response to our provisional findings, Bristol Water said that our analysis understated 2013/14 costs but that we should use that year as an appropriate base.[213] Bristol Water also said that 2013/14 understated base expenditure because key cost drivers were favourable that year.[214] We recognised that it was difficult for Bristol Water to quantify the specific impact of these drivers and considered that this strengthened the case for using an average for the period since it evens out such differences.

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[210] We considered therefore that should 2013/14 be an appropriate base year, an adjustment of £0.4 million would be appropriate

[211] As noted above, in the two years to 2014 Bristol Water recruited 41 staff to help deliver an increased capital programme. However, in 2015 Bristol Water identified the need for a restructure that involves the loss of 10% of Bristol Water's staff. [✄]. We considered that these were not a recurring cost of operating the network.

[212] We note that the refund of EA payments in 2014/15 is a one-off item that therefore should be added back if 2014/15 is chosen as the base year. This suggests, however, that previous years would have been overstated to the same value. As a working assumption earlier years, we assume a £0.1 million deduction from prior years in AMP5.

[213] Bristol Water response to our provisional findings, paragraphs 239 & 242.

[214] Bristol Water response to our provisional findings, paragraph 238.

5.52 In our provisional findings, we stated that the capitalisation of operating costs[215] was not a recurring cost of the business. We reduced its value from the last two years of AMP5 when calculating the overall average.[216] Bristol Water said that the adjustment was inappropriate. It said that increased capitalisation in earlier years led to reduced costs (£0.1 million by 2013/14).[217] As noted in paragraph 5.48(c), Bristol Water increased its staff to meet a higher capex programme [✂]. We considered that this may have been an inefficient way to address the increased capex programme, and that the £0.2 million increase to opex was representative of this inefficiency.

5.53 Bristol Water confirmed the 2014/15 opex outturn, which included an increase of £0.6 million for third party income. Bristol Water said that the increase in third party income was due to a restatement of these costs from Retail to Wholesale. Within the business plan forecast this expenditure was matched by forecast income and thus had no impact on the necessary allowance.[218]

5.54 We were concerned that there was a risk that 2013/14 was not representative of normal opex levels and were mindful of Ofwat's observation on the danger of base expenditure being inflated.[219] In these circumstances, we considered alternative approaches that could be used to establish a relevant base year expenditure level:

(a) We considered using 2014/15, suitably adjusted to remove non-recurring items, since this is now the most recent data available. We were concerned, however, that the use of any one year had the same disadvantages as using 2013/14.

(b) We considered using an average for the AMP5 period (suitably adjusted). While this included relatively high levels of opex in later years, these were balanced by lower levels of expenditure in the earlier years. We considered the possibility of calculating an average over a shorter period that did not include all of AMP5.[220]

[215] Bristol Water allocate some of their opex to capital schemes each year. [✂].
[216] The adjustment was £0.2 million for 2013/14 and 2014/15 per Table 5.5.
[217] Bristol Water response to our provisional findings, paragraph 240 and Table 10.
[218] We therefore did not review this movement. When calculating our AMP5 average expenditure, the income forecast in the business plan will not now match the third party costs. We reversed this effect when calculating the average to arrive at a starting point that matches the forecast income.
[219] Ofwat drew our attention to the large increase in base spend in AMP5 compared to AMP4 and in particular the 50% increase in 2010/11 to 2012/13. Ofwat suggested that this was indicative of Bristol Water's relatively high costs. It also considered that Bristol Water had a relatively high cost plan, and therefore had the scope to make significant efficiency savings.
[220] With relevant adjustments, such as the costs of CC10, for example.

(c) We also considered a high level sense check based on industry data. This would apply the 2010/11 opex (less CC10 costs) inflated by the average increase in other water companies' plans. This would have the disadvantage of only reflecting what was in the business plans, not what was allowed.

5.55 On balance, we considered that using any one year might be unrepresentative and that an average was therefore a more robust approach. We have therefore used an average for the AMP5 period, excluding items that we consider either non-recurring or inefficient. This approach meant that we did not need to make adjustments for burst costs, EA refund or regulatory costs as these items can be considered to average out over the period. We therefore calculated £43.9 million as an appropriate average starting base line position (having excluded CC10, this appeal and capitalisation costs and adjusted for the third party costs as in paragraph 5.53).

Additional opex arising in AMP6

5.56 In this subsection we consider whether there is evidence that indicates that opex in AMP6 will need to increase above the base level as determined in the previous subsection.[221]

5.57 Bristol Water estimated that there was some £1.3 million of additional base expenditure over AMP5 which related to £5.4 million of capex on AMP5 enhancement schemes and £3.3 million on AMP6 enhancement schemes.

- *Base additions*

5.58 Within base additions, Bristol Water included £0.8 million for payments to the government under the carbon reduction commitment increase. However, Bristol Water also assumed input price inflation relative to RPI based on work carried out by First Economics on RPE factors. This included power cost forecasts that took account of increases in the carbon reduction commitment. We therefore concluded that the £0.8 million increase was not required for AMP6 (Bristol Water agreed with this conclusion[222]).

- *AMP5 enhancement*

5.59 Bristol Water included a forecast of £5.4 million relating to the costs of AMP5 enhancements. This was based on an estimate of £1.1 million of opex per

[221] These are set out in detail in Table 7 and Table 8 of Appendix 5.2.
[222] Bristol Water response to our provisional findings, paragraph 246.

year, based on the incremental increase originally allowed for 2014/15 in the CC10 determination. In our provisional findings we disallowed this expenditure on the basis that Bristol Water had not provided evidence to justify its inclusion.

5.60 In response to our provisional findings, Bristol Water reiterated its view[223] that the allowance made in CC10 for enhancement opex for AMP5 remained an appropriate level for AMP6.[224] Bristol Water also provided additional detail on the opex it planned to incur, which suggested an ongoing level of £0.45 million yearly for the identified schemes.[225] We reviewed these calculations and considered them reasonable, and included this amount in our allowance.

- *AMP6 enhancement*

5.61 The Bristol Water business plan included £3.3 million to reflect the costs associated with the AMP6 enhancement programme.

5.62 £1.8 million of the additional expenditure related to new connections. We considered that the planned additional expenditure appeared to be reasonable and in line with the projected number of new connections.

5.63 £0.5 million of the additional expenditure related to the operating costs of a new water treatment works at Cheddar.[226] We considered it appropriate not to make an allowance given our decision not to make an allowance for this enhancement scheme.[227]

5.64 We considered that the remaining proposed additional expenditure was reasonable.

- *Other matters*

5.65 Bristol Water and Ofwat did not disagree on the level of ongoing pension costs or the recharge to the retail business. We saw no evidence that these costs did not represent reasonable projections and did not consider these further.

[223] Bristol Water had made this point in its SoC and other submissions on this issue.
[224] Bristol Water response to our provisional findings, paragraph 249.
[225] Bristol Water response to our provisional findings, Appendix 3.3.
[226] Bristol Water SoC, paragraphs 906 & 907 and Table 55.
[227] See Section 6. We have instead set out a notified item which would require Bristol Water to demonstrate it had satisfied specific criteria before it would receive a specific allowance to undertake the scheme.

Inflation assumption

5.66 Bristol Water obtained a forecast from First Economics of the estimated level of RPEs to support its business planning. First Economics estimate was 0.6% per year (in addition to RPI).

5.67 Ofwat did not explicitly consider RPEs for AMP6. In reaching our provisional findings, we considered that First Economics' estimate was broadly in line with regulatory precedent. For example, Ofgem's 2014 RIIO-ED1 determination assumed RPI+0.6% for the majority of the price control period.[228]

5.68 In response to our provisional findings, Bristol Water said that RPE factors were now considerably higher than originally estimated during the business planning process. First Economics has updated its report from August 2013 which included an estimate of nominal input price growth[229] at an average of 3.6% over the AMP6 period.

5.69 Removing the forecast RPI of 2.5% to 2.6% from this forecast, Bristol Water has calculated an overall RPE of 1.1% above RPI.[230]

5.70 We reviewed the Bristol Water calculation and noted that the increase from 0.6% to 1.1% is largely caused by a forecast that RPEs will be above RPI by 2.3% in 2015/16. This is based on a high cost inflation forecast (3.4%) and a relatively low RPI forecast (1.1%).

5.71 The RPE for 2015/16 is based on analysis of projected inflation for nine distinct categories of expenditure. We compared these to the latest actual input cost data[231] for materials and fuel (for manufacturing industry excluding food, beverages, tobacco and petroleum industries) from the Office for National Statistics. The ONS data showed first quarter input prices at 4% lower than 2014 for the quarter to June 2015. This was in contrast to the projected increase in nominal prices.

5.72 We recognised that there are many uncertainties in forecasting RPE factors and conflicting available short term data. We further noted the disproportionate effect of the current year on the five year average. We believe that our provisional decision to assume RPE factors of RPI + 0.6% remains reasonable (and consistent with Ofgem's view in December 2014).

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[228] Ofgem (28 November 2014), *RIIO-ED1: Final determinations for the slow-track electricity distribution companies*.
[229] That is, the overall level of price inflation for the wholesale business.
[230] Bristol Water response to our provisional findings, paragraph 265.
[231] Measured using Producer Price Index, July 2015, published 18 August 2015.

Scope for increased efficiency

5.73 In this subsection, we set out our assessment of the potential for Bristol Water to deliver cost efficiencies in AMP6 relative to AMP5.

5.74 The Bristol Water business plan included two challenges to the level of opex in its business plan:[232]

(a) The first was a 1% per year productivity improvement based on work conducted by First Economics;[233] and

(b) The second was a relative efficiency catch-up of 0.5% per year based on analysis performed by Oxera[234] that identified Bristol Water was 5% inefficient.

5.75 Together, these two challenges, net of assumed RPEs of 0.6%, resulted in an overall cost efficiency of 0.9% per year. We considered that this level of efficiency improvement was in line with other recent assumptions (for water and other utility sectors).

5.76 We noted that, with respect to the second challenge, Oxera's analysis of the level of relative efficiency was based on opex up to 2012/13 and did not reflect the increase in costs that occurred in 2013/14 and 2014/15. We considered, therefore, that the catch-up target might be understated.

5.77 We assessed changes in Bristol Water's operating environment. We considered for example that during AMP5, Bristol Water refurbished its head office,[235] which was expected to provide operational synergies and reduce future maintenance and operational costs. Similarly, there was also [✂] investment in IT. Both of these would be expected to show savings in the future. Bristol Water's approach, outlined above, to defining efficiency savings did not explicitly reflect these investments, which we therefore considered indicated potential upside opportunity.

5.78 Finally, we noted that, as Ofwat has also suggested, the base year may be inefficient compared with other companies.

5.79 Nevertheless, despite these concerns, Bristol Water's projections appeared to be both based on evidence and comparable with other regulatory

[232] Bristol Water SoC, section 9.3.2.3.
[233] Bristol Water SoC, section 9.3.2.3.2.
[234] Bristol Water SoC, paragraphs 915–921.
[235] At a cost of around £8 million.

determinations. We therefore used the same assumption (1.5% yearly) as in the business plan in our assessment.

5.80 In response to our provisional findings, Bristol Water said that, as we had based the starting point for opex on an AMP5 average, it did not consider that the efficiency challenge applied in 2014/15 (which also subsequently impacts on the efficiency challenge for AMP6) was appropriate.[236]

5.81 The use of an average does not in itself mean that it is inappropriate to make a further efficiency assumption. As an example, all other things being equal, a company that starts a period with £100 million opex and an efficiency target of 1% yearly should see opex of £100 million, £99 million, £98 million, £97 million and £96 million yearly. This will give an average of £98 million but this average does not reflect the efficiency achieved in years four and five, and therefore could overstate the efficient costs for the first year of the next period. Hence it would be appropriate to reflect these incremental efficiencies in projections for the subsequent period.

5.82 The position is complicated in this case since Bristol Water will also be experiencing the impact of RPE factors and additional enhancement capex impacts. To be consistent with adjusting for efficiency, we have added back the enhancement opex increases and estimated RPE effects for the last two years.

Findings

5.83 Our assessment of Bristol Water's business plan for opex has followed an approach consistent with regulatory precedent. This includes:

(a) defining a relevant base period;

(b) establishing an appropriate level of recurring costs;

(c) identifying relevant necessary increases in recurring costs;

(d) establishing an appropriate measure of inflation; and

(e) establishing the scope for additional cost efficiency.

5.84 Our analysis did not explicitly consider whether Bristol Water's recurring cost base was efficient beyond application of the 'catch-up' assumed by Oxera. It

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[236] Bristol Water response to our provisional findings, paragraph 277.

is therefore possible that this approach will result in higher (or lower) cost estimates than a benchmarking approach.

5.85 We have used an average of opex in AMP5 (adjusted to remove items we believe are inefficient or completely non-recurring) as a base level of opex.

5.86 Bristol Water included a number of upward cost drivers in its forecast, and we considered which of these to assume in our adjusted projections. We have made the following adjustments in coming to a base case scenario:

(a) We removed enhancement opex (relating to PR09) for which Bristol Water has been unable to provide robust evidence.

(b) We removed £0.5 million enhancement opex (relating to Cheddar WTW in 2019/20).

(c) We retained an efficiency assumption for AMP5 net of RPE impacts.

(d) We removed carbon costs from base additions.

(e) We recalculated the absolute level of efficiency based on applying Bristol Water's efficiency target to an adjusted baseline.

5.87 This approach results in total projected opex of £217.7 million as illustrated in Table 5.6.

Table 5.6: CMA assessment of opex build up

£m 2012/13 prices

	Base opex	*2014/15*	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*AMP6 total*
Opening	43.9							
Base additions		5.3	0.1	0.1	0.1	0.1	0.1	0.5
New connection		0.1	0.2	0.3	0.4	0.5	0.5	1.8
PR09 enhancement		0.5	0.5	0.5	0.5	0.5	0.5	2.3
PR14 enhancement		0.0	0.0	0.1	0.2	0.4	0.4	1.0
Total pre efficiency		49.7	44.6	44.7	44.9	45.2	45.3	224.8
Efficiency challenge		–0.7	–1.1	–1.5	–1.9	–2.3	–2.7	–9.6
Total post efficiency		49.0	43.5	43.2	43.0	42.9	42.6	215.2
Recharge to retail		–0.4	–0.4	–0.5	–0.5	–0.4	–0.4	–2.2
Pensions		0.9	0.9	0.9	0.9	0.9	0.9	4.7
Total opex		49.6	44.0	43.7	43.5	43.4	43.1	217.7

Source: CMA analysis.

5.88 This compares with £228 million within Bristol Water's business plan (and £215 million in our provisional findings). Our figure therefore implies a further 5% cost reduction, in addition to the £8.5 million (4%) efficiency challenge assumed by Bristol Water. The combined effect is based on an assumption that Bristol Water can achieve costs approximately 9% below its calculation of pre-efficient costs, through a combination of efficiency and/or avoidance of additional costs.

5.89 While we have considered various approaches to the base year used and on other items within the Bristol Water business plan, we recognise that other judgements than our own could be taken. Recognising this, we performed various sensitivities to identify the impact of these decisions.

5.90 Our sensitivity analysis is presented in Appendix 5.2. By comparison with other parts of Bristol Water's business plan, we considered that the range for sensitivities was relatively small as a proportion of total costs, as much of Bristol Water's costs were likely to be recurring over time. Our review generally indicated that Bristol Water has undertaken a proportionate approach to defining reasonable efficiency assumptions for opex. We have therefore focused on our point estimate of £217.7 million within our determination.

5.91 We note that this is £30 million (over 10%) above Ofwat's implicit allowance. However, we do not consider that these numbers are directly comparable. Ofwat benchmarked Bristol Water's costs at the level of total base expenditure, but did not calculate separate benchmark numbers for opex and capex.

5.92 Our numbers are therefore only comparable at the level of total base expenditure. We would observe only that our analysis suggested that Bristol Water was unlikely to achieve operating costs at a level comparable to Ofwat's implicit allowance in AMP6.

Capital maintenance

5.93 We next considered capital maintenance, which represents the balance of base expenditure. The aim of capital maintenance expenditure is to maintain the existing assets of the business and to therefore provide ongoing serviceability for consumers.

5.94 Capital maintenance is different from opex in that a greater proportion of capital maintenance is of a non-recurring nature from year-to-year. This means that one year's capital maintenance, or even one regulatory period's capital maintenance, will not necessarily be a good predictor of the future.

5.95 These characteristics of capital maintenance also pose some risks to the use of econometrics. For example, capital maintenance may be more 'lumpy'. In addition, the level of capital maintenance costs for a single company such as Bristol Water may be more closely linked to technical factors that are causally linked to the cost of the network. These may not be identified by econometric analysis.

5.96 Experience of capital maintenance actually incurred should therefore provide some support to the definition of a relevant baseline for planned capital maintenance. For example:

- the unit costs of replacing similar assets should follow efficiency trends;
- similar categories of expenditure should be required over time; and
- at an aggregated level, trends in the cost of maintenance should be related to changes in the value and quality of assets over time.

5.97 As with opex, the primary objective of our assessment is to test whether Bristol Water's business plan represents a reasonable baseline for comparison to the econometric analysis.

5.98 On that basis, we have performed a targeted review of the areas of investment within Bristol Water's plan. Where relevant, we have taken into consideration the following aspects of Bristol Water's business plan and supporting evidence to the plan (including its SoC):[237]

(a) **Scope (including relationship to serviceability)** – the assets that Bristol Water is proposing to replace, and what evidence Bristol Water is providing to demonstrate the need to replace those assets.

(b) **Efficiency** – the evidence that is available on trends in the costs incurred by Bristol Water (either unit costs and/or scope of activity to deliver comparable service outcomes).

(c) **Bristol Water-specific factors** – comparable to Ofwat's approach of 'special cost factors', we considered whether the evidence provided by Bristol Water indicated that its costs are likely to be higher or lower than any evidence drawn from the industry more generally.

5.99 We have followed the approach taken by Bristol Water in reviewing capital maintenance expenditure of considering IRE (generally below-ground assets) and MNI (generally above-ground assets) separately.

[237] Bristol Water SoC.

IRE

5.100 This subsection contains our assessment of IRE. The structure of this subsection is as follows:

(a) First, we set out the nature of Bristol Water's planned expenditure on IRE (paragraphs 5.100 to 5.105).

(b) Next, we set out our assessment of Bristol Water's plan which comprises a review of:

(i) the scope of Bristol Water's mains replacement programme (paragraphs 5.106 to 5.123);

(ii) the scope of other aspects of Bristol Water's IRE activity (paragraph 5.125); and

(iii) evidence on whether Bristol Water's planned activity is cost effective (paragraphs 5.126 to 5.148).

(c) Finally, we set out our findings on IRE (paragraphs 5.149 to 5.153).

Bristol Water's business plan

5.101 Bristol Water forecast IRE of £76 million for the AMP6 period. We considered how this compared to previous periods.

5.102 We noted that the proposed level of IRE for AMP6, was approximately 25% less than incurred in AMP5, but remained relatively high when compared to AMP4.[238] This is caused by a greater level of expenditure on:

(a) mains replacement (£12.5 million increase on AMP4). Bristol Water has projected the level of mains replacement that it has assessed to be necessary to maintain a stable burst rate;[239] and

(b) maintenance of raw water reservoirs (£6 million increase on AMP4) to address structural integrity issues.

5.103 Table 5.7 sets out the separate elements of Bristol Water's actual (AMP4 and AMP5) and planned (AMP6) IRE.

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[238] There was a relatively large increase in IRE in AMP5, driven by a significant rise in the planned level of mains replacement activity.
[239] Bristol Water SoC, paragraph 944.

Table 5.7: Bristol Water actual and planned IRE

		£m (2012/13 prices)	
Asset type	*AMP4*	*AMP5*	*AMP6*
Aqueducts	6.2	12.1	5.5
Raw water reservoirs	4.6	10.3	10.6
Mains and communication pipes	35.1	91.2	47.6
Infrastructure other	14.9	14.7	12.7
Total	60.8	128.3	76.3
Less trunk main lining*		26.2	
Total excluding trunk main lining	60.8	102.1	76.3

Source: Bristol Water SoC, Table 59.
Note: During AMP5, Ofwat required Trunk Main Lining to be categorised as Capital Maintenance. Thus it is removed from the AMP5 total for comparison purpose.

5.104 Bristol Water stated that it should be expected to continue to have relatively high levels of IRE compared to other water companies as a result of its older infrastructure and proportionately higher share of upstream assets.[240] It said that these factors made Bristol Water's costs appear inefficient compared to other water companies.[241]

5.105 Bristol Water's mains replacement programme was the largest element of its planned IRE. Bristol Water planned to replace some 233km of mains (46.6km per year) in AMP6 at a cost of £47.6 million. Distribution mains replacement was the most significant aspect of its mains replacement programme with planned expenditure of some £38 million. Details of Bristol Water's mains replacement programme are set out in in Table 5.8. Given the relative scale of its mains replacement programme, compared to other areas of IRE, we focused our review in this area.

Table 5.8: Bristol Water forecast costs of mains replacement

	£m
	2012/13 prices
Distribution mains replacement	38.0
Communication pipe replacements	4.8
Trunk mains cleaning	2.2
Network analysis	1.1
Other	1.5
Total	47.6

Source: Bristol Water.

[240] Upstream assets refers to those aspects of infrastructure relating to raw, untreated water.
[241] Bristol Water SoC, paragraph 946.

Our assessment

- *Scope (including serviceability) – mains replacement*

5.106 We considered the reasons given by Bristol Water to justify the level of IRE within its AMP6 plan, and in particular why its plan included a higher level of IRE than other water companies.

5.107 Bristol Water stated that older mains and the fact that a greater proportion of its network comprised upstream assets gave rise to higher costs.

5.108 Ofwat did not agree with either of these reasons:[242]

(a) With respect to the age of assets: Ofwat said that age was not a relevant factor and considered that there was no meaningful relationship between mains condition (proxied by bursts per km) and mains age. Ofwat said that condition is affected by such things as soil type, depth, pressure, the approach to network operation and effectiveness of maintenance ground conditions.

(b) With respect to the level of upstream assets: Ofwat said that it had found no relationship between the proportion of upstream assets and levels of IRE, and that the level of upstream assets was not an important variable in explaining differences in costs between companies.

5.109 In conducting our assessment, we did not consider that Bristol Water had submitted compelling evidence that demonstrated how the age or proportion of upstream assets meant that Bristol Water should have an unusually high level of IRE. Our review therefore focused on the specific assumptions by Bristol Water about the level of IRE within AMP6, rather than the arguments about why Bristol Water's rate of replacement may differ from the industry.

5.110 The serviceability of infrastructure assets was measured by Ofwat based on the number of mains bursts, interruptions to supply, discolouration of water and levels of properties subject to low pressure. Bristol Water considered its serviceability to be stable, although Ofwat rated the DG3 measure (interruptions of greater than 12 hours duration) as deteriorating, due to a series of unplanned interruptions in recent years. This is discussed further in Section 8.

[242] Ofwat response, paragraph 147 and Figure A1.1 and paragraph 151 and Figure A1.2 respectively.

5.111 Bristol Water's mains replacement programme (see paragraph 5.105) was part of its overall investment programme to maintain stable serviceability, including returning to normal levels of unplanned interruptions.

5.112 In 2010, the CC engaged Halcrow as engineering consultants to review Bristol Water's business plan for AMP5, including its level of mains replacement. The report made by Halcrow informed the CC10 decision to allow a significant increase in mains replacement. Halcrow suggested that, at that time, a replacement level of 45 to 50km per year was necessary to maintain the network and the CC allowed 47.5km per year for AMP5. [243]

5.113 The cost of replacing a given length of mains will depend on the mix of pipes replaced and techniques used. By changing the mix of pipes for example, Bristol Water could replace a greater number/length of smaller pipes for the same overall cost. Bristol Water told us that its mains replacement programme assumed that the mix of replacement in its business plan for AMP6 would be comparable to AMP5.

5.114 We considered how Bristol Water established its mains replacement programme. As noted above, Bristol Water told us that an older network has a higher degradation rate.

5.115 Bristol Water told us that for those pipes that had burst in the past the burst performance determined its assumptions on the length of mains which should be expected to need to be replaced. Where mains had not previously burst, the model used the age of the main as a determinant of need for replacement. The scale of the overall programme of mains replacements was thus dependent on both age and serviceability. Bristol Water targeted where to replace mains using burst and serviceability history.

5.116 At the PR09 review, Halcrow examined the process to develop the mains replacement programme and found it to be robust. Bristol Water said that the process of targeting in PR14 remained similar. We understand that the approach to determining the overall size of the programme appeared to have changed.

5.117 Bristol Water said that as it had a network in good condition, it would require more activity to maintain its network in a stable condition than a company with poorer quality mains. We were not persuaded that this would

[243] CC10 Final determination, paragraph 3.34.

necessarily be the case since mains in worse condition would have a worse leakage rate and will therefore require more frequent interventions.

5.118 We noted that the level of leakage reported by Bristol Water was less than most other water companies.[244] While this did not directly correlate to the level of mains replaced, we would expect leakage reductions to have been impacted by the level of mains replacement, particularly where zones with worse leakage were targeted.

5.119 We asked Aqua to review Bristol Water's approach to defining its mains replacement programme, in particular whether the process to establish the appropriate level of mains replacement required to maintain serviceability had been robustly calculated.

5.120 Aqua's review suggested that the process to identify the total length of mains to be replaced was not adequate. Aqua found that the model[245] used to determine the total length of mains to be replaced has regard to the overall age of the network.[246] Aqua's review found that although the total scale of the mains replacement programme was partly driven by the age of mains,[247] the specific targeting of individual mains was based on burst history.

5.121 Since Aqua produced its report, and in response to our provisional findings, Bristol Water has supplied greater clarification on the modelling which it used to determine its plans. We understand that age was used in the modelling as a factor, applied to parts of the network which do not have a history of bursting. Bristol Water provided analysis in its SoC in support of the relationship between age and bursts for such pipes.[248]

5.122 We were mindful that Ofwat did not consider age to be a sensible cost driver in the econometric models, but we see little alternative where the condition is unknown to determine overall length of mains to be replaced. Although Aqua raised some concerns with Bristol Water's approach, we concluded that Bristol Water had provided sufficient evidence that these would have a limited effect on the outputs of the relevant models. While both Aqua and Bristol Water's own consultants identified aspects of the modelling that could

[244] Our analysis of leakage rates found that Bristol Water's rate of leakage (16.3%) in 2012/13 was the 5th lowest rate out of 18 companies. Similarly, Bristol Water's leakage level has been below the economic level of leakage. Bristol Water Annual Report 2012, p6. Bristol Water has consistently outperformed its leakage target in the period 2008-2014.
[245] WiLCO (SEAMS), which is used an input to the cross-asset optimiser. Appendix 5.1, section 5.
[246] In the WiLCO distribution mains model there is an age/burst relationship that defines the current state of the distribution network and its propensity to burst in order to establish the amount of replacement required to maintain stable serviceability over a fixed period (25 years). Appendix 5.1, paragraph 141.
[247] Which is not a primary driver of the optimal level of mains replacement.
[248] Bristol Water SoC, Table 59.

potentially be improved, we saw no evidence that Bristol Water's approach was likely to result in an over-estimate of the level of mains replacement in AMP6.[249]

5.123 We therefore did not identify any evidence that the proposed levels were unreasonably high. We also note that Bristol Water has provided evidence which shows that it has replaced less of its network than many other companies in prior periods.[250]

5.124 On balance, we accepted the process to arrive at a total length of mains to be refurbished in order to maintain serviceability was reasonable, and was therefore likely to result in an appropriate level of activity within AMP6. We therefore decided that we should not adjust the scope of mains replacement within Bristol Water's business plan. We noted in particular that:

(a) Halcrow examined the evidence on levels of mains replacement in detail for the CC10 review. The conclusions from that report appear to remain broadly valid;

(b) the proposed level of mains replacement is consistent with the Halcrow report while also reflecting a reduced level of bursts over AMP5;

(c) based on Aqua's review, and our own analysis, the level of mains replacement for AMP6 appeared to be of a reasonable scale;

(d) there was evidence that Bristol Water has had a lower level of mains replacement than other water companies in previous periods; and

(e) Bristol Water's proposals still represented a reduction on AMP5.

- *Scope – other aspects of IRE*

5.125 The remainder of Bristol Water's planned IRE (that is, excluding its mains replacement programme) was comparable in value to previous AMPs:

(a) Bristol Water proposed to increase investment in raw water reservoirs to address concerns about the structural integrity of these assets.[251] We have not reviewed this item. We have accepted the Bristol Water

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[249] We note CH2M suggested that, while considering the model suitable for Bristol Water's need, the deterioration analysis should take into account factors such as materials, pipe type, diameter, soil type etc.
[250] Our analysis indicates that Bristol Water replaced some 7% of its network, the 15th highest out of 18 companies.
[251] Bristol Water SoC, paragraph 943.

assessment of the need for this work and have not assessed the cost separately.

(b) The level of investment in other areas of IRE was forecast to be below AMP4 levels. While this may reflect less planned activity, it did not suggest that costs were likely to be unusually high, and we have not considered these areas of cost separately.

- *Do the costs forecast appear efficient?*

5.126 We asked Aqua to review the relationship between the scope of IRE and Bristol Water's planned level of spend as illustrated in Table 5.7 above. Aqua requested details of the unit costs for mains replacement. Bristol Water provided a generic overall unit cost rate used in the modelling of £163 per metre.[252] Aqua compared the proposed Bristol Water unit cost to a comparable estimate for another company known to Aqua of £166 per metre. This estimate was not directly comparable to the Bristol Water cost of £163 per metre as it included many items that Bristol Water had identified as separate elements of its mains renewal programme as set out in Table 5.8. Aqua adjusted for these differences and calculated a restated Bristol Water rate of £193 per metre.

5.127 In response to our provisional findings and in subsequent supporting submissions to us, Bristol Water:

(a) expressed significant concerns with both the Aqua benchmark cost of £166 per metre and the adjustments made to its costs by Aqua to convert its costs from £163 per metre to an equivalent cost for Bristol Water of £193 per metre;

(b) said that Mott Macdonald had benchmarked the network contract in 2013 and found the costs to be efficient; and

(c) provided further analysis of the recent Kier contract, which it said had been subject to competitive tender. Bristol Water's view was that the market testing proved it was efficient.

5.128 Bristol Water asked some of its consultants to review Aqua's analysis. While the consultants generally supported the methodology that Bristol Water had used for targeting the mains to be replaced, both CH2M and Mott MacDonald suggested that Bristol Water should have a better understanding of the costs for specific types of mains replacement. We note that Bristol

[252] £163 per metre is based on £181 per metre less a 10% efficiency challenge.

Water did not appear to have followed Mott MacDonald's recommendation to collect robust detailed rates (for different sizes of main and excavation techniques) and does not appear to have this information.

5.129 We agreed with Bristol Water's submission that, on its own, a single blended rate from one other company may suffer from a lack of comparability to Bristol Water's costs. Bristol Water submitted a comparison across industry for the years 2009 to 2011 for all mains investment activity (ie base and enhancement). This suggested the Bristol Water unit cost for that period was £354 per metre against an industry average of £412 per metre. On detailed review of the underlying data we did not consider that the £412 per metre was a reasonable unit cost benchmark.[253] Aqua also provided data on 5 companies for various sizes of mains. We were not able to perform full comparisons to these data points due to the lack of comparable data from Bristol Water.

5.130 Bristol Water said the adjustment made by Aqua to derive a cost for Bristol Water equivalent to the benchmark was not appropriate since not all of the communication pipe cost was directly associated with the mains replacement programme. On the specific points raised by Bristol Water:

(a) We note the unit costs should not include all of the communication pipe replacement cost and we understand from Bristol Water that an estimated 40% of the cost of such replacements would be attached to this programme. Such a change would reduce the benchmark to £182 per metre.

(b) Aqua did not include trunk mains cleaning costs in the unit cost.[254]

(c) The other costs included (totalling less than £1 million) were those that would be expected to arise in such a programme.[255]

5.131 We therefore updated the analysis and calculated a revised unit cost for Bristol Water of £182 per metre, on a comparable basis to the £166 per metre of the comparator company. While Aqua has based its comparison on only one known similar sized company, we note this suggested that the

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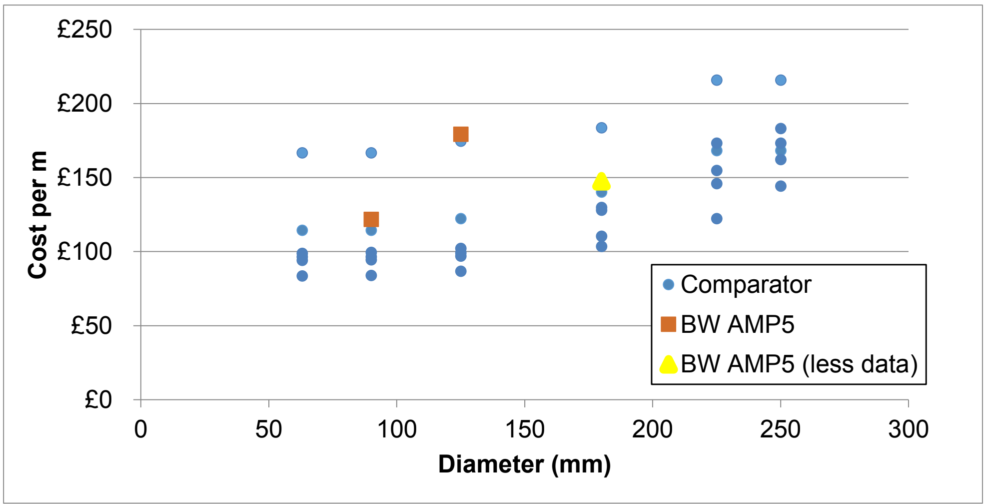
[253] Bristol Water response to our provisional findings, paragraph 342. We examined the data underlying these numbers and observed that many of the average rates showed large variation year on year (eg the Southern replacement rate went from £7745 per metre to £714 per metre in one year, similarly Yorkshire rate went from £69 per metre to £372 per metre in one year). In addition to the inconsistencies in the dataset we noted that it included the cost of enhancement expenditure.
[254] This, and the remaining 'other' spend, was included in Table 5.8 to show comparable total spend for the area.
[255] These are GIS (Geographic Information System) costs £0.675 million; Highways reinstatement £0.09 million; Roadworks diversions unrecoverable element £0.090 million and new boundary boxes and stop taps £0.18 million.

Bristol Water unit costs may be around 10% less efficient than that comparator company.

5.132 We recognise that the cost of mains replacement will vary with factors such as mains diameter, method and ground conditions. In response to our request Bristol Water was unable to provide a full breakdown of the mains replacement costs in AMP5 by such factors. Following the provisional findings, it provided details of costs associated with a selection of actual mains replacement jobs undertaken in AMP5. We analysed the details of schemes provided. We removed clear outliers. We found that we were able to obtain reasonable sample sizes for two sizes of mains (90mm and 125mm). We also analysed the data on 180mm mains, which is more limited, and therefore less robust, but we considered it to be indicative. We show in Figure 5.2 the results of this analysis compared to the six comparator companies supplied by Aqua.[256]

Figure 5.2: Bristol Water AMP5 mains replacement costs (as indicated from sample)



Source: Aqua unit costs and CMA assessment (2012/13 prices).

5.133 We understand that the comparators were based on data produced by companies as part of their business plan submissions, and we therefore consider these should be comparable.

5.134 We recognise that the blending of the costs is particularly sensitive to the mix of surface types and techniques, and therefore if the sample of jobs provided by Bristol Water was biased towards high or low cost work the comparison in Figure 5.2 may be less valid.

[256] We further considered that the length of mains for a given job could affect the unit cost of that job, with very short lengths of pipe potentially more expensive. We did not have sufficient data to compare the relative distribution of length of pipe replaced for individual jobs of Bristol Water's mains replacement programme with Aqua's benchmarks.

5.135 We compared the mix of techniques to those in Bristol Water's overall AMP5 programme to assess whether they were likely to be representative of Bristol Water's programme. The most expensive technique was open cut, and we noted the sample jobs provided contained fewer jobs in this category than the overall Bristol Water programme, which should have reduced the cost compared with the overall programme. A cheaper technique was slip lining, and we noted that the sample jobs provided contained more jobs in this category than the overall Bristol Water programme, which should also have reduced the unit cost compared with the overall programme. Overall, we considered that the sample of jobs provided by Bristol Water were likely to be less expensive than Bristol Water's overall AMP5 programme.

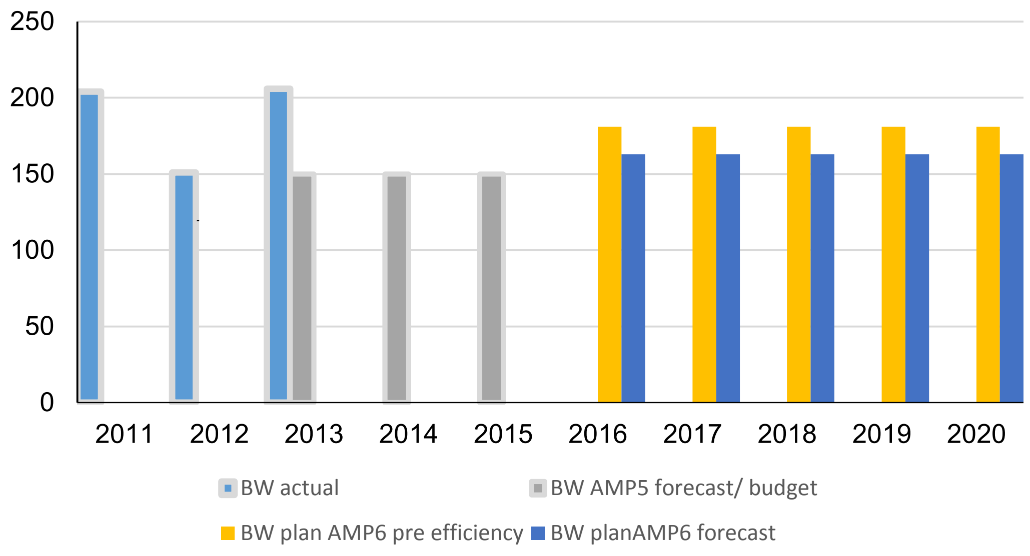
5.136 While recognising the limitations of the information displayed in Figure 5.2, we note Bristol Water's costs appear to be high within the comparator range.

5.137 We also considered the evidence applied by Bristol Water in identifying its planned unit cost. Bristol Water's business plan was based on an AMP5 unit cost of £181 per metre, and a 10% efficiency challenge. Bristol Water said the figure was calculated based on the first two years of Bristol Water's actual, incurred expenditure in AMP5 (2010/11 and 2011/12) combined with its forecast level of spend in year three (2012/13). This combined level of expenditure was then divided by the relevant length of mains either refurbished or that was planned to be refurbished in the relevant three-year period to provide a unit cost.

5.138 The value used for 2012/13 included in the calculation was a forecast of £206 per metre, prepared in July 2012. At the same time, Bristol Water also prepared a reforecast for the full AMP5 period, where it assumed a lower budget/target rate of £152 per metre for 2012/13 to 2014/15. It was not therefore clear to us whether the use of the £206 per metre rate remained appropriate.[257] Figure 5.3 shows, retrospectively, the actual unit costs incurred in the first three years of AMP5 and the revised forecast unit cost of mains replacement in the final three years of AMP5, compared with Bristol Water's pre-efficiency and post-efficiency projections for AMP6.

[257] Bristol Water provided us with a summarised calculation of expenditure and length of mains refurbished in 2012/13 to 2014/15. In those three years, the data provided indicated that its actual unit cost was some £259 per metre, some 70% above the forecast level of £152 per metre. This data implied an average cost over AMP5 of £219 per metre. We were not able to establish whether this data was provided on a consistent basis with the lower costs which Bristol has provided for the earlier years in AMP6. If comparable, it would indicate a sharp rise in unit costs, but it was not clear to us whether any variance was caused by optimism bias in forecasting, poor cost control, unforeseen circumstances (such as the specific condition of the pipes in question) or a combination of these or other factors. We therefore gave greatest weight to the data used in support of the business plan.

Figure 5.3: Bristol Water mains forecast and actual replacement unit cost trends (£/m)



Source: CMA analysis.

5.139 Bristol Water submitted a copy of a report carried out by Mott MacDonald in February 2013. Mott Macdonald reviewed the contract for network management (NM) that was in existence at that time and concluded that it provided value for money.

5.140 We studied this report and noted, in particular, the conclusion that the contract rates represented 'overall reasonable to good value for money'. We noted that this conclusion was based on the assumption that the remaining work in the AMP5 period would be based on the rates in the contract. By contrast, Mott MacDonald found the lump sum quoted work under the contract to be less efficient.

5.141 Within the data illustrated in Figure 5.3 and used to inform Bristol Water's planned unit cost, the volume of mains refurbished in 2011/12 was 70km, at an actual cost of £146 per metre. This was a substantially higher volume than both the 22km refurbished in 2010/11 at an actual cost of £205 per metre and the 17.5km refurbished in the early phase of 2012/13 prior to the reforecast[258] at an actual cost of £271 per metre. These actual unit costs for 2010/11 and the early part of 2012/13 appeared high compared with the Mott MacDonald benchmarking. We considered that they were unlikely to be representative of the overall programme.[259] Therefore, we considered that the £181 per metre included in Bristol Water's base case (paragraph 5.137)

[258] At that point, a year to date figure.
[259] For example Mott Macdonald found the Bristol Water unit rate for replacing 250mm pipe, open cut, in type 3 and 4 roads would be £210/metre.

was on balance likely to overstate costs. We further noted that Bristol Water's revised forecast of £152 per metre was substantially lower.

5.142 Bristol Water provided details of the rates negotiated into the contract it had signed in 2014 with Kier to supply NM services. Bristol Water said that it had tested the market effectively through the tender process for the new NM term contract and, as a result, ensured that the costs contained in the term contract entered into with Kier were competitive.

5.143 Ofwat said that the contracted value of work was a factor to be taken into account but such a contract may not be efficient, for example if more risk was being taken by the contractor than was appropriate. Ofwat also noted that contracts could contain a large amount of overhead costs or be increased by the allocation of company overhead costs. As a result Ofwat said it did not assume that costs that had been contracted out or put out to tender were necessarily efficient.

5.144 Kier negotiated a fixed Management Fee, regardless of the volume of work completed. Bristol Water said that, for the main renovation element of the contract, this was currently £[✂] and on the basis of the proposed programme calculated this to cost £[✂] per metre. We are unable to say whether this in itself is efficient (for example this would depend on the allocation of risk) but note that this would represent a large proportion of the Bristol Water business plan cost per metre of £163.

5.145 We have been limited in our ability to undertake a detailed assessment of unit costs due to a lack of information held by Bristol Water. The company does not maintain an easily accessible database of costs of performing this work split by technique, diameter and ground conditions. In undertaking our analysis, we therefore considered all of the relevant evidence on Bristol Water's relative efficiency including a number of comparative metrics:

(a) In terms of overall IRE spend per customer in AMP5, Bristol Water was the highest spending company out of 18.

(b) In terms of IRE spend by kilometre of mains in AMP5, Bristol Water was the 2nd highest spending company out of 18.

(c) The restated Aqua calculation has compared the projected unit cost of £182 per metre to the £166 per metre of a comparator company. This suggested a differential of up to 10% between the comparable unit costs.

(d) At the point of calculating the business plan rate for replacement work, Bristol Water's own projection for AMP5 cost was £169 per metre, and it

had budgeted £150 per metre. These costs were lower than the £181 per metre (pre efficiency) which Bristol Water then used as a baseline for projecting AMP6 costs. The evidence of Bristol Water's actual costs suggests that it may have overstated its base case, or at least taken an approach to defining the base case which was based on partial evidence.

(e) The Mott MacDonald report, while identifying that the underlying rates in the NM contract were value for money, did not provide clear evidence on the efficiency of the actual unit costs used by Bristol Water in determining its AMP6 projections. Mott MacDonald indicated that when the assessment was carried out, the 'composite rates' were more efficient than an average benchmark.[260] However, Mott MacDonald's report indicated that Bristol Water's actual unit costs included a significant proportion of work at lump sum prices.[261] The cost of these lump sum projects was higher than the average efficient rates it identified from comparator water companies, although within the range of comparator data. Mott MacDonald understood that the majority of the remaining AMP spend was to be completed using the more efficient composite rates that it had benchmarked. Bristol Water calculated its business plan unit cost of £181 per metre based on the early work in AMP5. It appears therefore that much of the early spend in AMP5 may have been on the more expensive lump sum rates. If so, this would imply that the £181 per metre is based on higher costs than should be expected for AMP6.

(f) The AMP6 Kier contract has been competitively tendered, but we agreed with Ofwat that this in itself does not prove efficiency. It is well established that effective contract management requires a combination of value-for-money techniques, and that competitive tendering is only a part of this process.

(g) The evidence provided by Bristol Water's consultants, Aqua and our own review all suggested that Bristol Water would be expected to have more data on the costs of repeatable items such as the replacement of smaller mains and this also suggested that Bristol Water may not have a good understanding of the efficient cost of this work.

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[260] Our understanding from the Mott MacDonald report is that the composite rates reviewed by Mott MacDonald are rates for individual jobs based on a sum of the relevant unit prices specified within the contract. Lump sum prices are used for jobs where the nature of the project means that a project-specific single price is calculated.
[261] The Mott MacDonald report indicates that £19.7 million of the mains rehabilitation contract work was undertaken at lump sum prices up to August 2012.

5.146 In view of these considerations, we considered that the costs Bristol Water had included in its plan for mains replacement may be high compared with industry levels. On this basis, we made an adjustment to the level of costs allowed. We recognised that many of the concerns identified above related to a lack of certainty around the level of Bristol Water's actual unit costs on a comparable basis to other benchmarks. However, both Bristol Water's own data and the evidence from the benchmarks that are available indicate realistic scenarios under which Bristol Water would be able to achieve a reduction in unit costs relative to the business plan.

5.147 We have not performed a comparable analysis for other IRE activities. However generally, we would expect that Bristol Water to have prepared its forecasts on a comparable basis, and therefore it could be appropriate to make an adjustment to all IRE. We recognise that there is uncertainty over Bristol Water's ability to achieve such an adjustment. In our assessment below we identify a range of costs, based on different strengths of efficiency challenge.

5.148 We have given weight to a range of different evidence. We therefore find that our assumption on IRE spend should reflect an incremental unit cost efficiency range of 5 to 10%. We propose this range based on the following scenarios:

(a) **High incremental efficiency scenario** – an overall reduction of 10% to the whole programme, which would reduce costs by £8 million. This would assume savings broadly comparable to the unit cost differentials identified by Aqua across the whole programme, and bring Bristol Water's business plan projection in line with the forecast made for AMP5 at around the same time. This would also bring Bristol Water's spend more in line with other water companies.

(b) **Low incremental efficiency scenario** – an overall reduction of 5% to the whole programme, which would reduce costs by £4 million. This reflects the uncertainties in the data which may mean there is lower potential to reduce costs.

Findings

5.149 We have performed a targeted review of the IRE programme. In particular, we have reviewed, with support from Aqua, Bristol Water's mains replacement programme. This represents around 62% of Bristol Water's total IRE within AMP6.

5.150 Our review of Bristol Water's programme has revealed some concerns with the approach to defining the planned level of mains replacement activity, and the potential for efficiency improvements in unit costs.

5.151 This is consistent with our high-level analysis in paragraph 5.11 above, which showed that the level of spend proposed by Bristol Water for IRE remained well above the average for water companies. At the same time, we note evidence provided by Bristol Water that this may in part have been driven by under-investment across prior periods.

5.152 We have decided the following:

(a) We will make no adjustment to Bristol Water's assumed replacement rate of 46km per year. This is consistent with the CC10 Halcrow report and lower than actual replacement in AMP5. We consider that there is uncertainty over this figure, due to the lack of a clear link between certain aspects of Bristol Water's approach to planning (which has regard to asset age) and its actual approach to replacement. However, the scale of the programme appeared to be a reasonable starting point.

(b) We will assume that Bristol Water could achieve further reductions in unit costs of mains replacement. Our work has indicated that unit costs could be reduced by as much as 5 to 10%.

(c) On that basis, we will assume that Bristol Water may also be able to achieve further reductions on the remaining IRE spend.

5.153 Based on this analysis, using unit cost reductions of 5 to 10%, we obtain a range for the efficient level of IRE in AMP6 compared with the Bristol Water business plan of £76 million of:

(a) £68 million (low scenario); and

(b) £72 million (high scenario).

Non-infrastructure maintenance

5.154 This expenditure relates to the maintenance of assets other than infrastructure (ie other than pipes and raw water reservoirs) for example pumping stations and water treatment works.

Bristol Water's business plan

5.155 In its business plan, Bristol Water included £80 million of MNI expenditure over AMP6. This represented an 8% increase on AMP5 and a 100%

increase on AMP4. Although some categories of MNI, such as pumping station maintenance, fell relative to AMP5, and others (such as treatment works) rose sharply. Bristol Water's MNI programme for AMP6 was structured as follows:[262]

(a) **Treatment works (£34 million, 43% of total spend)** – this included a substantial increase in expenditure on both processes and structures. Bristol Water stated that this expenditure was required to replace assets constructed since 1990. Subsequently, Bristol Water amended these figures, stating that £3 million of the expenditure shown as 'treatment works – structures' should have been included under raw water reservoirs and sources. This related to borehole shafts and housings.

(b) **Pumping stations (£9 million, 12% of total spend)** – forecast expenditure on pumping stations has reduced following a major AMP5 programme to refurbish three large stations. However, the level remained significantly above that seen in AMP4.

(c) **Reservoirs and towers (£10 million, 13% of total spend)** – One major asset that Bristol Water had identified as needing replacement was Bedminster service reservoir. Bristol Water said that if this asset remained out of service, the risk of interruptions that would otherwise not have occurred would increase.[263]

(d) **Management and general (M&G, £22 million, 27% of total spend)** – forecast expenditure was projected to reduce in AMP6 following large projects being undertaken in AMP5. However, Bristol Water had identified switchgear that was non-compliant with current legislation, and which therefore required a significant increase in the level of expenditure for the health and safety sub-category of expenditure.

5.156 Bristol Water suggested that it would have higher MNI costs generally than other companies since it had a greater level of treatment complexity (and therefore correspondingly more assets) and a greater level of pumping requirements.

Our assessment

5.157 Within MNI, it is difficult to directly compare the level of expenditure to prior periods, as the proportion of costs allocated to different categories of expenditure in AMP6 has changed relative to those in AMP4 and AMP5. We

[262] This list excludes £4.5 million associated with meter replacements and leakage reduction.
[263] Bristol Water SoC, paragraph 962.

therefore asked Bristol Water to provide further evidence to explain its cost assumptions, in particular where it was assuming sharp increases in costs.

- *Scope (including serviceability)*

5.158 Serviceability for non-infrastructure is measured by Ofwat using a combination of technical measures of water quality performance and some analysis of outcomes. These include turbidity performance at treatment works, coliforms non-compliance, enforcement orders from DWI and unplanned maintenance events. Bristol Water said that from AMP6 Ofwat's serviceability measure has been replaced by a non-infrastructure asset reliability measure.[264] We considered that while there was a stronger direct relationship between serviceability and MNI expenditure it was not determinative evidence as to whether the level of planned expenditure in AMP6 was appropriate.

5.159 Bristol Water projected to invest in a comparable level of MNI in AMP6 to its actual investment for AMP5. We note that the Ofwat assessment for 2014/15 was stable. The expenditure in AMP5 has therefore been sufficient to maintain a stable service to consumers. However, this does not in itself demonstrate why MNI is reasonable and could not be reduced, for example to AMP4 levels, which were around 50% below the proposed level of AMP6 investment.

5.160 We note that Ofwat provided us with evidence that its determination was comparable in scale to Bristol Water's actual base totex for AMP4. Based on our analysis of other categories of base totex above, we considered that Ofwat's analysis of reductions in base expenditure would in practice be likely to require a reduction in MNI towards AMP4 levels. This was consistent with Ofwat's view that AMP4 spend represented a relevant benchmark. We consider below, for the main categories where MNI has increased from AMP4 levels, whether Bristol Water has provided sufficient evidence to demonstrate that such a significant increase is necessary to maintain serviceability.

5.161 We considered that it would be neither proportionate nor feasible within the timetable to evaluate all of Bristol Water's MNI programme in detail. However, we have reviewed a series of examples of the largest categories of MNI spend below, in particular:

[264] Bristol Water response to our provisional findings, paragraph 361.

(a) Bedminster Service Reservoir, which represents a large ‘one-off’ investment in AMP6;

(b) Water Treatment Works asset replacement (in particular 1990s assets), which was highlighted by Bristol Water as a category of increasing investment; and

(c) increasing areas of maintenance and general (M&G) expenditure.

5.162 We drew on the advice of Aqua. Where Aqua reviewed a project, its analysis focused on the strength of Bristol Water’s case for investment, which it considered in terms of:

(a) the need for the investment;

(b) the most suitable option had been identified;

(c) an appropriate approach to risk had been adopted; and

(d) the cost efficiency of the selected scheme.

5.163 We did not ask Aqua to provide its own view of a preferred investment option, but to test whether Bristol Water’s own evidence was sufficient to form the basis of a reliable five-year investment programme.

- *Bedminster Service Reservoir*

5.164 The replacement of Bedminster Service Reservoir was a significant and separately identifiable MNI project that Bristol Water included in its business plan. Bedminster Service Reservoir was proposed to Ofwat as a special cost factor, with investment of just over £6 million in AMP6. Ofwat rejected the special cost factor claim, on the basis that the replacement of a service reservoir was not atypical, and should be included in normal costs. However, it calculated that the ‘implicit allowance’, ie the level of cost implicitly allowed in its econometric assessment for replacing service reservoirs, was £1 million across AMP6.

5.165 Bedminster Service Reservoir is currently out of action and has been since 2013. Bristol Water has therefore had to develop an alternative approach to managing water in the relevant geographic area in the absence of this service reservoir. The service reservoir is one of 136 used by Bristol Water.

5.166 In our provisional findings we said that we would expect to see a full review of whether there is a need to replace Bedminster Service Reservoir and we would expect to see evidence of the comparison of four options:

(a) Do nothing (Bedminster failed in 2013, and there has been no immediate effect in respect of supply interruptions).

(b) Refurbishment of Bedminster Service Reservoir.

(c) Replacement of the provision of water from Bedminster Service Reservoir through construction of a new reservoir or new capacity elsewhere.

(d) Like-for-like replacement of Bedminster Service Reservoir.

5.167 Bristol Water provided us with analysis of the proposed plans for Bedminster Service Reservoir provided by Black and Veatch, and it appeared to indicate a reasonable and well-costed proposal for a new reservoir (ie option *(d)*). However, Bristol Water was unable to provide evidence that it had fully considered the alternative options.

5.168 In that context, we were concerned that the ‘need’ for a full replacement had not been demonstrated. We asked Aqua to review the case for the replacement of Bedminster Service Reservoir. Aqua indicated that there is a credible case for each of the alternative approaches.

5.169 Aqua’s analysis suggested that Bristol Water has significantly more storage than currently required. Based on discussions with Bristol Water, Aqua found that zonal demand could be supplied through various mains. We noted that, significantly, the reservoir has also been out of action for two years with no apparent impact on relevant serviceability measures.

5.170 Bristol Water disputed some of Aqua’s assumptions. It claimed that there was not more storage than required, saying that the storage requirement should have been established on local average day peak week (ADPW) demand levels and that Aqua had not considered this measure. Bristol Water said that the use of average daily demand was inappropriate in a region that experienced seasonal fluctuations.

5.171 We noted that Bristol Water appeared to require a higher margin than other water companies in the region who had similar seasonal fluctuations.

5.172 Of the options considered, Aqua considered that the refurbishment approach should have been considered explicitly within the evidence provided. We understand that Bristol Water had dismissed this as infeasible, but did not explain in its plan why this was the case. In response, Bristol Water said that repair and refurbishment had continued through the life of Bedminster.

5.173 Aqua also identified that, rather than build a replacement at Bedminster, there might be other locations that would give greater operational efficiency, and suggested the impact of the Southern Resilience service reservoir should be included in this review. Bristol Water said that there was no interaction between Bedminster and the Southern Resilience scheme. However, we understand that the reason Aqua suggested a review of the location of the reservoir was in the broader context of total network requirements (including for example the impact of Southern Resilience).

5.174 In our provisional findings, we found that Bristol Water had not demonstrated either that there was a need for additional storage capacity or that Bedminster was the most appropriate location.[265] We therefore did not find the need to replace Bedminster service reservoir had been demonstrated and we reduced the assumed baseline MNI spend by £6 million.

5.175 In its response to our provisional findings, Bristol Water disputed these points and said that:[266]

(a) the lack of impact that the decommissioning of Bedminster service has had on its ability to supply water or its serviceability levels during the last two years must be seen in the context that Bedminster Service Reservoir is required for resilience, rather than operational storage;

(b) a simplistic calculation of available storage is misleading, given that the purpose was to provide local storage to meet the resilience needs of the local zonal demand;

(c) it did not consider that it required greater levels of storage than other comparable companies;

(d) because of the nature of the Bedminster supply zone, the resilience risk could not be mitigated effectively either through supply from other mains or the Southern Resilience Scheme; and

(e) the only viable option was to replace Bedminster service reservoir and the alternative options put forward by Aqua were not ‘credible’ by reference to the potential impact on customers, a whole life cost analysis of the best solution, and the need to manage the resilience risk.

[265] Bristol Water provided additional evidence on the location/optioneering of the reservoir in response to our provisional findings. We do not however set out a full assessment of Bristol Water’s optioneering given our consideration of need below.
[266] Bristol Water response to our provisional findings, paragraph 369 and section 3.6.

5.176 We recognised that the reservoir is intended to provide resilience and considered these points and the additional evidence submitted by Bristol Water. We focused on Bristol Water's arguments on the basis of the need to maintain an appropriate level of storage in the local zone and to provide resilience.

5.177 We first considered whether Bristol had a greater level of storage than other companies. We reviewed evidence presented by Bristol Water[267] and compared this against Aqua's findings. Bristol Water drew attention to other companies which it said had greater storage requirements.[268] We found that there was not a standard approach[269] in setting the strategic storage requirements of a network but noted that Bristol Water's approach was based on the average demand for the peak week in a year.

5.178 We next considered whether Bristol Water had greater storage requirements than required by forecast demand and if it had appropriate levels of resilience. We found that across its network as a whole it had storage capacity in excess of overall demand (on an average basis),[270] which Bristol Water did not dispute.[271]

5.179 We considered that Bristol Water's argument that storage was only relevant (in the context of the resilience of a supply zone) if it was in the right location to be valid (paragraph 5.175).[272,273] We therefore considered the level of storage in the local zone[274] and the forecast demand under two metrics (average demand and ADPW).

5.180 Bristol Water stated that the total relevant storage in the local zone was 271 Ml including the Bedminster reservoir (247 Ml excluding Bedminster). As at 2010, it calculated average demand was 186 Ml/d and that ADPW demand was 213 Ml/d.[275] We therefore found that Bristol Water had sufficient storage at 2010. We next considered whether there was evidence of growth in demand and at what point storage would be insufficient.

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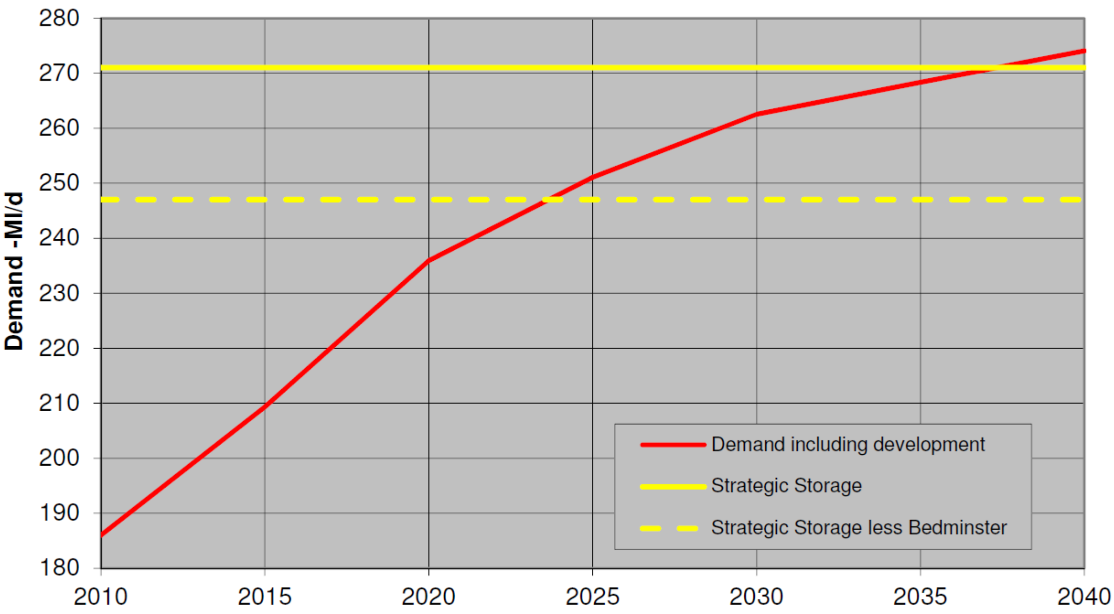
[267] Bristol Water response to our provisional findings, Table 15.
[268] We noted that this observation did not include consideration of the interaction of the aspects of service reservoir network management. For example, other companies with a higher target time do so on a reduced demand measure, with one company using 'peak day' as its measure of demand.
[269] In part driven by different metrics of daily demand.
[270] Aqua found that Bristol Water's overall level of storage (current capacity of 537 Ml) was far in excess of demand (399Ml/d).
[271] Bristol Water response to our provisional findings, paragraph 377.
[272] Bristol Water response to our provisional findings, paragraph 377.
[273] Thus, it was inappropriate to take into account storage located some distance from centres of demand.
[274] This zone is variously called 'Bristol City Zone' (the area of supply) and 'Purton-Barrow-Littleton Zone' (after the treatment works supplying potable water to the area.
[275] Originally these numbers were said to be current (ie as at June 2014).

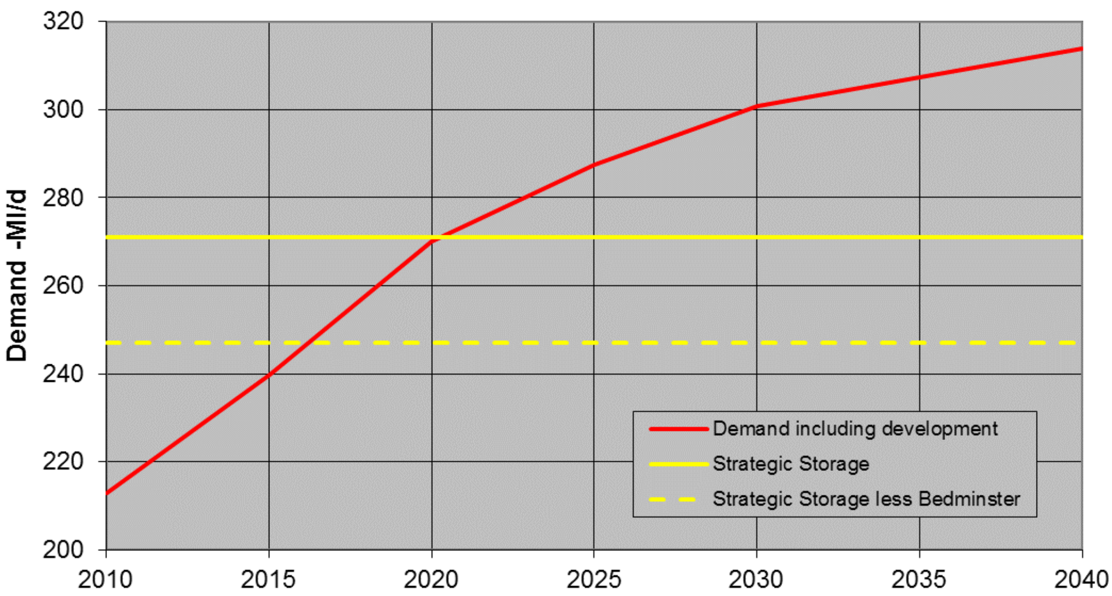
5.181 We reviewed Bristol Water's forecasts for average (Figure 5.4) and ADPW (Figure 5.5). Bristol Water's analysis indicated that under average demand there would be a shortfall in storage late in AMP7 and under ADPW demand there would be a shortfall in storage in around 2016.

Figure 5.4 Purton-Barrow-Littleton average demand forecast (Ml/d)



Source: Bristol Water.

Figure 5.5 Purton-Barrow-Littleton ADPW Demand Forecast



Source: Bristol Water.

5.182 We sought to understand the basis for the forecasts and requested the actual ADPW figures for AMP5 to assess whether the forecast for AMP6 and beyond was reasonable. Table 5.9 presents the information we received and Figure 5.6 present the ADPW data graphically.

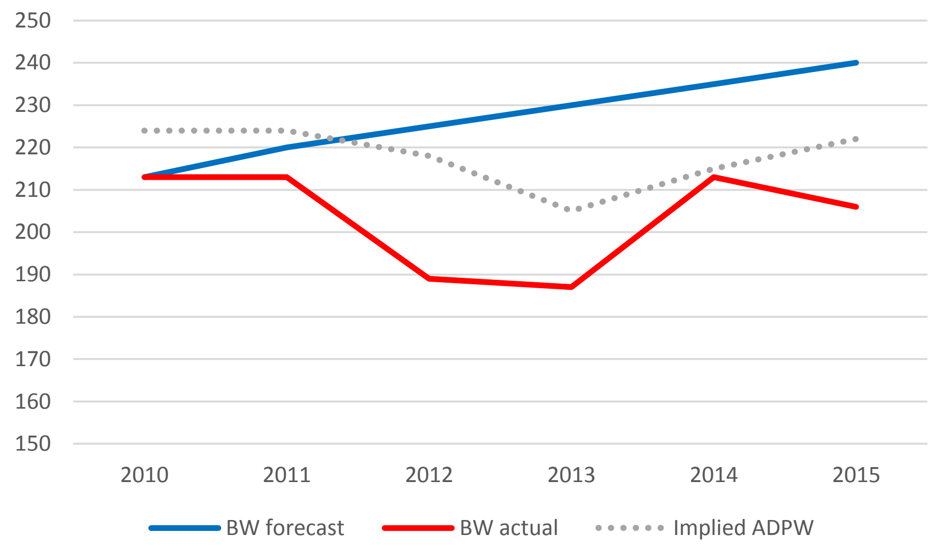
Table 5.9 Bristol Water Actual demand Purton-Barrow-Littleton zone

Ml/d

Year ending	*Actual average demand*	*Actual demand excluding leakage*	*Actual peak week demand*	*Implied ADPW*
1 April 2011	186	154	213	224
1 April 2012	180	153	189	218
1 April 2013	170	143	187	205
1 April 2014	178	150	213	215
1 April 2015	184	156	206	222

Source: Bristol Water.
Note: Implied ADPW is calculated as an uplift to average demand based upon the maximum peak week figure in the last 20 years (July 2003).

Figure 5.6 Bristol Water ADPW Actual vs forecast Purton-Barrow-Littleton zone (Ml/d)



Source: CMA Analysis of Bristol Water forecast.
Note: Axis truncated for clarity. Bristol Water Forecast based on ADPW demand forecast presented in Figure 5.5.

5.183 This analysis showed that the basis of Bristol Water's forecasts used a demand figure for 2014/15 of 240Ml/d which was some 34 Ml/d (ADPW) or 18 Ml/d (implied ADPW) greater than actual demand in 2014/15. We therefore did not consider Bristol Water's forecast to be sufficiently robust to demonstrate the need for an additional service reservoir in AMP6.

5.184 Given our finding that there was insufficient evidence of a shortfall in capacity, we did not formally reconsider whether Bristol Water had demonstrated that Bedminster was the most appropriate location for a service reservoir.

- *(1990s) water treatment assets*

5.185 As described above, Bristol Water proposed to spend approximately £34 million in AMP6 on replacement of water treatment assets. This represented an increase of over 50% against AMP5 and over 200% relative to AMP4.

5.186 In its SoC, Bristol Water said that expenditure on process plant and treatment work structures was required to be higher than AMP5. This reflected the need to start maintenance on additional processes added to treatment in the 1990s and to replace life-expired chemical tanks.[276] Bristol Water later clarified that the comment was not intended as a complete explanation of the variance.

5.187 Bristol Water also advised that £3 million identified in its SoC had been incorrectly allocated to treatment works and related, in fact, to springs, wells and boreholes. We also note that the treatment works investment included £1.5 million for pumping station refurbishment at Purton. It was not clear why this was not included as part of the pumping station capex.

5.188 The investment in treatment works assets represented over 40% of MNI investment, and was highlighted by Bristol Water in its SoC.[277] In response to our provisional findings, Bristol Water submitted greater detail of its modelling approach together with the named schemes which it had identified.

5.189 Bristol Water explained that the modelling took into account performance deterioration, life-expired obsolescence and consumable 'media' replacements. Bristol Water's modelling identified £23 million of required investment. In coming to its business plan, Bristol Water included a further £14 million for additional 'named' schemes in areas where it could identify particular investment requirements. It considered the named schemes were not captured by the asset level models.

5.190 We asked Aqua to review Bristol Water's forecasts for the cost of the replacement of assets created post-1990. Bristol Water provided forecasts based on asset life and some information on processes that have been added over time. While we did not ask Aqua to perform a full review of need on a scheme-by-scheme basis, we wanted to see evidence of best practice in identifying a five-year investment plan. As part of this review, we were seeking to understand why the maintenance cost might be increasing sharply relative to prior periods. Aqua provided the following comments on Bristol Water's evidence:

(a) It was unclear why the £14 million of named schemes were required in addition to the outputs identified by the modelling approach. If the model

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276 Bristol Water SoC, paragraph 957.
277 Bristol Water SoC, paragraph 957.

was an accurate predictor any additional work would be expected to be exceptional.

(b) From the list of named schemes, Aqua identified that some £5.5 million was allocated to chlorination schemes. Aqua suggested that Bristol Water should provide further evidence that these were consistent with wider policy on replacement with 'On Site Electrolytic Chlorination' and to demonstrate that there was no duplication. Additionally, there were two named schemes, each to the value of £2 million, which appeared to deal with environmental compliance.

5.191 Bristol Water explained further about the process of asset led models and named schemes. It also provided a list of the named schemes considered and noted why each scheme was not generated from the ALMs.[278,279]

5.192 We accepted the rationale for this approach, although when schemes are identified as named schemes we would expect the outputs from the ALMs to be reduced to prevent duplication.[280]

5.193 We noted that Bristol Water has provided some evidence as to why costs may be rising:

(a) It has included £4.2 million for structures that need replacing and has identified nine chemical bulk storage tanks. Bristol Water said that this was associated with an ageing asset base. The requirement was said to be higher than AMP5, partly due to past constraints in spend on this area.

(b) Bristol Water also identified some £3.6 million for media replacement,[281] following expenditure of £2.1 million in AMP5. In response to our provisional findings, detail of estimated spend was provided, which totalled £2.6 million.[282] £0.9 million was for the replacement of UV lights

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[278] Bristol Water asked some of its engineering consultants to review the Aqua report. Mott MacDonald commented that it would expect to see that some renewal activity is required before asset failure. It suggested that Bristol Water provided the evidence requested in order to support the case.
[279] CH2M said it had confidence that the modelling methodology was robust, however, it understood that the estimates of typical asset life were based on expert panel judgement and it had not seen evidence that these estimates were themselves robust. It said that this was a problem for Bristol Water because the step change in treatment works related MNI investment from AMP5 to AMP6 was significant (£22.4 million compared with £34.1 million) and that there was therefore an added burden of proof. It also commented on the ALMs that the process for establishing need was, in its opinion, sufficient and the models were good practice, enabling a risk-based and optimised plan to be produced. However, it had not seen evidence that substantiated the assumptions that fed the models and could not, therefore, conclude that the estimate was correct.
[280] For example, we note that for the named scheme 'On Site Electrolytic Chlorination' (OSEC), a duplication of £350,000 was identified, but Bristol Water said that this was not considered significant. Bristol Water response to our provisional findings, paragraph 419.
[281] Such as granular activated carbon.
[282] Although this included some expenditure that is described as 'asset expenditure, not media'.

which we understand was a new requirement, following recent installation of this equipment. However, its value (£0.9 million pre-efficiency in the period) only explained a small part of the overall increase from AMP5 levels.

5.194 We provide further discussion of our assessment of the schemes identified by Bristol Water in Appendix 5.2. Overall, our review of Bristol Water's plans suggested that Bristol Water was likely in practice to be able to reduce costs below the levels indicated by the combination of the ALMs and the named schemes. This could be through a combination of duplication and/or the deferral of some schemes identified as being potentially required within AMP6 into future periods.

5.195 Some specific examples included the following:

(a) We note that OSEC is being installed as a company strategy not through any formal direction. Bristol Water advised OSEC is being installed as a company strategy to address health and safety and resilience risks, in line with the company's risk appetite statement. Bristol Water has also advised us that although OSEC has been installed at Purton the need for drum chlorine will continue at this specific site for the raw water feed to Littleton to reduce the risk of bromate failures. As Bristol Water said that these assets are being replaced over AMP5, AMP6 and AMP7, it could be considered that the assets could be better replaced as their condition warranted, in line with ALMs.

(b) £8 million is proposed to be spent at Purton WTW in a variety of schemes. This amounts to some 25% of expenditure on treatment works. This follows significant maintenance expenditure in AMP5. It was not clear that Bristol Water had considered the efficiency implications of a wide investment programme at a single location.

(c) The named environmental schemes (total £4 million pre-efficiency) were described as 'must invest' for the original plan, but were reclassified in January 2015. This suggested that there was some element of choice around Bristol Water's approach to this work.

5.196 We accept that some elements of assets constructed since 1990 will need replacing on average. We agree with Bristol Water that to a certain extent, the replacement of these assets will be determined on a rolling basis. However, in considering such a large increase from AMP4 levels of expenditure, we would have expected a greater focus and better detail, in setting out what needed replacing, on the condition and performance of these assets. Our review suggested that the level of replacement needed is likely to be lower than that identified through the modelling process.

5.197 It is therefore not clear why expenditure on treatment works (process and structures) should be substantially higher than AMP4 or AMP5 levels. The direct evidence provided would only justify a small increase. We therefore considered that the level of treatment works expenditure would be able to reduce towards the levels observed in prior periods.

5.198 We considered three options for AMP6 investment in treatment works:

(a) **Low investment scenario** – reduce spend to AMP4 levels (£12 million).

(b) **Medium investment scenario** – reduce spend to AMP5 levels, (£19 million).

(c) **High investment scenario** – reduce the Bristol Water planned spend to the extent of certain identified items only, and assume everything else is required (£29 million).[283]

5.199 Bristol Water provided evidence that its projections for MNI in treatment works include £3 million that relates to raw water sources, and therefore would be incremental to the scenarios above.

- *Other areas of MNI*

5.200 Bristol Water included within its business plan a decrease in M&G expenditure from AMP5. The decrease, in general terms, was because the expenditure in AMP5 on head office refurbishment (around £8 million) which was not repeated. Bristol Water has identified some switchgear for replacement, and this appears to be an example of a normal replacement activity. IT expenditure is planned to decrease following the major IT schemes carried out in AMP5; however, it is still higher than at AMP4.

5.201 Taken together, the overall total of M&G capex is £6 million (40%) higher than AMP4 levels. We note that in AMP5, Bristol Water spent substantially more than in AMP4, and this spend does not recur in AMP6. Much of the increase in AMP5 related to the choice made to refurbish the head office and close the Bedminster depot (this was not in the original plan or funding). Apart from the switchgear replacement, it was therefore unclear why this higher level should continue.

[283] OSEC duplication; media; ICA, bunds, pipes (total approximately £5 million).

5.202 We have reviewed the evidence provided by Bristol Water on the M&G programme, including the increase in switchgear. While the evidence is consistent with items that are in the normal course of business within the water industry, we have not seen clear evidence which supported a continuation of levels above AMP4.

5.203 From the detailed list of named schemes provided we note that £3.2 million was to be spent replacing electrical installations that were no longer compliant with existing standards. We agree that such health and safety expenditure is a priority, but question whether, since by definition these will be older assets, any of them would have been forecast for replacement by the ALMs. We have not seen any reduction relating to these items.

5.204 Bristol Water has suggested that IT levels will be higher due to a greater level of IT in use. We observe that IT expenditure relating to the retail business is excluded from the wholesale expenditure calculation. It was not clear to us if the AMP4 and AMP5 figures are therefore on a comparable basis.

5.205 While we have relatively limited evidence, in a low investment scenario, our analysis suggests it should be feasible for Bristol Water to reduce its M&G investment. A return to AMP4 levels would reduce M&G investment by around £6 million.

5.206 The Bristol Water business plan also included an increase in capex on pumping stations from AMP4 levels. The amount was substantially reduced from AMP5 where additional funding was given for some major schemes (although it appears not all spent in this area). We have not examined this area further.

- *Cost efficiency*

5.207 We asked Aqua to review cost efficiency for both the Bedminster project and for the 1990s asset replacement work.

5.208 In respect of Bedminster, the proposed solution costed came within Aqua's range of cost estimates. Aqua considered that Bristol Water's costing approach was consistent with good practice.

5.209 For the assets created post-1990, Bristol Water did not provide sufficient detail on either what it intended to spend the MNI on, or evidence of unit cost trends.

5.210 From the replacement of bulk chemical storage tanks scheme shown by Bristol Water, there were a number of items that did not appear efficient:

(a) Aqua calculated that the allowance for bund capacity was overstated and said that the chemical tanks also had a bund included in the price.

(b) Aqua identified that for replacement tanks the level of instrumentation controls may be relatively high, as existing telemetry should be sufficient.

(c) The estimate included substantial quantities of pipework, which Aqua considered should not be required for a tank replacement.

5.211 Bristol Water responded to these points and said:

(a) not all of the bunds were being replaced. Only three were being replaced and five new ones were being provided.

(b) all bulk tanks are now remotely monitored with a direct interface with telemetry and SAP. Replacement of the existing level monitoring (part of Instrumentation and Control Automation (ICA)) related to the tanks was required. The existing 'telemetry' as described by Aqua would not be replaced.

(c) This was a standard design arrangement considered to be best practice in the water sector.

5.212 We noted that the biggest difference in regard of the tank costs related to Aqua's observation that the quotes oversized the requirements. We also considered that Bristol Water have not addressed the observation that Aqua were making with regards to pipes and ICA. The bulk of the ICA in place and existing pipework should not need replacing although this was included in the cost shown. We also observe that there was a separate allocation for ICA under the M&G category.

5.213 If any of these items could be excluded, this would suggest the potential for further efficiencies against Bristol Water's planned unit costs.

5.214 This fairly limited analysis suggests that on balance there may be potential for some additional unit cost efficiency. We are proposing adjustments in a number of areas where Bristol Water has proposed to increase expenditure. In practice, this may be addressed through a combination of a scope and efficiency challenge. Therefore, we did not consider a further efficiency adjustment was necessary.

Further evidence on overall approach to MNI

5.215 In response to our provisional determination, Bristol Water supplied us with outputs from the ALMs, a list of named schemes and information on the age of some of the assets now due for replacement.

5.216 While we understand the usefulness of the ALM approach, we noted that the models produce a prioritised list of all assets that need replacing over time. In practice, Bristol Water will replace assets at the point when investment needed to be made to maintain serviceability. It appeared that the scenario chosen, based on the customer research undertaken, may be a more risk-averse approach than necessary to maintain serviceability. This could be considered a reasonable approach, but may mean customers paying more than needed to maintain the base service level.

5.217 We note Bristol Water obtained a report from KPMG that suggested that overall, Bristol Water did not systematically exhibit any greater level of risk aversion than its peers. The CH2M report also said that considering Bristol Water as risk-averse was not a wholly appropriate conclusion.

5.218 Ofwat suggested that Bristol Water's own cost levels and forecasts may reflect an unduly risk averse philosophy in its management team, which may have affected its business plan forecasts and individual project assessment.

5.219 We agree that the approach Bristol Water has taken appeared logical, although it did not, by its nature, maintain MNI replacement levels at what may be considered a natural rate. This is because even if the asset led models (ALMs) were perfect, the named scheme aspect would replace assets before they were no longer serviceable.[284] We noted that the intention was to improve the ALMs over time. We considered it probable, however, that at this stage in its development Bristol Water was using fairly conservative modelling assumptions.

5.220 We also understand that the results of the ALMs and named schemes are fed into the cross asset optimiser (CAO) to determine which schemes to include in the final plan. The CAO ultimately determines the level of base investment based on the willingness to pay research.[285] It appears that the scenario chosen, based on the customer research, may be a more conservative approach than necessary to maintain serviceability. To the extent that this is the case, the programme presented in the business plan

[284] Although we accept there may be good reasons (for example to address health and safety concerns) to do this.
[285] The CAO uses a cost benefit analysis approach in which outputs from schemes and scenarios are assessed against benefits derived from WTP.

will therefore have more expenditure than the minimum required to maintain serviceability.

Findings

5.221 As part of our review of Bristol Water's business plan, we sought to review the proposed approach to MNI spend, and requested information on the main categories of spend.

5.222 A significant amount of information was received late in the process. This has made us generally concerned about the quality of supporting evidence that Bristol Water had available, both in respect of the assumptions within its plan and within its SoC.

5.223 We have seen limited detail on what Bristol Water would spend the £80 million assumed within its business plan on. Much of the forecast appeared to originally have been based on model outputs, without supporting evidence to reconcile this to actual assets and its condition. While we understand the difficulty in identifying five years of maintenance expenditure by asset, there appears to be significant uncertainty about whether the level of spend proposed would be required in practice.

5.224 As a result, we considered that it is likely that Bristol Water may be able to spend materially less than it planned in AMP6, as much of the spend did not relate to identified assets that needed replacing. However, we consider that there is a wide range of potential outcomes for actual replacement.

5.225 In deciding on a range of outcomes we therefore considered various adjustments to Bristol Water's proposed areas of spend as shown in Table 5.10.

Table 5.10: MNI options considered

		£m
Approach	*Low investment scenario*	*High investment scenario*
Align water treatment work (and resources) spend with previous levels	17.6	29.1
Service reservoirs and water towers – remove all Bedminster costs	4.2	4.2
Pumping stations	7.5	9.3
Meter replacements and leakage reduction	4.5	4.5
Align M&G spend to AMP4 levels	15.4	21.7
Total	49.2	68.8

Source: CMA analysis.
Note: The low scenario removes the Bedminster costs and aligns levels of spend back to AMP4 levels. The high scenario excludes Bedminster and those areas where we have seen detail of costs we find too high or duplicated.

5.226 In total, relative to Bristol Water's plans of £80 million, this gives a range for MNI of £49–£69 million.

Findings on base expenditure

5.227 In the analysis above, we have undertaken a range of targeted assessments of aspects of Bristol Water's planned base expenditure.

5.228 As part of our review, we have sought to establish supporting evidence to Bristol Water's assumptions underlying its business plan. The quality of analysis provided varied by category. Generally, Bristol Water was less able to provide supporting evidence to explain its assumptions within the categories of capital maintenance.

5.229 As a result, where Bristol Water assumed significant increases in capital maintenance relative to historic levels, we were not persuaded that it has fully demonstrated that these increases were necessary to maintain serviceability.

5.230 In some cases, there is evidence that Bristol Water has been able to invest lower amounts in the past, and there is no clear causal link between asset condition or other external factors and any proposed increase in spending. In that context, we consider that it is reasonable to assume that Bristol Water may be able to spend less than projected by its business plan modelling.

5.231 In summary:

- *(a)* our review has found that it is reasonable to assume that Bristol Water may be able to deliver its plan at lower cost and/or with scope reductions relative to its plans;
- *(b)* on opex, we have primarily assumed an updated baseline, as Bristol Water appeared to be assuming that certain costs were recurring which we consider may be avoidable in future years;
- *(c)* on IRE, we consider Bristol Water is likely to be able to achieve its planned level of activity at a lower cost, either on unit cost or potentially on scope reduction; and
- *(d)* on MNI, we are uncertain over required levels due to lack of evidence. However, where we have been able to review Bristol Water's plans, they appeared to be high in cost and suggested a potentially material ability to implement reductions in scope.

5.232 From the above, our assessment of the Bristol Water plan is that total base expenditure is between £335 million and £359 million as summarised in Table 5.11.

Table 5.11: Summary assessment of Bristol Water business plan base expenditure

£m (2012/13 prices)

	Bristol Water business plan	*Ofwat pre-menu final determination*	*CMA adjustment to Bristol Water business plan*		*Range*
			Low	*High*	
Opex	228	188	–10	–10	218
IRE	76	63	–8	–4	68-72
MNI	80	67	–31	–11	49-69
Total base	385	318	–50	–25	335-359

Source: CMA analysis.
Note: Ofwat modelling was at a base expenditure level. The numbers shown are those assumed for Ofwat modelling purposes.

6. Review of enhancement expenditure from Bristol Water's business plan

Introduction

6.1 In this section we set out our approach to the evaluation of enhancement expenditure schemes included in Bristol Water's SoC.

6.2 Bristol Water included £152.3 million for enhancement expenditure (out of total expenditure of £536.9 million) in its final business plan. Ofwat included an allowance of £91.2 million in FD14 for enhancement expenditure (out of total expenditure of £409.2 million).[286] The composition of Bristol Water's enhancement programme expenditure by scheme and category of expenditure is shown in Table 6.1 below.

Table 6.1: Enhancement expenditure by scheme and category of expenditure in Bristol Water SoC

£m

Scheme	*Improving taste*	*Raw water deterioration*	*Meeting lead standards*	*NEP*	*Balancing supply/ demand*	*New develop-ments*	*Resilience*	*SEMD*	*Total*
Cheddar 2					42.8				42.8
Cheddar WTW		20.8							20.8
Raw water deterioration		8							8
Southern Resilience					8.4		19.8		28.1
Growth					12.5				12.5
NEP				11					11
Asset reliability	10.2								10.2
Lead			0.8						0.8
Other smaller schemes					15.5	0.4		2.2	18.1
Total	10.2	28.8	0.8	11	79.2	0.4	19.8	2.2	152.3

Source: Bristol Water SoC, Section 10.
Note: New developments is the net expenditure figure after contributions of £25.3 million. Of the £152.3 million of planned expenditure we reviewed £133.5 million. The balance of expenditure not reviewed (some £18.8 million) relates to smaller 'balancing supply/demand' schemes (£15.5 million out of £79.2 million), Security and Emergency Measures Direction (£2.2 million), meeting lead standards (£0.8 million) and new developments (£0.4 million).

6.3 We have set out Ofwat's approach to modelling of enhancement as part of its overall approach in Appendix 2.2.

6.4 The remainder of this section is structured as follows:

(a) First, we outline our approach to enhancement expenditure and the views of Bristol Water and Ofwat to our approach and our provisional findings.

[286] Bristol Water SoC, Table 2.

(b) We then set out our review of Bristol Water's largest enhancement schemes:

(i) A second Cheddar Reservoir (Cheddar 2) (paragraphs 6.23 to 6.176);

(ii) Cheddar Water Treatment Works (Cheddar WTW) (paragraphs 6.177 to 6.266); and

(iii) Southern Resilience (paragraphs 6.267 to 6.306).

(c) We then consider a number of smaller schemes[287] (paragraphs 6.308 to 6.341).

(d) We then set out our overall assessment of enhancement expenditure (paragraphs 6.342 to 6.347).

(e) We conclude by setting out our findings with respect to enhancement expenditure (paragraphs 6.348 to 6.355).

6.5 We additionally set out relevant evidence on smaller schemes in Appendix 6.1.

Our approach to enhancement

6.6 We have reached our findings with respect to enhancement expenditure by separately concluding on our assessment of the evidence on individual enhancement schemes. The schemes we have reviewed, in aggregate, account for some 98% of the enhancement expenditure included in Bristol Water's Business Plan.[288] We adopted a framework of assessing the evidence for each scheme on: *(a)* the basis of need; *(b)* whether the most suitable option has been chosen (optioneering); and *(c)* the robustness of cost estimation.[289]

6.7 The principal sources of evidence used were:

(a) Ofwat's models and deep dive assessments;[290]

[287] These are Raw Water deterioration (excluding Cheddar WTW), Growth Expenditure, National Environment Programme (NEP), Asset reliability – discoloured water contacts, new connections and enhancements to the supply/demand balance.
[288] We consider that 'schemes' can be an individual capital project or a group of discrete or interconnected projects with the same strategic purpose.
[289] In the case of supply/demand balance enhancement schemes and new connections we have only reviewed evidence on cost.
[290] A 'deep dive' is an Ofwat term for a focused review of a specific element of a business plan. We used Ofwat's unit cost models for new connections and supply/demand balancing schemes.

(b) Bristol Water's water resource management plan (WRMP), business plan, SoC and supporting documents;

(c) responses from Bristol Water and Ofwat at our hearings and in response to additional questions and their respective submissions in response to our provisional findings;

(d) the findings of our consultants (Aqua); and

(e) submissions by third parties.

6.8 Our approach to the assessment of wholesale costs and the use of econometrics is considered in paragraphs 3.29 to 3.33 where we set out why have not chosen to adopt an econometric approach to enhancement expenditure.

Views of the parties on our approach

6.9 We set out in this subsection the responses we received from Ofwat and Bristol Water which relate specifically to our approach to enhancement expenditure. In the next subsection, we set out the views of parties on our provisional findings.

6.10 Ofwat said that we had given limited explanation to justify a partial or complete removal of top-down approaches to modelling enhancement. Ofwat reiterated the benefits of totex modelling compared to a project-by-project review, which included the relative level of resource required, potential issues of cost allocation, the danger of engraining traditional approaches to business planning, the danger of failing to consider costs against industry benchmarks and the difficulty of assessing the risk appetite of Bristol Water.

6.11 Ofwat told us that a modelling approach was more straightforward to implement with a focus on benchmarking and comparative information, and it reduced the need for 'bespoke' assessment of project specific costs.

6.12 We acknowledged the benefits of this approach, but considered that appropriate attention directed to schemes that were material to Bristol Water's business plan was necessary (and indeed the special cost factor process was a significant element of Ofwat's approach). Ofwat further noted the interaction between base and enhancement expenditure and the danger of risk averse business planning; however, we consider that our approach has identified robust challenges to Bristol Water in how it proposes to operate and develop its network.

6.13 Bristol Water told us that Ofwat's estimate of enhancement expenditure arising from its modelling streams should not be taken into account in our assessment. Bristol Water said that the approach we proposed was reasonable for a pure cost assessment, but told us that we should consider customer preferences with particular reference to the balance between service and bills favoured by customers.

6.14 Bristol Water told us that we should not focus on downwards adjustments because as part of the planning process, Bristol Water had excluded a number of cost beneficial schemes that could have been included in order to make its business plan as acceptable to customers as possible. Bristol Water told us that, should we exclude schemes included in its business plan, we should consider schemes which had been omitted from its final business plan (while recognising the difficulty of achieving this in a redetermination).

6.15 We considered Bristol Water's points and identified merits in their argument that our assessment should not simply be a downward adjustment of the level of expenditure in its business plan.

6.16 While we recognised the point made by Bristol Water in paragraph 6.14, it has been our approach to review the separate enhancement projects proposed by Bristol Water as part of our calculation of an overall wholesale expenditure allowance. Given the freedom that Bristol Water has to design and deliver its business plan with the allowance we have found, we did not consider it appropriate to increase Bristol Water's allowance to deliver alternative projects that it had not specifically proposed to us. We considered that it was (and remains) for Bristol Water to demonstrate sufficient evidence that the projects it sought to deliver meet the criteria of the framework we have adopted. We did not therefore consider it appropriate to assess and approve specific alternative projects that were not included in Bristol Water's final business plan.

Views of the parties in response to our provisional findings

6.17 In this subsection we set out the responses to our provisional findings that relate to our overall approach to assessing Bristol Water's enhancement schemes. We consider and respond to scheme specific comments in the relevant subsections below and in Appendix 6.1.

6.18 Bristol Water said we had been inconsistent in our approach to adjusting its estimated costs relative to benchmarks. Bristol Water said that where its cost estimates were greater than a benchmark, we had reduced those costs to the benchmark, but where its costs were below a benchmark we did not increase the allowance accordingly.[291] Ofwat said that it did not object to increasing allowances where Bristol Water's estimate was below the benchmark.[292]

6.19 We considered that there was merit in adopting an 'in-the-round' approach, as it could ensure that Bristol Water was not subject to any such asymmetry but noted that consistent benchmark information was not available for all schemes and that any netting-off of differences in benchmarks would need careful consideration.

6.20 Ofwat, in its response to our provisional findings, told us that those schemes subject to the greatest level of scrutiny from us had resulted in significant cost saving.[293] Ofwat said it was not clear that it was appropriate to give Bristol Water the benefit of the doubt without applying further cost challenges. Our approach in reaching our provisional findings was to focus on the largest schemes (we reviewed some 88% of Bristol Water's planned net expenditure) and to consider individual schemes on their own merits both with respect to cost and scope. We noted Ofwat's approach of applying a standard efficiency challenge on all costs which exceeded the relevant implicit allowance but considered this approach did not offer a consistent level of challenge.[294]

6.21 In response to the views of Bristol Water (paragraph 6.18) and Ofwat (paragraph 6.20) we reviewed our overall allowance for relevant enhancement schemes[295] against the range of benchmarks in aggregate to establish if there was an indication of bias or inconsistency in our approach. We set out our review in paragraphs 6.342 to 6.347.

6.22 We now turn to our assessment of individual enhancement schemes.

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[291] Bristol Water response to our provisional findings, paragraph 565.
[292] Specifically, we asked whether it was appropriate to increase the allowance for Southern Resilience to the third party benchmarks. Ofwat said that a proportionate view could be taken and an allowance based on an average of benchmarks could be taken. In the case of Southern Resilience, this would lead to an increase in the allowance relative to that requested.
[293] Ofwat response to our provisional findings, paragraph 79.
[294] Implicit allowances were calculated by applying a percentage uplift of base expenditure, and allocated into cost categories based on the allocation across the industry. As a result, those cost categories where Bristol Water had proportionately little spend received little or no cost challenge, while those schemes which exceeded the implicit allowance were subject to challenge. The use of implicit allowances meant that not only was there an inconsistent approach but that allowances in excess of the value of relevant schemes were given.
[295] Where we have a specific financial comparator (rather than a statement from a third party that costs are appropriate) and need had been demonstrated.

Cheddar 2

Overview of the proposed enhancement

6.23 Bristol Water planned to build a second raw water reservoir at Cheddar, Somerset ('Cheddar 2'). The construction of the reservoir was included in its WRMP. The total cost of the project was £120 million,[296] and Bristol Water included £43 million in its SoC for AMP6. Bristol Water planned to deliver Cheddar 2 by 2025.

6.24 The expenditure included in AMP6 by Bristol Water in its SoC for this scheme was primarily for land acquisition, further investigations and enabling works.[297]

6.25 A planning application was submitted to Sedgemoor District Council in December 2013, and planning permission was granted in November 2014. A condition of the planning permission was that construction must commence within seven years of the date that planning permission was granted (November 2021, which falls in AMP7).[298]

6.26 Bristol Water stated in its SoC[299] that once in service, Cheddar 2 would:

(a) in combination with other measures, provide sufficient water to meet population growth and to mitigate the effect of climate change on its resources;

(b) increase the level of storage and resilience in its total system helping to improve security of supply to customers; and

(c) improve local supply security during short period droughts in a vulnerable area and improve system management by increasing yield of an existing source and holding a larger volume of stored water closer to zones of demand growth.

PR09 and CC10

6.27 Expenditure for preparatory work for the reservoir was included in both Ofwat's and the CC's respective AMP5 determinations.

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[296] We note that Bristol Water has submitted evidence indicating that the total cost is now estimated at £114 million.
[297] Bristol Water SoC, paragraph 1350.
[298] Sedgemoor DC, Planning Portal, Planning Application number 17/13/00080.
[299] Bristol Water SoC, paragraph 1292.

6.28 Cheddar 2 was one of six ‘supply/demand balance’ projects in the AMP5 determination where differences existed between Ofwat and Bristol Water and formed part of the CC’s determination.

6.29 In AMP5, Bristol Water included £9.85 million in its business plan for preparatory works[300] to allow for ‘just in time’ construction when demand arose. Ofwat reduced this by approximately 15% (£1.5 million)[301] because it considered that Bristol Water had not provided sufficiently detailed evidence in its business plan of both the costs involved and the specific work to be undertaken. In addition, it had not discussed any outputs for this scheme against which Ofwat could measure efficiency of the scheme, progress and completion.[302]

6.30 The CC’s external engineering consultant considered that the level of expenditure was robust and justified following a review of the costs and further evidence from Bristol Water on outputs.[303] Ofwat considered that expenditure (£5.83 million) on land purchase was excessive (it considered the value of land to be in the order of £0.9 million).[304] Because of this disagreement and because the expense would be incurred at the end of AMP5,[305] the CC disallowed this expenditure to allow for a market appraisal at the beginning of AMP6 to gain a more accurate assessment of land prices.[306] As a result, £4.02 million on preparatory work was allowed.[307]

6.31 We noted that Ofwat had accepted the need for the reservoir but in granting an allowance referred to the allowance as relating to ‘design stage work’.[308]

Responses to provisional findings

6.32 In our provisional findings we provisionally found that Bristol Water had not demonstrated that there was need for construction of Cheddar 2 to commence in AMP6 and made no allowance.

6.33 CCWater told us that it supported this decision.[309] The LEF said that that some delay (and particularly a delay to commencement which remained within AMP6) may be appropriate so that completion would be during AMP8.

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[300] These consisted of various surveys, obtaining planning permission and purchase costs of land.
[301] CC10 Final determination, paragraph 3.82.
[302] CC10 Final determination, paragraph 3.82.
[303] CC10 Final determination, paragraph 3.83.
[304] On 31 March 2015. CC10 Final determination, Appendix E, paragraph 78.
[305] On 31 March 2015. CC10 Final determination, Appendix E, paragraph 78.
[306] CC10 Final determination, paragraph 3.85.
[307] CC10 Final determination, paragraph 3.86. £4.7 million has been incurred to date.
[308] For example, Ofwat response to Bristol Water PR09 SoC, Annex D paragraph 3.11.3.
[309] CCWater response to our provisional findings, paragraph 3.6.

The LEF was concerned that any further delay might expose Bristol Water's customers to an inappropriate level of risk in their supply.[310]

6.34 We considered that our approach in our provisional findings was reasonable given our consideration of Bristol Water's own optimisation of schemes in a scenario where there was no new large non-potable customer.[311]

6.35 Ofwat supported our decision not to make an allowance for Cheddar 2.[312]

6.36 We identified a number of key themes in Bristol Water's response to provisional findings:

(a) The role of the WRMP and the weight that should be placed upon it.

(b) The consensus, according to Bristol Water, that Cheddar 2 was needed (particularly in respect of the possible impact of a large non-domestic customer in the future) and thus the need to maintain planning permission.

(c) Customer support for Cheddar 2 (regardless of any demand from a power station) and the benefits of improved service levels, additional resilience, and the willingness of customers to pay for those improvements.

6.37 We set out each of these in the relevant subsections below.

Need

6.38 The construction period for reservoirs can be significant depending on the size and complexity of the project.[313] Construction to provide for additional capacity or resilience must be planned and commence some years in advance. To demonstrate need (in respect of balancing supply and demand), we considered that Bristol Water should demonstrate that additional supplies will be required in the future, and identify when the additional supply will be required. We considered that in demonstrating need in respect of resilience, Bristol Water should provide evidence of the vulnerability of the network and of support for the enhancement.

6.39 The timing of the commencement of construction of such a significant piece of infrastructure is also important to the extent that it impacts on the profile of any subsequent increase in customer bills. We note, however, that

[310] LEF response to our provisional findings, p2.
[311] Bristol Water WRMP, Scenario 4.
[312] Ofwat response to our provisional findings, paragraph 76.
[313] In addition, the reservoir must reach a minimum capacity to be fully effective.

mechanisms exist to facilitate smoothing of bills in addition to the timing of construction in specific AMPs.

6.40 In establishing the need for a new reservoir, or any enhancement to capacity or resilience, Bristol Water must model the future demand[314] for water, anticipated levels of supply[315] based on its existing network and the additional volume of supply needed to maintain its target headroom.[316]

6.41 In its SoC, Bristol Water identified a number of factors that would affect when a supply deficit in its network would arise:[317]

(a) the actual rate of population growth;

(b) the impact of climate change;

(c) the impact of major non-household customers;

(d) customer expectations of supply security; and

(e) success of mitigation measures such as metering and water efficiency programmes.

6.42 Our initial review of evidence indicated a number of aspects of Bristol Water's network and operations that were material considerations in establishing need. We set these out in turn in the following sub-sections.

Non-domestic demand

6.43 Bristol Water's preferred planning scenario (which drives the optimisation of the order that schemes are delivered in its business plan) included the assumption that it would need to provide a non-potable supply to a power station proposed by SSE (referred to as 'Seabank 3').[318]

6.44 In making our findings, we were aware of a second power station, proposed by Scottish Power, at an adjacent site. This power station was not included in the scenario chosen by Bristol Water. In its SoC Bristol Water stated that while it had been approached by Scottish Power, because the proposal was

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314 This includes both actual usage and leakage from the network.
315 The relevant measure supply of water is referred to as water available for use (WAFU), which is net of agreed non-potable supplies.
316 A water company will need to allow some level of headroom (ie the difference between demand and supply) to allow for volatility in demand and supply. The scale of the headroom will depend on the inherent volatility of demand and supply in the network and a water company's risk appetite.
317 Bristol Water SoC, paragraph 1300.
318 Bristol Water have stated that they were in commercial negotiations with SSE, Bristol Water, Wholesale Business Plan, p173.

at an early stage in its planning application, Bristol Water had not made a formal offer of supply.[319]

6.45 Jacobs, commissioned by Ofwat, found that there was not a requirement for Bristol Water to invest in provision of new resources to manage a deficit consequent on the unproven requirement for a supply of non-potable water.

6.46 Ofwat's view[320] was that the final WRMP showed the future supply/demand deficit that Cheddar 2 sought to address was driven in the short term mainly by the assumption that there will be significant additional non-domestic demand.[321] Bristol Water said that without the reservoir, should the non-domestic demand arise, there would be increased pressure on water supplies.[322]

6.47 Bristol Water presented correspondence with SSE Thermal Projects, about a non-potable supply from Bristol Water, to Ofwat; however, Ofwat did not consider that the current maturity of SSE's proposals provided compelling evidence for the need.[323]

6.48 The Planning Inspectorate expects SSE to submit a planning application for Seabank 3 in late 2015.[324] Once an application is submitted, the planning process is likely to take at least 12 months.[325] At the point of FD14 there was therefore no certainty that it would proceed (given that a planning application had not (and still has not) been submitted).

6.49 Ofwat noted that under the WIA 91, Bristol has no duty to supply water for non-domestic purposes if such supplies put at risk its ability to meet current and probable future obligations to provide water for domestic purposes.[326] In response, Bristol Water told us that it was under a duty to supply water for non-domestic purposes when requested to do so, other than in certain circumstances, and that Ofwat's statement that Bristol Water does not have

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[319] Bristol Water SoC, paragraph 321.
[320] Ofwat's consultants, Jacobs found that Bristol Water's modelling for the need for the reservoir was contingent on the construction of a power station.
[321] Specifically, SSE's proposed power plant Seabank 3.
[322] Ofwat, Bristol Water – Special Cost Claims.
[323] Ofwat, Bristol Water – Special Cost Claims.
[324] Planning Inspectorate website. We understand that SSE's proposed power station is currently on hold, and we discuss this further in paragraph 6.53.
[325] Planning Inspectorate guidance allows 28 days for the Planning Inspectorate to decide whether to accept the application, with a three-month pre-examination period, followed by an examination period of up to six months, followed by a three-month period for the Inspectorate to prepare a report and recommendation with a final three-month period for the Secretary of State to make a decision.
[326] Ofwat response, paragraph 207.

an obligation to plan for non-potable supplies was not a reasonable position for Ofwat to adopt.[327]

6.50 Ofwat concluded that if the possible power station demand was not taken into account, there was no projected deficit until late within AMP7 (2024-25).[328]

6.51 CCWater presented evidence from May 2014 that SSE had publicly stated it was likely to take non-potable water from Wessex Water waste water treatment works at Avonmouth.[329]

6.52 Bristol Water told us that there was a clear need for resource development by 2027 irrespective of any need to make provision for non-potable supplies and that the need to make a non-potable supply to SSE's proposed power station was not intended to be presented as a driver for the project. It assumed a ten-year lead time for the project and concluded this would result in a need to start construction in AMP6.

6.53 We sought to understand the likelihood of one or both proposed power stations at Avonmouth and the potential need for Bristol Water to identify and/or commence development of new sources of water in AMP6. We were told the following:

(a) **Seabank 3 (SSE)** – there are provisional national grid connections from 2025 which would require water in 2024. The project is, however, currently on hold, awaiting an improvement in market conditions. SSE told us that both Bristol Water and Wessex Water could provide a supply, [✂].

(b) **Avon Power Station (Scottish Power)** – we were told that construction was subject to market conditions, but that a planning application would be submitted. The station could be supplied by Wessex Water or Bristol Water, but the supply from Wessex Water could be constrained by Seabank 3. The site currently has a main from Bristol Water in place.

6.54 In response to our provisional findings, Bristol Water said that while it was probable that the power station developments referred to in the WRMP may be unable to proceed within the AMP6 period, it did not mean development

[327] Bristol Water reply, paragraphs 127–130.
[328] Ofwat, Bristol Water – Special Cost Claims. Bristol Water in its response to provisional findings noted this finding as relevant to the need for Cheddar 2 absent a large non-potable customer. However, we placed weight on Bristol Water's own optimisation under scenario 4.
[329] CCWater submission, Appendix 1: Re-examining Bristol Water's proposal for Cheddar 2 reservoir, Mark Hann Consulting.

would not occur in the future. Additionally, Bristol Water said that Avonmouth is a significant industrial area for the South-West, and the availability of industrial quantities of water will attract development in the future.[330]

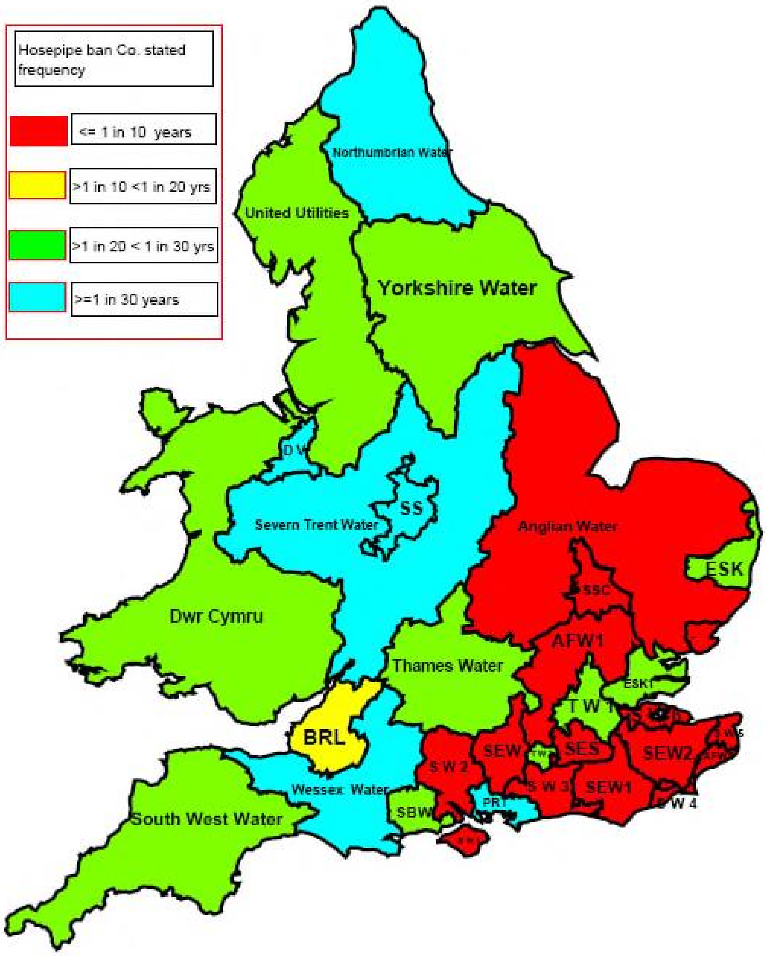
Improving service levels

6.55 We next considered Bristol Water's proposition that Cheddar 2 would enhance service levels to customers.

6.56 Bristol Water presented analysis that its WRMP that sought to limit hosepipe bans to once every ten to 20 years provided a lower standard of service than neighbouring water companies, as shown in Figure 6.1 (which had targets for the frequency of hosepipe bans of less than once every 20 or 30 years). Bristol Water also presented evidence that its target for rota supply cut-offs or standpipes was more frequent than other water companies.[331] Bristol Water argued that by constructing the reservoir, its network will have greater resilience in the event of low rainfall.

[330] Bristol Water response to our provisional findings, Appendix 4.1, paragraph 6.
[331] Bristol Water's target is less frequent than once every 100 years. The majority of other water companies do not have a target; rather, they state such cuts are unacceptable. Bristol Water SoC, Figure 67.

Figure 6.1: Target level of service – frequency of hosepipe bans by water company



Source: Bristol Water Analysis of Water Companies Business Plans 2013/14, Bristol Water SoC, Figure 66.

6.57 Ofwat, in its considerations, recognised that Bristol Water had presented evidence that customers had a preference for the improved resilience and levels of service that would be delivered by the scheme.[332] Jacobs, however, noted that customer research indicated that 'maintaining service' was acceptable to the majority (74%) of customers and that there was no strong case for Cheddar 2 by itself.

6.58 In response to our provisional findings Bristol Water reiterated that its research indicated that household customers assigned a relatively high benefit for an improved service.[333] We noted, however, that its research showed that out of ten possible customer investment priorities, customers rated reducing the risk of hosepipe bans as the least important (building new

[332] Ofwat, Bristol Water – Special Cost Claims.
[333] Bristol Water also said that developing a scenario providing the level of service equivalent to neighbouring companies would have resulted in potential bill increases customers would be unwilling to support. Bristol Water response to our provisional findings, Appendix 4.1, paragraph 12.

reservoirs was seventh).[334] We discuss customer support in more detail below in paragraphs 6.80 to 6.89.

Developing appropriate headroom

6.59 CCWater submitted evidence (shown in Table 6.2) that Bristol Water's risk profile for assessing necessary headroom was overly conservative compared with other companies and EA guidelines. It said that this would have a material impact on the headroom required. It calculated that adopting a headroom risk[335] figure of 80% (rather than 90%) for 2040 would push back the planning need for the reservoir by five to ten years.

Table 6.2: Headroom risk of water companies

		%
Company	*2015*	*2040*
Bristol	90	90
Wessex	85	72
South West	85	70
Bournemouth	90	90
Portsmouth	95	91
United Utilities	95	70
Dŵr Cymru	90	75
Thames	95	70
South Staffs	90	80

Source: CCWater analysis of company WRMPs, CCWater submission.
Note: Headroom risk is the level of confidence that a company has that its water network and planned improvements will achieve the company's target headroom.

6.60 Bristol Water told us that actual headroom[336] was a more significant metric, and submitted evidence on the relative level of actual headroom of different water companies. Bristol Water disagreed with CCWater's view that it was risk-averse, and said that its actual headroom compared favourably with Wessex Water (Bristol Water's average headroom was 12% above distribution input compared to Wessex Water's figure of 22%).[337]

6.61 Figure 6.2 shows Bristol Water's headroom as a percentage of its distribution input (DI) plotted against a number of other water companies. Bristol Water said that this showed that it was not risk-averse compared to other companies, and that should it increase its risk appetite (by reducing its 'headroom risk' to 80%), it would reduce its actual headroom by only 2-4Ml per day and would delay the need for Cheddar 2 by one year.

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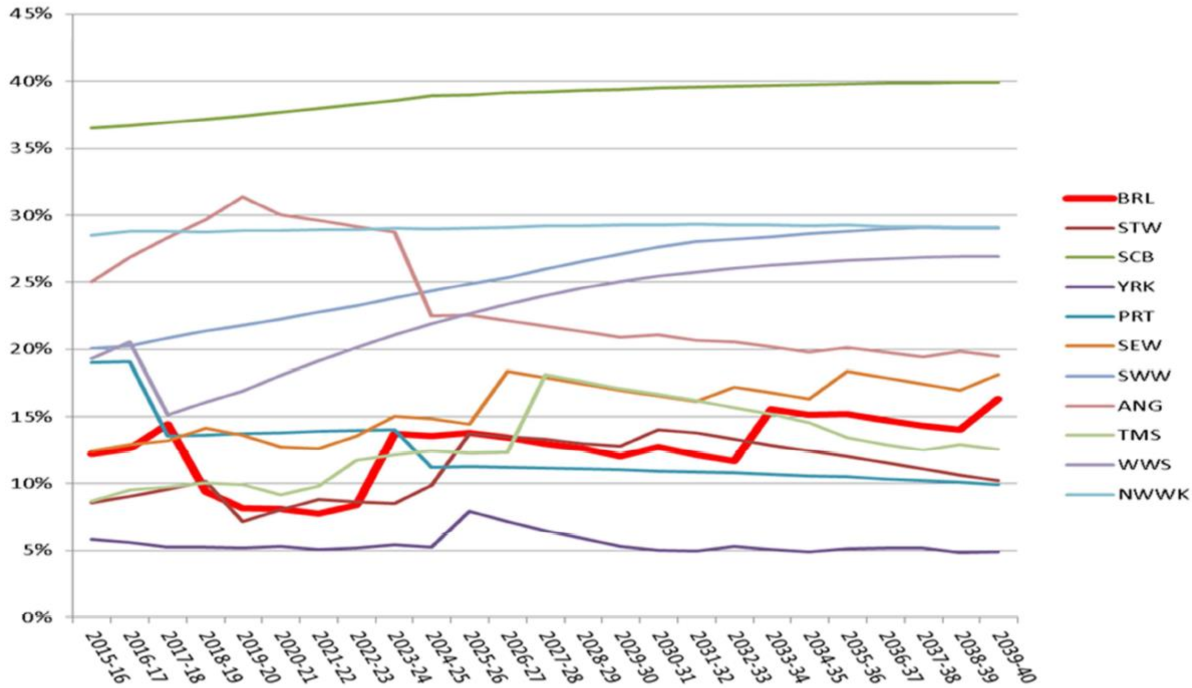
[334] Bristol Water WRMP, p156.
[335] The degree of certainty that WAFU will exceed demand.
[336] Target headroom, plus headroom above target.
[337] Wessex Water's headroom showed a year-on-year increase from around15% in 2017-18 to around 27% in 2039-40.

Figure 6.2: Water company available headroom as % of dry weather DI

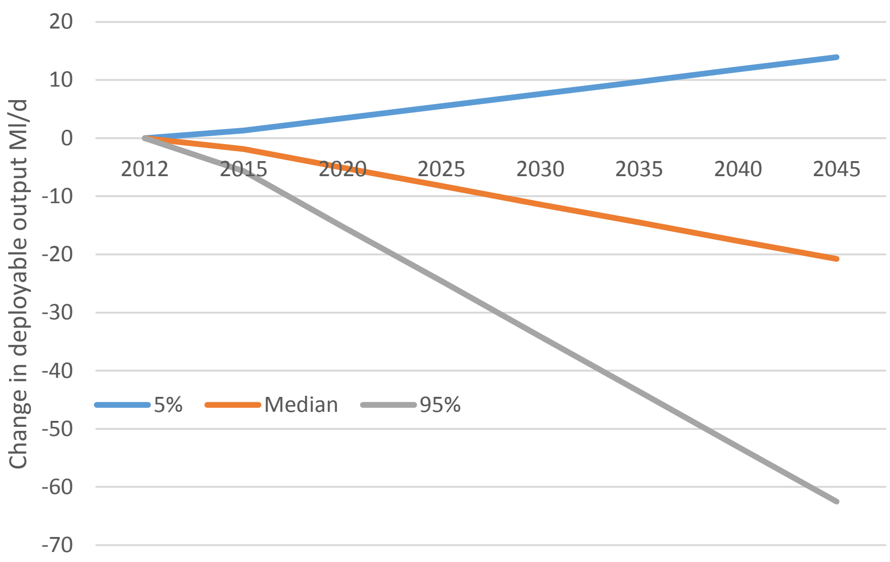


Source: Bristol Water analysis of WRMPs.
Note: Bristol Water is included as 'BRL'.

6.62 We understand that both demand for and supply of water are expected to be affected by climate change. Uncertainty relating to climate change is a component of headroom. Figure 6.3 shows the modelled range of the possible effect of climate change on available water in the Bristol Water supply area. The impact of climate change on demand is expected to be lower than it is on supply, and is expected to be in the order of 4Ml/d for households and 2Ml/d for non-household consumption by 2040.[338] It is the uncertainty arising from forecasts of climate change (amongst other factors) that leads to the modelling approach to headroom that Bristol Water has adopted. It is this modelled headroom that forms a key element of Bristol Water's case for Cheddar 2.

[338] Bristol Water WRMP, p53.

Figure 6.3: Change in deployable output as a result of climate change in different scenarios



Source: CMA analysis, Bristol Water WRMP, p52.

6.63 CCWater commissioned a report that considered whether construction should start in AMP6. It concluded that, on the basis of the evidence reviewed, the reservoir did not need to be in service by 2025, and that by developing some smaller resources, and by choosing not to offer to supply a new power station (unless there was a contractual obligation), Bristol Water would not need a major water resource to be in service until after 2030.[339]

6.64 In response to our provisional findings, Bristol Water reiterated its view that the use of 'headroom target' was unreliable as a comparative metric to assess risk appetite across the industry and that available headroom was a more suitable indicator in interpreting the risk position of companies.[340] It said that for much of its plan, its headroom target was close to its total headroom, effectively meaning it was more vulnerable than companies with apparently lower headroom targets.[341]

Most suitable option

6.65 Jacobs reviewed Cheddar 2 for Ofwat. It found that Bristol Water had considered a large number of schemes to manage potential future supply/demand deficits, and in particular the deficit arising from the provision of a non-potable supply to the proposed Seabank power station. Jacobs found that analysis by Bristol Water had shown that Cheddar 2 was the

[339] CCWater submission, Appendix 1: Re-examining Bristol Water's proposal for Cheddar 2 reservoir, Mark Hann Consulting.
[340] Bristol Water response to our provisional findings, Appendix 4.1, paragraph 16.
[341] Bristol Water response to our provisional findings, Appendix 4.1, paragraph 15.

optimal means of addressing any supply shortfall in the event of the power station being built, but noted that more of the cost of the reservoir would be passed onto customers if the power station was not constructed.[342]

6.66 In its draft determination, Ofwat said that if it had accepted the need to make provision for a non-domestic supply, Bristol Water had presented information to show that Cheddar 2 was part of a best value plan to meet the emerging deficit.[343]

6.67 The report commissioned by CCWater identified the importance of balancing the levels of service and resilience with the cost of implementing a scheme of improvements. The report concluded that if Bristol Water was to follow the example of other companies and make affordability more of a priority, it might conclude that a different plan was a better option. In particular, the early development of some minor and more cost-beneficial resources could allow the company time to review its headroom risk analysis in the light of additional operating experience.[344]

6.68 We reviewed Bristol Water's approach to identifying the location for a reservoir in the Cheddar area (taking into account proximity to Cheddar Springs, population centres, topography, geology and proximity to existing developments)[345] and found Bristol Water's approach to be rational.

Cost estimation

6.69 Ofwat found that Bristol Water had not provided any significant additional information to show that the cost estimates were robust or reflected upper quartile efficiency.[346]

6.70 Subsequent benchmarking by Chandler KBS (CKBS) indicated that costs might be overstated but ultimately concluded that the estimated costs were in the range that it was comfortable to support. Bristol Water has subsequently reduced its cost estimate (after an efficiency challenge and reflecting design progress) from £126.7 million to £114.5 million (a 10% reduction).

6.71 Jacobs concluded that at this stage in the development of Cheddar 2, it is likely that cost estimates would lack precision and an estimate

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[342] A large number of options have been considered to manage potential future supply/demand deficits, in particular the deficit arising from the provision of a non-potable supply to the proposed Seabank.
[343] Ofwat, Bristol Water – Special Cost Claims.
[344] CCWater Submission, Appendix 1: Re-examining Bristol Water's proposal for Cheddar 2 reservoir, Mark Hann Consulting.
[345] For example, avoiding locations which might be at greater risk of introducing pollution to the water.
[346] Ofwat, Bristol Water – Special Cost Claims.

representative of more accurate figures and higher relative cost efficiency could be expected to emerge if and when the project moves forward. Jacobs assessed Bristol Water's cost estimation as a partial pass.

6.72 In its review, Aqua identified opportunities to reduce the cost by £11.3 million (9%).

6.73 We considered that the above indicated that Bristol Water's cost estimation was broadly reasonable, though we noted that an element of any identified relative overestimation was likely to be driven by costs to be incurred in AMP7 and would need to be revisited subsequently.

6.74 In response to our provisional findings, Bristol Water submitted evidence that challenged Aqua's finding that costs could be reduced by £11.3 million.[347]

Other factors

Timing of investment

6.75 Bristol Water's business plan is based on much of the Cheddar 2 investment being incurred in AMP7, with around one-third in AMP6. Bristol Water's view is that its approach to investment in AMP6 represents the lowest overall cost to consumers of construction of Cheddar 2, or other options for addressing the supply/demand balance issues identified in the WRMP.

6.76 Following FD14, Bristol Water engaged Arup to assess the impact of deferring the investment. Arup identified four options:

(a) Do nothing in AMP6[348] (AMP6 cost nil; additional costs in AMP7 to re-obtain planning permission).

(b) Commence a limited part of the development that qualifies as a material operation early in AMP7 without requirement to discharge numerous planning conditions or trigger section 106[349] obligations.[350]

(c) Delay all planned and consented construction activity until early in AMP7 (AMP6 cost £4 million).

[347] Bristol Water response to our provisional findings, Appendix 4.1, section 1.1.7.
[348] Arup concluded that if no activities commence until 2020, 'material start' will not occur prior to 10 November 2021 and the planning permission will lapse.
[349] Planning obligations under Section 106 of the Town and Country Planning Act 1990 (as amended), commonly known as s106 agreements, are a mechanism which make a development proposal acceptable in planning terms, that would not otherwise be acceptable.
[350] No AMP6 expenditure figure was included in Arup's report, but the option was considered high-risk.

(d) Delay construction of the new reservoir element until early in AMP7 (AMP6 cost around £40 million).[351]

6.77 Arup noted significant risks with all four options. It considered that its third scenario delayed the programme start, but would achieve material development before planning permission expired. However, it would still require Bristol Water to incur costs of £4 million in AMP6.[352] Arup considered that any lapse in planning permission could add an additional two years to the process and an additional £1 million in planning consultation costs.

6.78 In response to our provisional findings, Bristol Water submitted further evidence on the need to undertake some level of works in AMP6 to prevent planning permission lapsing in AMP7. Allowing sufficient works in AMP6 to prevent planning permission lapsing would allow completion of the reservoir in 2032.[353] It said its cost of obtaining planning permission was £4 million and said a low estimate of the cost of regaining planning permission was £1.2 million.[354] Bristol Water said that its preferred approach was to buy land from those landowners currently willing to sell, which it estimated to be a cost of around £6.9 million[355] and would help address concerns over potential planning blight.

6.79 Bristol Water said that the consensus of opinion was that Cheddar 2 needed to be built at some point in the near future, and that making an allowance for preparatory works and land purchase would be consistent with the WRMP process and avoid the need to incur an additional £1.2 million to regain planning permission.[356]

Impact on consumers and consumer support

6.80 Ofwat noted Bristol Water's assertion that, even without the non-domestic demand, customers had a preference for the improved resilience and levels of service that would be delivered by the scheme. Ofwat also said that analysis was presented that showed that Cheddar 2 was cost beneficial without the non-domestic demand due to the value of the surplus water. Ofwat considered that this appeared to contradict customers' wider

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[351] No specific figure is provided but is described as approximately that currently included in Bristol Water's business plan.
[352] £3 million of this relates to land acquisition.
[353] Bristol Water response to our provisional findings, paragraph 495. Planning permission lapses in 2021 and there would be insufficient time to discharge all necessary pre-construction planning obligations in the first 18 months of AMP7.
[354] Bristol Water response to our provisional findings, paragraph 502.
[355] Bristol Water response to our provisional findings, Table 20. This is approximately two-thirds of the total land. It is possible that compulsory purchase powers would need to be used for the remaining land.
[356] Bristol Water response to our provisional findings, paragraph 504.

preferences for no increases in bills.[357] Ofwat described the evidence on customers' willingness to pay for the scheme as 'relatively weak'.[358]

6.81 Bristol Water argued that Ofwat did not appear to have recognised customer preferences for improved security of supply when rejecting Cheddar 2. It concluded that customers were willing to pay the additional cost of the scheme to improve security of supply. It noted that the scheme received planning permission in November 2014 and, in its opinion, has been supported by all other stakeholders, including through the WRMP consultation process. It said that Ofwat was alone in rejecting the scheme.[359]

6.82 Bristol Water stated that 93% of customers supported its business plan (which included Cheddar 2).[360]

6.83 The impact on customer bills in AMP6 was estimated by Bristol Water as £2 yearly.[361] However, the total cost to customers of constructing Cheddar 2 will be significantly higher as further spend occurs on the reservoir. The incremental effect will be subject to whether the power station is built.

6.84 Ofwat said that Bristol Water had not presented analysis showing bill impacts and benefits where Cheddar 2 was not constructed and demand from Seabank 2 did not arise. Ofwat's analysis of Bristol Water's WRMP found that under this scenario, the supply demand surplus was higher and therefore that service level improvements would be higher, while bill impacts would be around £2 per year lower. Ofwat further stated that customer preferences are for bills not to increase, rather than service levels and bills to go up.[362]

6.85 We noted that customers ranked building new reservoirs as 7th out of 11 in importance for investment. Bristol Water said it had chosen not to bring forward the scheme in response to this finding, but did not defer the scheme to avoid unacceptable bill increases later.[363]

6.86 In response to our provisional findings Bristol Water reiterated that customers placed a high value on supply security and that its service levels

[357] There appears to be conflict in the views of customers, with customers prepared to pay a small increase for increased resilience, but with a preference for no overall increase in bills. Ofwat estimated that the reservoir would add an additional £7 yearly to bills compared to the alternative. Ofwat, Bristol Water – Special Cost Claims.
[358] Ofwat: Final Price control determination notice: company specific appendix – Bristol Water, p68.
[359] Bristol Water SoC, paragraph 1144.
[360] Bristol Water SoC, paragraph 1370. Customer support/acceptability for Bristol Water's plan is quoted variously in Bristol Water's documents as 92 or 93%. We consider the difference to be immaterial and where we refer to customer support we have used 93% throughout.
[361] Bristol Water SoC, paragraph 1298.
[362] Ofwat response, paragraph 194.
[363] Bristol Water, Wholesale Plan, p183.

were significantly lower than customers of neighbouring companies.[364] Bristol Water's phase two acceptability research found that 93% of surveyed domestic customers considered the aspects of Bristol Water's plan relating to sufficient supply to be acceptable.

6.87 We further noted the support that customers had demonstrated for Cheddar 2 including from the LEF[365] but balanced this against the views of CCWater.[366]

6.88 In Bristol Water's acceptability research, customers chose between four scenarios with different service levels and bill impacts. We understand that Cheddar 2 was included in all four scenarios.[367]

6.89 We noted that Bristol Water's customer research that indicated support for Cheddar 2 was undertaken at the point[368] at which Bristol Water included a large non-potable customer in its preferred scenario for water planning. Our review found no evidence that customers had been presented with evidence on the alternative scenarios (and optimisation) contained in the WRMP that would lead to alternative sources of water being introduced ahead of the construction of Cheddar 2.

The role of the WRMP

6.90 Bristol Water provided a submission from its lawyers it had requested on the legal framework governing the WRMP and how this should impact on our assessment of enhancement schemes.[369] The advice noted that:

(a) the WRMP was subject to a thorough and robust statutory consultation process;

(b) for a scheme to be included in the WRMP meant it has been demonstrated as being needed and the best solution;

(c) Ofwat had ample opportunity to challenge the inclusion of Cheddar 2 in the WRMP; and

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[364] Bristol Water response to our provisional findings, Appendix 4.1, paragraph 11.
[365] LEF response to our provisional findings.
[366] CCWater response to our provisional findings.
[367] We assumed that the bill impacts were based on a large customer buying large volumes of non-potable water and that if there wasn't a new customer bills would increase slightly. This assumption did not affect our overall view.
[368] The information presented in Bristol Water's post hearing submission is dated January, July and October 2013.
[369] Bristol Water response to our provisional findings, Appendix 4.4.

(d) by extension the CMA should not endorse Ofwat's rejection of this reservoir and in 'standing in the shoes of Ofwat' should give significant weight to Cheddar 2's inclusion in the WRMP.

6.91 The advice concluded that the legal framework clearly demonstrated that the WRMP should be treated as the definitive statement on a company's management of its supply demand balance. It further raised concerns that we had given the same weight to the WRMP as the evidence from Aqua and had not given due recognition to the WRMP's status.

6.92 The advice also concluded that the starting point for our determination should be that any schemes recommended by the WRMP should be seen as an integral part of the business plan and that these should be funded, unless material new evidence had come to light since the WRMP was finalised that suggested the WRMP was in need of material revision. Finally, the advice stated that to the extent that the CMA decides to take a contrary view to the WRMP, it must be prepared to justify the legal and factual grounds on which it has done so.

6.93 We asked Bristol Water about its preferred scenario in our response hearings. We were told that the exact assumptions of the preferred scenario were not valid but that of the 12 scenarios presented, Cheddar 2 was included in nine. Bristol Water said that effectively, its central case was based on the need to provide water to a power station, but that should the need not arise, Bristol Water's willingness to pay research demonstrated that customers were prepared to pay for the additional benefits it provided.

6.94 Bristol Water told us that commencement of construction of Cheddar 2 in AMP6 was specifically the most cost beneficial approach in nine out of twelve scenarios included in the WRMP. Bristol Water explained that in the scenarios where Cheddar 2 was not included, the following assumptions were required:[370]

(a) A substantial reduction in supply security.[371]

(b) The company will make no further provision for large industrial supplies.

(c) Climate change would lead to wet conditions in future.[372]

[370] Bristol Water response to our provisional findings, Appendix 4.1 paragraph 3. *(a)-(c)* are specific assumptions for one of each of the three scenarios where Cheddar was not included in the optimisation.
[371] Assuming there was a large non-potable customer.
[372] Assuming there was a large non-potable customer.

6.95 We sought to understand the nature of the WRMP consultation process and the comments that Ofwat had provided on Bristol Water's draft WRMP. We noted that Ofwat had submitted high-level comments on the draft WRMP 'without prejudice' (in respect to its determination).[373]

6.96 We understand that Ofwat did not respond directly to Bristol Water on its Statement of Response, but submitted its views to the Environment Agency when requested by the Environment Agency. Ofwat said that these views were in the context of the earlier correspondence with the Secretary of State that had made it clear that Ofwat was only commenting on the overall approach that companies had adopted to WRMPs and not on specific projects/programmes, and, in any case Ofwat's comments on WRMPs were on a without prejudice basis to the decisions to be made as part of the price control determinations. In its letter to the Environment Agency in response to the Revised Statement of Response,[374] Ofwat said in summary that:

> The only issue not addressed relates to scenario testing and the fact that the company's testing of the robustness of its preferred solution does not distinguish between alternative programmes of work and alternative planning scenarios.[375]

6.97 We noted, however, that there was little additional supporting detail setting out Ofwat's concerns and it was not clear from its letter how significant Ofwat had considered the issue or what the impact on the validity of the WRMP was.[376] Ofwat told us that it had commenced its risk based review two months prior to commenting on the Revised Statement of Response.

6.98 Ofwat provided extracts from relevant guidance that it said demonstrated that its approach to Bristol Water's determination had not been inconsistent with the WRMP process. We noted two extracts that Ofwat had highlighted in particular:

(a) Firstly, from the Water Resources Planning Guideline Guiding Principles:[377]

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[373] Ofwat, letter to the Secretary of State on Bristol Water's draft WRMP. The consultation process is such that Ofwat responds to the Secretary of State rather than the water company directly.
[374] Ofwat also wrote to the Environment Agency with its views on the Statement of Response on 29 November 2013.
[375] Ofwat, letter to the Environment Agency, 5 February 2014.
[376] The supporting information was limited to "We noted that it would be helpful if the company distinguished between alternative programmes and alternative scenarios for its final WRMP." Ofwat, letter to the Environment Agency, 5 February 2014.
[377] Water Resource Planning Guideline, the guiding principles for developing a water resources management plan, June 2012, page 37.

Ofwat’s view of the robustness of a company’s water resources management plan, and the effectiveness of customer engagement in its development, will determine the level of scrutiny it will give to the supply demand element of the strategic business plan.

(b) Secondly, from the Water Resources Planning Guideline technical methods and instructions: [378]

> Where Ofwat agrees with the proposals contained within a company‘s final water resources management plan, there will be minimal further challenge to its business plan if that accurately reflects those proposals. However, where Ofwat has concerns with a company‘s draft water resources management plan, and these concerns are not addressed in the company‘s final water resources management plan, then there will potentially be further challenge to its business plan. The extent of the challenge will be determined by the scale of the concerns.

6.99 We discuss this further below in paragraphs 6.151 to 6.157.

Views of Aqua

6.100 Aqua said that Bristol Water had appropriately prepared its WRMP and the inputs that flowed from the WRMP into its business plan.

6.101 Aqua said that it did not consider Bristol Water’s arguments about its chosen level of headroom compelling. Given the uncertainty of the proposed power stations, Aqua remodelled Bristol Water’s projections of headroom. Aqua noted that both base demand (people use more water in warmer weather) and supply (rainfall is expected to be reduced) were affected by climate change, but that supplying water to a power station would reduce available water by the same extent as 40 years of climate change.

6.102 As part of its review, Aqua reviewed the timing of proposed smaller schemes that increased water supplies by revising Bristol Water’s projects. Aqua’s illustrative analysis[379] indicated that bringing forward certain schemes already identified by Bristol Water could delay the need for Cheddar 2 to

[378] Water Resource Planning Guideline, technical instructions and manual, p26
[379] This is set out in Figures 4 and 5 respectively of Appendix 5.1.

supply water if no new power station was supplied until around 2037 (2032 if there was a new power station) rather than around 2026 as modelled.[380]

6.103 Aqua noted that Cheddar 2 was not the cheapest cost beneficial scheme (although it was the cheapest large scheme), with some of the other schemes providing water at a lower average incremental social cost (AISC).[381] Given the scale of the project, Aqua noted that the project was susceptible to slight rate changes in costs and identified some £12 million (net) included in planned expenditure over the lifetime of the project which could be reduced.

6.104 Aqua did not consider that customer support had been demonstrated, as it had only seen evidence of the scheme being discussed in the context of providing a supply to a power station.

6.105 Overall, Aqua's view was that Bristol Water had not demonstrated the need to construct a major investment project such as Cheddar 2, and did not consider that it was a necessary part of Bristol's AMP6 investment programme, given the uncertainties associated with the longer-term WRMP.

Our assessment

6.106 Cheddar 2 is a material investment that would, over its life, increase Bristol's RCV by around a quarter.[382] Consequently, committing to investment in this scheme will have a material impact on customer bills.

6.107 The most significant consideration relating to the project was whether need had been demonstrated. We considered that, should a large new customer (such as one of the proposed power stations) require water, Bristol Water's optimisation of the schemes it had identified was reasonable. We considered that the information provided on site selection indicated that Bristol Water had chosen a location that was appropriate from a design, engineering and operational basis. The evidence provided indicates that the level of costs at this stage of the project had an element of uncertainty arising from issues relating to surveys and trial earthworks in constructing the reservoir. We did not consider that these costs were excessive (recognising some

380 We set out further details of Bristol Water's planned interventions at Table 6.3 and Figure 6.8.
381 We note, however, that information subsequently provided by Bristol Water, presented in Table 6.3 indicates that those schemes adopted by Bristol Water have been with increasing AISC. The AISC of a scheme is calculated by dividing the net present value of scheme costs by its discounted contribution to balancing supply and demand.
382 Subject to a number of assumptions such as run-off rate. Ofwat estimated that at its peak it would be valued at 24% of AMP6 opening RCV value.

benchmarks identified cost savings), but noted that there would be greater certainty once investigative work concluded.

6.108 Based on the evidence provided, we observe that there are three primary supporting arguments made by Bristol Water in support of its proposal for Cheddar 2, which we set out further in this section:

(a) Cheddar 2 may be required to supply a new power station.

(b) If not, Cheddar 2 may be required to meet a supply/demand imbalance in the second half of the WRMP period.

(c) In any case, the need for Cheddar 2 is supported by improved security of supply considerations.

6.109 The remainder of this subsection sets out our consideration of the evidence.

Demand from a new power station

6.110 We considered Ofwat's statement that Bristol Water did not have a duty to supply a non-domestic customer if it put domestic customers' supplies at risk (see paragraph 6.49). We did not consider that supplying a power station would increase risks to domestic customers if appropriate new supplies were identified to address any shortfall. We considered, however, that the cost of introducing a new source of water to cover the risk that Bristol Water may need to accommodate a non-domestic customer should not fall on domestic customers unless customers had been adequately consulted.

6.111 We reviewed evidence on the likelihood of a large non-domestic customer buying a large volume of water from Bristol Water. Despite proposals for two power stations, we did not consider that Bristol Water had demonstrated with any degree of certainty that either power station would either receive planning permission or commence construction (or associated preparatory work or investigations) in AMP6. It was therefore not evident that Bristol Water would need to commence construction in AMP6 to be able to supply water to a power station.

6.112 We noted that in its CC10 SoC Bristol Water included projections on non-household demand from two power stations. One, Seabank 3, was expected to be operational in mid-2015 (which has yet to submit a planning application) and the other, a biomass plant, has since been cancelled as a result of the promoter going into liquidation having failed to find an investor.[383]

6.113 We further noted that SSE had stated that Wessex Water was its preferred supplier for Seabank 3 and that Scottish Power's Avon Power Station had not finalised its choice of cooling technology which would affect the volume of water required. We considered that both of these points further demonstrated uncertainty around the demand from a non-domestic supply.

6.114 We considered that even if one of the power stations was constructed, there was significant uncertainty whether Bristol Water would be chosen to supply the power station with water. We noted the current status of the two power stations and considered that even if a supply agreement was in place, there was material uncertainty that either would progress to the point which would require Bristol Water to commence construction of Cheddar 2 in AMP 6 to supply water.

6.115 We noted Bristol Water's comments in response to our provisional findings that Avonmouth was a key industrial area and that availability of industrial quantities of water would attract development in the future.[384]

Risk and headroom within the WRMP period

6.116 We reviewed evidence on Bristol Water's approach to headroom risk and considered that it had adopted a level of headroom risk greater than a number of other companies (see paragraph 6.59 and Table 6.2).[385] We noted Bristol Water's argument that its risk appetite increased its headroom by only 4Ml/day by 2030 and that its headroom modelled against dry weather demand did not appear to be significantly different to other water companies.[386]

6.117 We noted Bristol Water's statement that available headroom was a more appropriate metric for comparison of risk than target headroom.[387]

6.118 In considering Bristol Water's approach to modelling headroom, we found it useful to consider headroom as comprising two elements: operational

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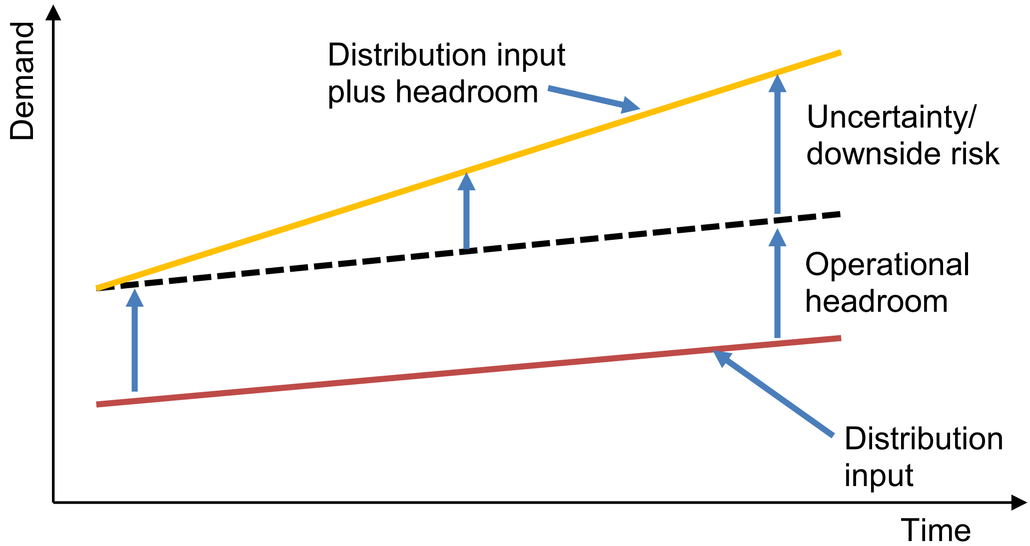
[383] The power station received planning permission which lapsed as a result of failing to find an investor to finance it. BBC News (23 March 2015), Southampton and Avonmouth biomass plants shelved; South West Business (22 September 2014), Investor pulls out of controversial £380 million Helius Energy biomass plant in Avonmouth near Bristol; Helius Energy website.
[384] Bristol Water response to our provisional findings, Appendix 4.1, paragraph 6.
[385] Bristol Water had planned to 90% 'headroom risk' (ie that there was 90% certainty that it would have sufficient headroom in the future).
[386] Evidence on this point is set out in paragraph 6.61 and Figure 6.2.
[387] Bristol Water response to our provisional findings, Appendix 4.1, paragraph 16.

headroom reflecting the need to account for potential asset failure;[388] and headroom arising from increasing uncertainty with time. This is shown in Figure 6.4. We considered that the level of operational headroom was relatively simple to model and could broadly be modelled as an upward shift in the modelled DI.[389] Headroom relating to uncertainty (such as a result of climate change or general uncertainty) would necessarily be greater the further into the future that demand was modelled.

Figure 6.4: CMA consideration of composition of headroom



Source: CMA.

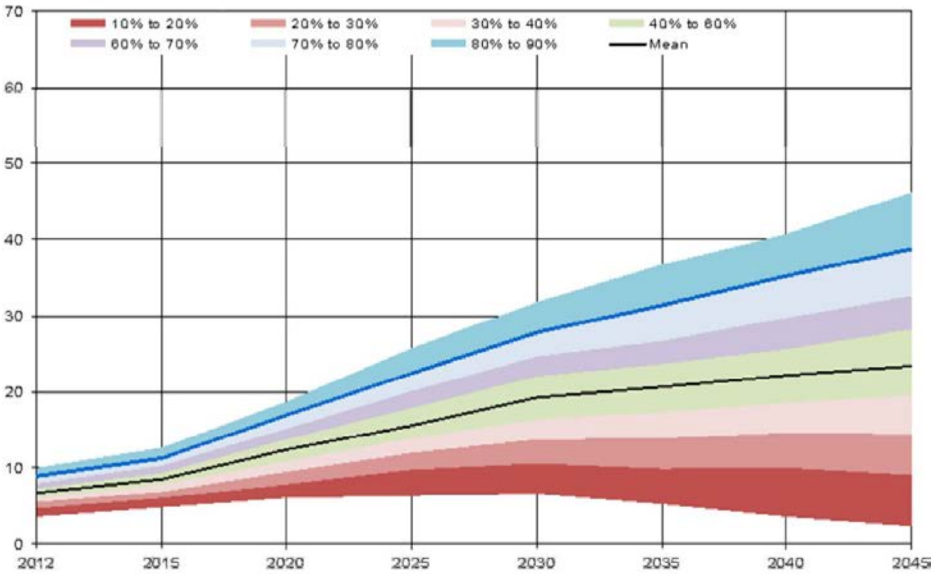
6.119 We considered this further. If the degree of uncertainty increases the further forward one projects, then headroom necessarily needs to increase.[390] Taking this one step further, as time progresses, the uncertainty relating to a future point in time will necessarily decrease (all things remaining equal).[391] Broadly, we considered that if an intervention was planned to address a shortfall in the future, there could be benefits of delaying a project where there was a significant degree of uncertainty.

6.120 The impact of this uncertainty is evident in Bristol Water's modelling of headroom for different levels of headroom target risk as shown in Figure 6.5. The diagram illustrates that if Bristol Water planned with a 90% degree of

[388] For example, planning for a 'once in x years' event.
[389] To the extent that headroom is modelled as a percentage of DI rather than a fixed buffer (measured as an absolute volume of water per day), we recognise that the gradient of operational headroom would be greater than the predicted DI.
[390] That is, that events in 20 years are less certain than events in ten years.
[391] That is, that the uncertainty of demand in 2030 will be less in 2025 than in 2015.

confidence, a headroom of 40Ml/d would be necessary in 2040, but at a 50% confidence level, a headroom of only 20Ml/d is necessary.[392]

Figure 6.5: Headroom target risk distribution (Ml/d)



Source: Bristol Water WRMP, p105.

6.121 We considered that identifying additional water resources to accommodate sufficient headroom in 25 years was a prudent and sensible approach to managing risk. We considered that there was a balance to be struck that would be determined by a company's risk appetite, but noted the range of possible headroom[393] varied by around 15 Ml/d in 2020, but around 20Ml/d by 2025.[394]

6.122 We considered that delivering a series of smaller schemes to address a declining supply/demand balance as it arises was a more flexible approach compared to a strategy of developing large schemes to address a larger, and more uncertain future shortfall in headroom. We noted, however, that delivering large schemes could provide greater certainty of the security of supply with a potentially lower overall cost, but that this approach would only be cost effective if the realised supply/demand balance reflected the headroom modelled some years previously.

6.123 We noted that there was significant uncertainty around climate change and this was necessarily reflected in Bristol Water's modelling. We considered that given the 90% headroom risk adopted by Bristol Water, there was little

[392] This comparison is to demonstrate the impact of adopting different levels of headroom target risk, rather than advocating a reduction to 50%.
[393] Between modelling with 10% certainty and 90% certainty.
[394] In 2040, this increased further to around 35Ml/d in 2040.

justification to increase WAFU to levels significantly in excess of DI plus headroom.[395]

6.124 We agreed that the impact of climate change was uncertain and that this was reflected in the increased level of headroom targeted by Bristol Water. We recognised Bristol Water's reliance on surface water and potential vulnerability as a result of climate change. We have not assessed Bristol Water's climate change modelling in detail, but noted the evidence it submitted on its adherence to guidance from the EA.

Alternative approaches to maintaining headroom

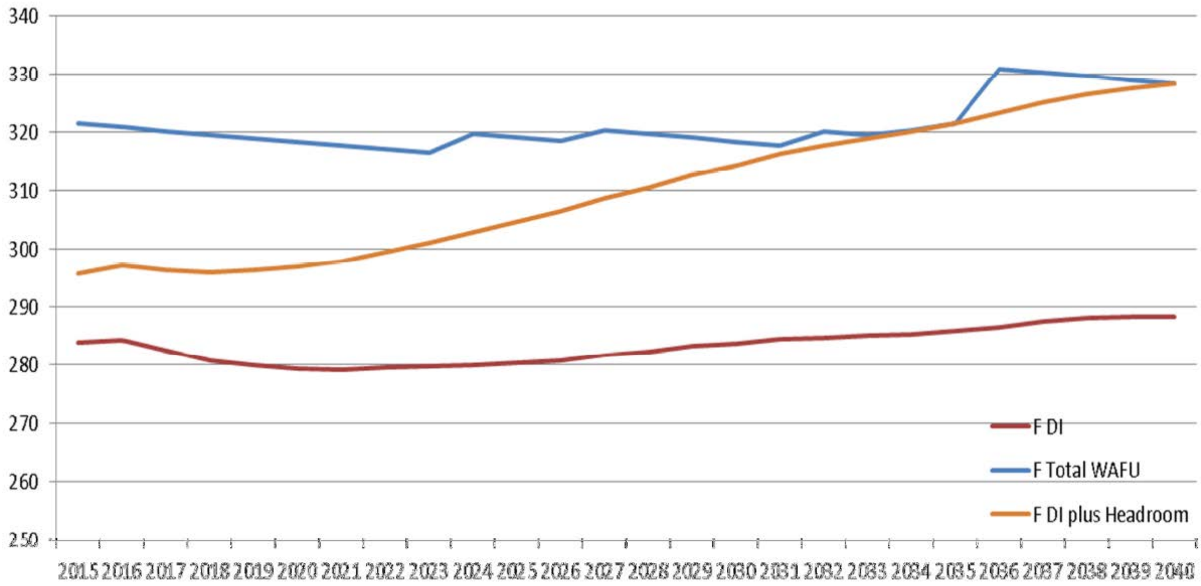
6.125 We considered whether there were other approaches to maintaining headroom in scenarios where: *(a)* no supply was provided to a power station; or *(b)* a supply was provided.[396]

6.126 We noted Aqua's alternative modelling in Figure 6.4 that demonstrated that alternative sources could be used. We took into account Bristol Water's comments on its optimisation of its business plan which identified the combination of schemes with the greatest benefit and with the lowest cost (see paragraph 6.139).

6.127 We next reviewed Bristol Water's WRMP and noted that it had included alternative scenarios, one of which (scenario 4) did not include anticipated demand from a power station. This scenario, which we understand is comparable to Bristol Water's preferred scenario, (with the exception of the supply to the power station) is shown in Figure 6.6. In such a scenario, the first increase in supply would need to be in 2024 and Cheddar 2 would not need to complete construction until at least 2036.

[395] Though noting Bristol Water's point that available headroom is a more appropriate comparison than target headroom.
[396] Where we have referred to increasing WAFU to meet DI plus headroom, we have assumed the models presented are based on 90% headroom risk.

Figure 6.6: Bristol Water WRMP scenario 4 – no supply to power station



Source: Bristol Water WRMP, p184.

6.128 Bristol Water said that this scenario decreased the full life costs compared to its preferred plan, but allowed for very little flexibility if circumstances changed. Bristol Water further identified that should demand arise it would go into a long period of supply deficit, and that to address the deficit in the short term would require an interim non-optimum resource scheme.[397]

6.129 We noted that this scenario had been optimised using the same approach as Bristol Water's preferred scenario (while excluding demand from a power station).

6.130 We further noted Jacobs' observation that Bristol Water's WRMP showed that if Cheddar 2 and Seabank were not included in Bristol Water's business plan, the planned interventions (including leakage reduction and metering) would be sufficient to maintain a positive supply/demand balance beyond 2030. Jacobs concluded that the proposed investment was not justified.

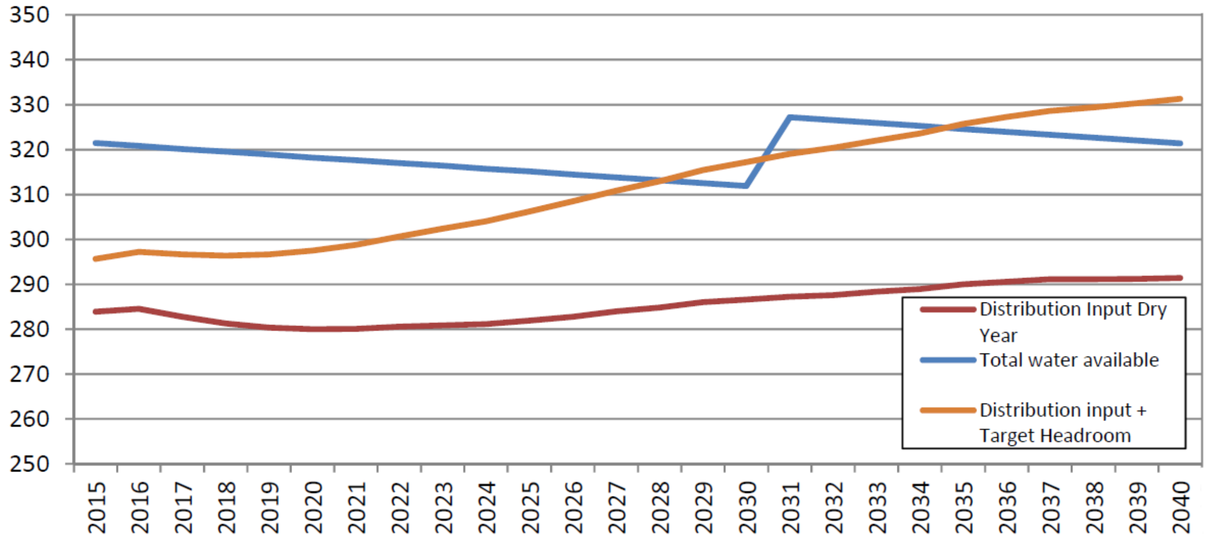
6.131 Where there is significant uncertainty over need, we would generally expect there to be caution before committing to the cost of a large investment project. We therefore considered whether there were alternative approaches to responding to the uncertain demand from a power station, should it arise, and in particular we noted Aqua's illustrative analysis in paragraph 6.102.[398]

[397] Bristol Water WRMP, p184.
[398] As discussed, Aqua identified that there were a number of smaller schemes which could be implemented with a shorter lead time if necessary, both within Bristol's WRMP and related to other aspects of its investment programme.

6.132 We reviewed Bristol Water's alternative approaches, which included deferring the construction of Cheddar 2. We considered that Bristol Water's analysis appeared to be based on an assumption that Cheddar 2 would be required at a broadly comparable timescale to its original proposed timetable.

6.133 We noted, for example, Arup's 'option 2', regarding profiling of expenditure, which delayed the start of construction until AMP7, the effect of which is shown in Figure 6.7 (although it does not include any non-potable supply requirement in its modelling). Bristol Water said that delaying construction until 2020 and completing in 2030 was theoretically possible, but resulted in a planning position where there was insufficient water available to maintain the headroom margin for three to five years.[399]

Figure 6.7: Supply/demand balance for case where Cheddar reservoir construction is delayed for five years (no power station)



Source: Bristol Water, SoC, Figure 71.

6.134 We did not find the modelling shown in Figure 6.7 convincing as it did not recognise or reflect Bristol Water's own optimised modelling of a scenario where additional non-potable demand was not anticipated. Bristol Water's approach to this particular scenario appeared not to include alternative sources as it did not deliver the local resilience benefits of Cheddar 2. However, as discussed below in paragraphs 6.146 to 6.148, we considered that the Southern Resilience scheme could provide significant resilience benefits in a shorter timeframe.

6.135 We considered that both CCWater and Aqua demonstrated that there were scenarios under which Cheddar 2 was not required until a far later period.

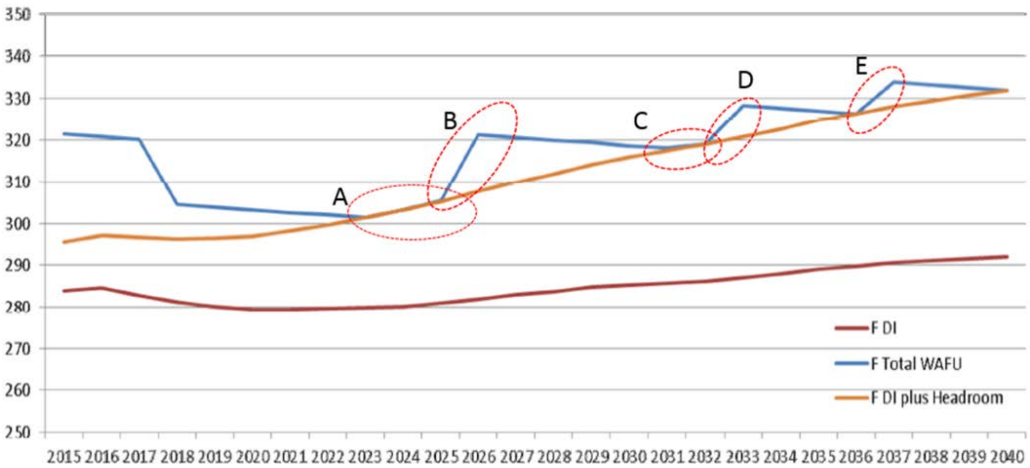
[399] Bristol Water SoC, paragraph 1357.

We further noted the assessment by Ofwat and by Aqua that there was no need to invest in Cheddar 2 within AMP6.

6.136 In response to Aqua's initial analysis, Bristol Water stated that this could be considered as a 'plan to fail'. We do not agree. Where there is uncertainty over the need for large investments, then deferral may well be the best option. This is consistent with the majority of opinions on the scheme as well as normal practice. We were not persuaded by this or by evidence previously provided that Bristol Water has properly considered the benefits to customers of maintaining flexibility.

6.137 To understand better its proposed future interventions we asked Bristol Water for detail of the additional schemes that increased its WAFU in its preferred scenario. We identified five increases in WAFU, which we labelled as A-E, as shown in Figure 6.8.[400]

Figure 6.8: Bristol Water planned interventions with power station



Source: CMA, based on Bristol Water WRMP, page 175.

6.138 Bristol Water provided details of the six[401] schemes that led to five increases in WAFU, which are set out in Table 6.3.

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[400] In Aqua's illustrative analysis, it did not amend its analysis for intervention 'C'.
[401] One of the five increases comprised two schemes.

Table 6.3: Bristol Water planned schemes affecting WAFU

Intervention per chart	*WRMP reference*	*Date in service*	*Description*	*Yield Ml/day*	*NPV £m*	*AIC p/m³*	*AISC p/m³*
A1	R030	2024	Honeyhurst to Cheddar raw water transfer	2.4	8.1	29	43
A2	R023	2025	Huntspill raw water transfer	3.0	16.4	57	69
B	R005	2026	Cheddar 2	16.3	104.8	82	83
C	R032	2032	Gurney Slade treatment works	1.5	15.1	119	129
D	R0191	2033	Wessex Water Bridgwater to Banwell bulk transfer	10.0	80.5	100	103
E	R0193	2037	Chew Stoke reservoir	8.0	60.2	128	132

Source: Bristol Water SoC, Table 97.

6.139 Bristol Water told us that its order of scheme deployment was determined by its optimisation model which identified the combination of schemes with the greatest benefit with the lowest cost. Bristol Water told us that the reservoir schemes would require ten years to complete construction, and the raw water schemes would take two to four years. We reviewed Bristol Water's planning and scheduling of interventions and agreed that these were broadly in order of increasing cost, with the cheapest cost per cubic metre of water delivered first.

6.140 We considered that the optimised scheduling of the reservoir in the two scenarios[402] differed significantly. We recognised that the reservoir had a lower AIC[403]/AISC per cubic metre of water than the other three schemes scheduled to be completed after it in Bristol Water's preferred scenario (see Table 6.3).

6.141 We considered whether AIC and AISC per cubic metre were appropriate cost metrics to compare schemes where the increase in supply led to WAFU being significantly greater than DI plus headroom (which would be the case if the demand from a power station did not arise). We noted that the calculation of AIC/AISC per cubic metre is based on the net present value of the cost of a project[404] divided by the relevant net present value of the volumetric yield.[405]

6.142 We considered that AIC/AISC were suitable metrics for comparing schemes where the full yield is expected to be used,[406] but it was less apparent that it should be the principal determinant in the assessment of a scheme where a

[402] Bristol Water WRMP, scenario 2 and scenario 4.
[403] AIC, or average incremental cost, is based upon the financial net present value of a scheme. AISC, or average incremental social cost, also includes environmental and social costs of the project.
[404] Which, under AISC, includes estimates of the financial value of environmental and social costs.
[405] That is, the volume of water supplied discounted using the same discount rate as the costs of the scheme.
[406] Such as addressing a supply/demand deficit.

significant proportion of the potential annual yield is not anticipated to be used.[407]

6.143 We further noted Aqua's view that water could begin to be drawn-off from a reservoir in less than the full ten-year period required for construction.

6.144 In response to our provisional findings, Bristol Water said it had shown that Aqua's modelling of alternate solutions (including reliance on depictions of alternate ordering of schemes) without considering the cost implications may provide a misleading result.[408] We agreed with Bristol Water, which is why in reaching our provisional findings we had placed weight on Bristol Water's own optimisation of supply/demand balancing schemes modelled on the basis of no large industrial customer. Bristol Water submitted no further evidence that demonstrated that Cheddar 2 needed to begin construction in AMP6 for scenarios where a significant increase in non-potable demand occurred after AMP6.[409]

6.145 We noted Bristol Water's challenge that our approach of making no allowance for Cheddar 2 and suggesting that a number smaller schemes (to address the fact that the scale of uncertainty increase the further forward one projected) was not consistent with good climate science nor with government policy. We disagreed with Bristol Water's assessment. While we had suggested the use of smaller schemes in addressing uncertainty around headroom, this was predicated on the fact that: *(a)* Bristol Water had not demonstrated evidence of a large non-potable customer; and *(b)* Bristol Water's own optimisation of a scenario of no such large customer favoured the implementation of smaller schemes first on a cost-benefit basis. Indeed, in paragraph 6.122 we note that large schemes could prove more cost effective and provide greater security.

Improved resilience

6.146 We considered Bristol Water's arguments on customers' desire for resilience of supply, but found that Bristol Water had not provided sufficient evidence that demonstrated that immediate investment in Cheddar 2 was necessary to meet customers' interests or that customers would be willing to have higher bills to finance this increase in security of supply. We also considered

[407] For example, in the case of a reservoir, while the volume of water stored and available for supply may be significant, the cost per cubic metre entering supply may be understated if only a small proportion of the reservoir's yield actually enters supply (as a result of addressing a supply/demand deficit or short-term asset failure).
[408] Bristol Water response to our provisional findings, Appendix 4.1 paragraph 22.
[409] All scenarios included in Bristol Water's WRMP (excluding scenario 4) assume that non-potable demand increases during AMP6 as the result of a power station requiring water.

that Southern Resilience would provide greater security of supply in the Cheddar region.[410]

6.147 We considered that Bristol Water had failed to demonstrate how the Southern Resilience scheme would interact with Cheddar 2 in a number of different scenarios. For example, Bristol Water failed to articulate the difference between balancing supply and demand and ensuring security of supply, and it was not always clear on what basis Bristol Water was promoting the scheme, given the significance of any possible large non-potable customer on Bristol Water's WAFU.

6.148 We considered Bristol Water's case that Cheddar 2 improved the security of supply in addition to increasing its WAFU. We reviewed Jacobs' review of Cheddar 2 and noted its view that current security of supply and level of service can be maintained without both Cheddar 2 and a non-potable customer. In the event that the reservoir was built but there was no non-potable customer, Jacobs found that domestic customers would benefit from, and value, improved levels of service and security of supply; however, this would increase customer bills as any offsetting revenue derived from Seabank would be lost. Customers may not support increased bills. We further noted Aqua's observation that its review of evidence suggested that customers had only been presented with the scenario that included the supply to a power station.

Other issues

6.149 We considered whether to allow an amount to allow Bristol Water to discharge planning obligations to reduce the risk of planning permission for Cheddar 2 lapsing. We reviewed the options that Arup presented to Bristol Water around undertaking sufficient activity to retain planning permission. We saw merit in retaining planning permission for operational flexibility given Arup's view on the length of time taken to subsequently regain planning permission. However, it was not clear that the proposals were an efficient approach to expenditure[411] and we did not consider that we had sufficient evidence to make an allowance for these costs.

6.150 We considered whether other commercial entities would commit to such a large project if there was no certainty of return on the investment (as arises from the return on the RCV). While we recognised Bristol Water's duties as a

[410] We recognised, however, that there was a fundamental difference between increasing resilience by providing an additional source of raw water (and system wide WAFU) and resilience relating to treated water.
[411] It was not clear whether such an approach increased the overall cost of construction to avoid the risk of failing to regain planning permission.

water company, we were not certain that there was sufficient evidence that construction of the reservoir would be justified on commercial grounds in this AMP.

The role and significance of the WRMP

6.151 We considered the legal advice that Bristol Water had received and included in its response to our provisional findings and Ofwat's evidence on the comments that it had provided and how its actions were consistent with the Water Resources Planning Guideline (see paragraphs 6.90 to 6.99).

6.152 Our provisional findings were based upon the uncertainty of a large non-potable customer and Bristol Water's optimisation of schemes absent such a new large customer. In response to Bristol Water's concerns, we reviewed the relevant WRMP guidance to understand the water resource planning process in greater depth. We also questioned Bristol Water and Ofwat on the WRMP in our hearings.

6.153 Bristol Water noted that it had responded to Ofwat's comments on its draft WRMP in a Statement of Response, which was sent to Ofwat in November 2013. A Revised Statement was also sent to Ofwat in January 2014. Bristol Water received no further comments from Ofwat on its draft or final WRMP. Bristol Water further set out its view that Ofwat had adopted a different approach to the WRMP from that set out in the WRMP guiding principles, of which Ofwat was a co-author.[412]

6.154 Ofwat told us that the final WRMPs were important to the price review, but they were only part of the information that it took into account. Ofwat said that its responses to the draft WRMP had been published and that no objections had been expressed.[413]

6.155 We noted Ofwat's evidence that it had provided additional comments on the Statement of Response and Revised Statement of Response to the Environment Agency. We recognised that the guidance for water resources planning allowed Ofwat opportunity to scrutinise supply/demand schemes included in the WRMP, but that the degree of scrutiny should be linked to the scale of Ofwat's concerns. The severity of Ofwat's outstanding concerns was not clear to us from its letters. We also noted, however, that the overlapping

[412] We do not set out at length Bristol Water's concerns here, but note that the guidelines state that Ofwat should provide clear feedback on concerns and provide specific instructions where possible, and that where significant concerns exist Ofwat should request a draft WRMP, and that Ofwat and the EA should review any Statement of Response.
[413] Ofwat's responses to all water companies' draft WRMP were published, but Ofwat's advice to the Environment Agency was not.

timing of the WRMP and business planning processes was problematic, given that Ofwat's Risk Based Review of company business plans commenced before the final WRMP was published.

6.156 We considered Bristol Water's statement that the inclusion of Cheddar 2 in nine of the 12 scenarios meant that its inclusion was robust. We noted, however, that in all but one scenario it was assumed that there would be demand from Seabank power station.[414]

6.157 In our review of the WRMP we noted that 11 of the 12 scenarios included the assumption that a large non-potable customer would take water from 2017-18. In reaching our provisional findings we did not conclude that there would not be a large potable customer in the future, but that there was significant uncertainty that one or both proposed power stations would be granted planning permission or that Bristol Water could be required to supply either power station if built. Moreover, we considered that 11 of Bristol Water's scenarios (including its preferred scenario and subsequent optimisation) were therefore no longer a realistic presentation of likely demand over time.[415] In response to our provisional findings, Bristol Water presented no revised scenarios demonstrating the impact of a new, large, customer over different timeframes and how this would affect the optimisation. We therefore placed weight on the one scenario where there was not a new, large customer (in AMP6).[416]

Customer support for Cheddar 2

6.158 We noted the level of customer support that Bristol Water had demonstrated for its plans. We considered this evidence carefully to understand both its basis and how this should be reflected in a determination.

6.159 We noted two particular examples where customer support was not sufficiently conclusive. Firstly, we noted that when customers were presented with four service packages to choose from as part of Bristol Water's acceptability research, all four included Cheddar 2.[417] We did not consider that this disproved customer support for any given package, merely

[414] In this scenario, Cheddar 2 was delayed.
[415] That is not to say that there would not be a large non-potable customer, but that in respect to the optimisation of additional sources of water it had not been demonstrated that Cheddar 2 was the appropriate solution.
[416] The scenarios were each identical other than the change in one assumption.
[417] The expenditure profile for supply/demand schemes varied in each package. Construction of Cheddar 2 was assumed to be completed by 2022 in one service package ('Orange' – £12 increase in bills), by 2024 in two packages ('Brown' – no change in bills; and 'Blue' – £6 increase in bills) and 2028 in one service package ('Purple' – £12 decrease in bills).

that it did not demonstrate support for Cheddar 2 over any other possible combination of smaller schemes.

6.160 The second example (and used as evidence by Bristol Water) was evidence that 93% of surveyed customers had shown support for the inclusion of Cheddar 2 in the business plan. We noted that when customers were asked if this aspect of the business plan was acceptable, insufficient context was provided to customers to make an informed decision.

6.161 As part of this acceptability research the information provided to customers included the following statement:

> Bristol Water will start building a new reservoir at Cheddar – to be brought into service by 2025 – to ensure that there is enough water for a growing population.

6.162 We considered that this statement implied that without Cheddar 2 being completed by 2025, there would be insufficient water – and thus customer acceptance of the plan was contingent on this assumption.[418] We did not consider at the point of our determination that this fully captured the complexities of water resource planning and the timing of anticipated demand.

6.163 We further considered that had customers demonstrated a preference for Cheddar 2 over other possible sources of water (and an informed acceptance the impact on bills should there be no large non-domestic customer), the evidence would have carried more weight. We did, however, recognise the difficulty of obtaining meaningful customer opinions on this issue, and given the presented weight of support did not dismiss this evidence without due consideration.

6.164 In considering the appropriate weight to place on Bristol Water's customer engagement, we recognised the extent of Bristol Water's engagement and how it had used quantitative evidence to shape its business plan. We concluded, however, that although customer support was important, it was not determinative in demonstrating the need for construction of Cheddar 2 to commence in AMP6 to address a supply/demand imbalance or as the most appropriate way to enhance resilience.

[418] It also did not make clear that the increased demand it was likely to serve was for a power station that it did not have a contractual obligation to serve.

Findings

6.165 In the previous subsections we have set out the nature of our review and the evidence we have considered. We now set out our conclusions on the need for Cheddar 2.

6.166 We considered Bristol Water's concerns around the challenge to Cheddar 2 given its inclusion in the WRMP. We recognised that Ofwat had submitted comments on aspects of Bristol Water's draft WRMP 'without prejudice' but also noted that Ofwat had not submitted comments on the revised draft WRMP directly to Bristol Water (but did provide comments to the Environment Agency). Given Bristol Water's need to choose a preferred scenario and the explicit guidance that schemes to address the supply/demand balance were to be taken from the WRMP we considered it unfortunate that the inclusion of Cheddar 2 had not been challenged during the WRMP process.

6.167 In part, we considered this to be a result of the WRMP process not having been completed at the point at which Ofwat's assessment of Business Plans began. Similarly, we recognised that at the point that the draft WRMP was being consulted on, Ofwat had not finalised its approach to PR14.

6.168 We considered whether to make any allowance to enable construction to commence in AMP7 prior to expiration of planning permission. In its response to our provisional findings,[419] Bristol Water identified this as a cost of around £1 million, a similar amount to the estimated cost of regaining planning permission. Bristol Water also sought an additional amount of around £6.9 million for land purchases.

6.169 Given the uncertainty around the need to supply a non-potable customer, we did not find sufficient evidence to be certain that construction would need to commence in the first year of AMP7. We therefore balanced the cost to retain the ability to commence construction in 2020 against the cost of regaining planning permission.

6.170 We considered that, regardless of any deficiencies identified by Bristol Water[420] with the interaction of PR14 and the water resource planning process, we were not bound by the WRMP, rather we considered we should take account of the WRMP as part (albeit a significant part) of all the

[419] Bristol Water response to our provisional findings, section 4.3.
[420] We noted also Ofwat's observation that it had started its risk based review of Bristol Water's Business Plan before Bristol Water had finalised its WRMP.

available evidence in assessing the need for the construction of Cheddar 2 to commence in AMP6.

6.171 We recognised Bristol Water’s general point on the economic importance of the Avonmouth area and that the availability of industrial quantities of water could attract development in future. We did not, however, consider that Bristol Water’s domestic customers should be expected to finance large scale water infrastructure to support speculative industrial development.

6.172 We decided that on balance, making no allowance for AMP6 and allowing planning permission to lapse was in customers’ best interests. We recognised the potential additional cost of around £1.2 million that would need to be incurred to regain planning but consider this to be justified given the uncertainty of need for the reservoir to commence construction in AMP6 or indeed within the first year of AMP7. We considered that there was a greater danger that making an allowance of £1 million in AMP6 would be ‘fruitless’ expenditure as it assumed that an additional allowance for construction would be made in AMP7.

6.173 Finally, given our conclusion that we would not make an allowance for preparatory costs, we considered whether there was merit in making an allowance for the purchase of land. We found, however, that the impact upon bills of purchasing land that was not certain to be used either in AMP6 or beyond was not in customers’ interests. While we recognised that there were potential issues of planning blight arising from not allowing Bristol Water sufficient allowance to acquire land from willing vendors, we did not consider that this risk outweighed those associated with pre-emptive land acquisition.

6.174 We found that Bristol Water had not sufficiently demonstrated the need for construction of Cheddar 2 to commence in AMP6 or early in AMP7 and we have made no allowance for expenditure in this price review period.

6.175 In summary we set out the basis for our findings:

(a) With respect to providing a supply of water to a power station we found that:

(i) there was significant uncertainty that one or both proposed power stations would be granted planning permission and constructed in the initially proposed timescale; and

(ii) there was no certainty that Bristol Water would be required to supply either power station in the event of their construction.

(b) Absent the provision of a supply of water to a power station, there was sufficient water available without introducing any alternative sources (to a timescale requiring commencement of construction) in AMP6.

(c) Absent the provision of a supply of water to a power station, we did not consider that Bristol Water had demonstrated that the reservoir was the scheme with the lowest whole life cost to address any shortfall in supply.

(d) We found that Bristol Water's headroom target included an amount of operational headroom sufficient to ensure an appropriate level of supply in the event of asset failure and to accommodate the uncertainty of climate change.

(e) We found no clear evidence that customers would support an increase in bills even if security of supply improved (in the event that no power station bought a supply).[421]

(f) We further found that the uncertainty modelled in Bristol Water's target headroom would reduce as time progressed and that smaller schemes would be more proportionate in addressing any shortfall in supply in the short term.

6.176 Given our finding that the need to commence construction in AMP6 had not been demonstrated, we have not concluded on whether this scheme would have been the most suitable option if needed, or whether it was appropriately costed. We have not identified concerns with the site selection or cost estimation other than those outlined above.

Cheddar WTW raw water deterioration

Overview of the proposed enhancement

6.177 Bristol Water proposed to undertake enhancement through replacement of its water treatment works at Cheddar (Cheddar WTW) owing to serious operational issues caused by the quality of raw water.

6.178 At present the treatment process at Cheddar WTW comprises microstrainers, slow sand filters and an ultraviolet light disinfection system. Bristol Water proposed to replace the existing treatment process with pre-ozonation, powdered activated carbon dosing, Dissolved Air Flotation (DAF)

[421] We noted the evidence presented by Bristol Water on customers being willing to pay £13 per year to reduce the risk of supply interruptions, but considered that this may have been achievable with other schemes.

followed by Rapid Gravity Filtration (RGF) and retain the UV plant for primary disinfection and Cryptosporidium inactivation.

6.179 Bristol Water said that there has been increased algal loading due to deterioration of the raw water abstracted from Cheddar Reservoir, which has led to blinding of the slow sand filters at Cheddar WTW. On a number of occasions, Bristol Water said that this has significantly restricted the throughput of the treatment works and has led to a DWI-notifiable incident when the major strategic service reservoir supplied from the WTW went empty, impacting the supplies to around 20,000 people.

6.180 The project was costed at £21 million[422] by Bristol Water at FD14, and was included with a number of other raw water quality projects in Bristol Water's Cost Exclusion Case submission.

6.181 The scheme was subject to a 'deep-dive' review by Ofwat. Ofwat's consideration of the scheme can be set out as follows:

(a) At draft determination, the scheme passed Ofwat's gates and was allowed in full (subject to an efficiency challenge).

(b) Subsequent to draft determination, Ofwat reviewed Mott MacDonald's assurance work on the scheme.[423] Ofwat became concerned that it might be more appropriate to address the algal issues at Cheddar treatment works through monitoring in AMP6, with a view to adopting a capital solution in AMP7.

(c) Having reviewed the Mott MacDonald report, Ofwat's assessment team found that Bristol Water had not proven the need for the scheme.

(d) Ofwat considered the finely balanced evidence for the scheme in conjunction with the large gap that existed between Bristol Water's business plan and Ofwat's proposed final determination and gave Bristol Water the benefit of the doubt and gave an additional allowance of £16.9 million.[424]

[422] It was initially costed at draft determination (post efficiency) at £23 million.
[423] It had previously requested this document but had only had sight of the executive summary at draft determination.
[424] Cheddar WTW was one part of a set of schemes relating to raw water deterioration. As a result of Ofwat's approach, any expenditure in excess of an implicit allowance was subject to an efficiency challenge. The £4.1 million difference between the £21 million for Cheddar WTW in the Bristol Water business plan and the £16.9 million allowance granted by Ofwat relates to an efficiency challenge on the entire proposed £28 million of enhancement expenditure on raw water deterioration. It does not reflect an assessment by Ofwat of the appropriate level of expenditure for that scheme. Had the efficiency challenge been prorated across all raw water deterioration schemes, the allowance for Cheddar WTW would have been £18 million.

Responses to provisional findings

6.182 In this subsection we summarise the principal points raised by parties in response to our provisional findings. We incorporate additional evidence in the appropriate subsection.

6.183 In our provisional findings, we provisionally found that there was insufficient evidence to support the replacement of Cheddar WTW and did not make an allowance; we instead provisionally decided to grant Bristol Water an allowance to undertake additional investigation, reservoir management and minor capital works. We also set out the possibility of an uncertainty mechanism to provide for an additional allowance, should this be demonstrated to be appropriate.

6.184 CCWater supported our provisional findings and said our approach would allow a full exploration of options, including investigating the possibility of more innovative approaches that may have been trialled since Bristol Water considered its plans for the treatment works.[425]

6.185 The LEF told us it was concerned that the delays and uncertainty that our approach led to was not consistent with the risk based approach to water quality that was for the Company to manage as part of its statutory duties. The LEF said that having an uninterrupted supply was customers' top priority and that Bristol Water's plan which included this scheme was acceptable to customers.[426]

6.186 The LEF said that there was agreement by all parties that action needed to be taken, and that completion of detailed assessments by Bristol Water should be provided if necessary, but should not delay or impede efficient business planning. The LEF said that excluding the scheme was not in customers' interests.[427]

6.187 In reaching our final determination we considered the views of the LEF and the weight that customers placed on an uninterrupted supply. We recognised the LEF's statement that Bristol Water's plan was acceptable to customers; however, we did not consider that this negated the need to assess the appropriateness of the scheme in addressing the specific circumstances of Cheddar reservoir. We disagreed with the LEF that not allowing the full allowance requested would delay or impede efficient business planning;

[425] CCWater response to our provisional findings, paragraph 3.7.
[426] LEF response to our provisional findings.
[427] LEF response to our provisional findings.

rather, we considered that further investigation would ensure that the most appropriate solution was able to be delivered for the benefit of customers.

6.188 We considered Bristol Water's detailed response to our provisional findings and reviewed the supporting documents.[428]

6.189 Bristol Water particularly noted the views of the LEF (see paragraphs 6.185 to 6.186).[429]

6.190 Bristol Water recognised that we had sought to balance the risk between water quality and the financial impact on customers. Bristol Water also reemphasised that customers' willingness to pay for water quality was greater than the cost of the scheme.[430]

6.191 Bristol Water told us that a failure to provide funding during AMP6 for the proposed Cheddar WTW scheme could leave Bristol Water in an awkward regulatory position, with respect to the EA (given Cheddar Reservoir was in a safeguard zone) and the DWI, and their expectations with regard to management of water quality risks.[431]

6.192 Ofwat said that it supported the removal of funding for this project but also questioned whether an uncertainty mechanism was needed. With respect to the need for an uncertainty mechanism, Ofwat said that:[432]

(a) as we had provisionally made a greater wholesale cost allowance than Ofwat had allowed, Bristol Water could fund the scheme from any underspend on this increase;

(b) we had proposed cost sharing incentives (via the menu) that would provide partial funding if BRL were to overspend its totex allowance, which would therefore provide a degree of protection for Bristol Water;

(c) the provisional decision to allow an overall cost of capital greater than in Ofwat's determination meant Bristol Water would receive more funding to manage risk; and

(d) Bristol Water's failure to provide high quality information should not be rewarded by extra protections from the risk of cost over runs – in these circumstances any extra costs (over and above those already

[428] Bristol Water response to our provisional findings, section 4.4 and appendices 4.2 and 4.3.
[429] Bristol Water response to our provisional findings, paragraph 514.
[430] Bristol Water response to our provisional findings, paragraph 515.
[431] Bristol Water response to our provisional findings, Appendix 4.2, paragraph 26.
[432] Ofwat response to our provisional findings, paragraph 78.

compensated for by generous allowances elsewhere or through totex cost sharing).

Need

6.193 The case that Bristol Water has presented to demonstrate need is that raw water quality at Cheddar Reservoir is deteriorating, as evidenced by increasing algal blooms. Bristol Water said that this has been recognised by the EA and there is a Final Determination Safeguard Zone Action Plan for the Drinking Water Protected Area Cheddar Reservoir for total algae.

6.194 Bristol Water said that in future, both Barrow and Blagdon reservoirs and Honeyhurst Spring would provide supplementary raw water resources for Cheddar works. These varied in quality,[433] but their ability to supply Cheddar WTW would increase security of supply. Bristol Water said that the capacity of Cheddar WTW in its present arrangement relied on receiving a superior water quality from Cheddar Reservoir and treatment by microstrainers and slow sand filtration. Bristol Water further said that the performance of these systems and the resultant final water quality was already compromised by increased algal loadings, and the WTW was likely to be put further at risk as a result of treating inferior water quality from these alternative sources.

6.195 In 2013, Mott MacDonald, in providing initial assurance on the scheme, found that:

(a) Bristol Water was not clear in the documentation what was causing the change in algal populations;

(b) there was only one documented impact on Bristol Water customers in AMP5 related to reliability of supply and not water quality;

(c) the exact impact of the incident was not clear (how many customers were affected for how long) and the exact cause also seemed unclear from the information provided;

(d) there was no analysis linking algal concentrations in the reservoir to operational activities or customer incidents;

(e) the (then) current risk score was acceptable according to the DWSP methodology. Bristol Water stated that this risk would increase, but it was not clear how this increased risk will manifest; and

[433] Bristol Water states that Blagdon Reservoir in particular has quality issues.

(f) given only one AMP5 service impact, and the current risk score, the timing of the expenditure needed to be challenged. Mott MacDonald questioned whether Bristol Water could monitor the situation more closely in AMP6 with a view to a potential capital solution in AMP7.

6.196 Bristol Water told us that all of the above challenges were addressed prior to submission of the December 2013 Business Plan, as confirmed by Mott MacDonald in its letter dated 7 November 2014.

6.197 Mott MacDonald advised Bristol Water to fully justify what the primary causative factor responsible by demonstrating the link between climate change and algal blooms. Mott MacDonald also recommended that in order to justify the scheme when the current risk level was acceptable, Bristol Water needed to demonstrate a detailed analysis of water quality and works throughput that was both historic and forward-looking, and analysed risk, both with and without intervention.

6.198 In response to our provisional findings, Bristol Water told us that it continued to consider that there was a good case for the scheme, driven by the fact that during an algal bloom, capacity at Cheddar WTW was reduced from a sustainable 50 Ml/d to 30 Ml/d.[434]

6.199 Bristol Water told us that in 2012 the EA designated Cheddar Reservoir as a safeguard zone in response to the water quality issues caused by algal blooms within the area. Atkins (acting for the EA) observed (as we did in our provisional findings) that increases in algae populations started to get worse in 2006.[435] Atkins found that the increased algal populations had provided Cheddar WTW with a challenge that it has struggled to deal with.

6.200 Atkins noted a decline in phosphates[436] and no clear pattern in nitrate loads,[437] although loads in the last two years of the period were relatively low.

6.201 In response to our provisional findings, Bristol Water commissioned Mott MacDonald to review Aqua's findings, and provided us with a copy of Mott MacDonald's report. Mott MacDonald found that there did not appear to be an increase in the nutrient levels in the reservoir in the period 1995 to 2015.

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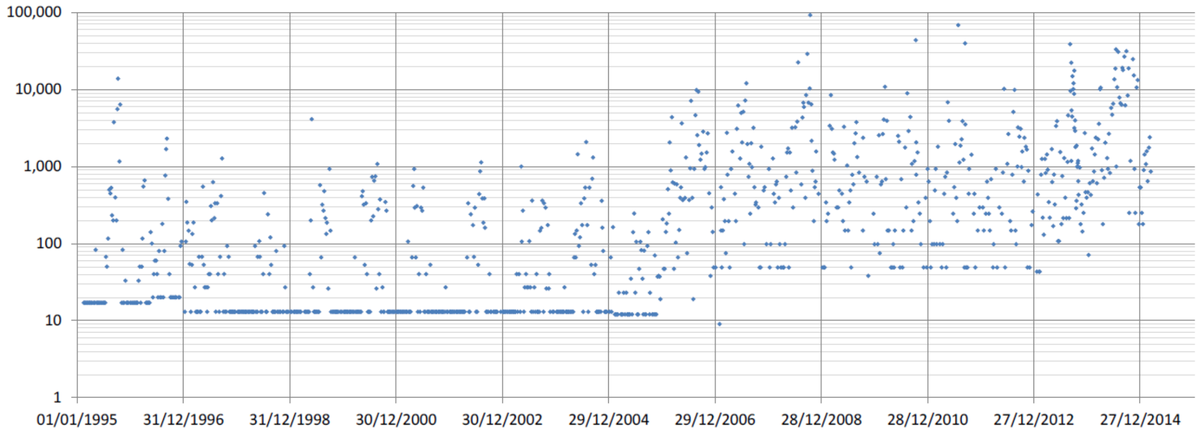
[434] Bristol Water response to our provisional findings, paragraph 514.
[435] The evidence presented showed three very large peaks in counts of microcystis in 2008/09, 2010/11 and 2011/12, but the report did not present a link between the peaks and any specific operational impact on the treatment works on those occasions.
[436] There was a decline from a peak of around 2,700kg per year in 2002 to around 500kg per year in 2010
[437] Nitrate loads peaked in 1998-2000 at around 850,000kg per year. Between 2001 and 2009 levels varied between around 500,000 and 800,000 kg per year. From 2007 levels fell year-on-year from around 750,000kg per year to around 350,000kg per year in 2010.

Mott MacDonald noted that whilst total algae counts increased (Figure 6.9) there was not a similar increase in Chlorophyll ‘a’ levels.[438]

Figure 6.9 Total algae cells per ml



Source: Mott MacDonald

6.202 Mott MacDonald found that:

> As a result of Aqua’s challenges we have further challenged your underlying data. We have become concerned that the case rests on algal count values, the significant change in which appears to coincide with a change in analytical supplier. Other indicators in the source do not appear to have deteriorated. We conclude that further research is required in order to confirm the most appropriate course of action.

6.203 We considered Mott MacDonald’s view to be significant, given both the overall increase in cell counts and in particular the sudden upward shift in the shelf of minimum cell counts from 2006.[439]

Most suitable option

6.204 In its SoC, Bristol Water considered and discounted a number of alternative options at the feasibility stage where they did not provide a sufficiently robust or reliable long-term solution.[440] In its outline design report it shortlisted three options and chose a ‘dissolved air flotation’ and ‘rapid gravity filter’ based

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[438] Chlorophyll ‘a’ is the primary pigment used in photosynthesis and provides an indication of the level of algae in water. We noted that while no data was presented for the period 1999 to 2011, the levels in 2011 to 2014 did not appear different to those between 1995 and 1999,

[439] While we noted that there appeared to be an upward shift in algae counts indicating an increase in algae but note that the minimum count increased from around ten to 15 cells per ml between 1997 and 2005 to a relatively constant 50 cells per ml from 2006. We received no evidence from Bristol Water had not presented an explanation for why the ‘shelf’ had shifted so significantly in 2005.

[440] These ranged from management of the reservoir and the catchment to barley straw bales being stored in the reservoir, algae skimming, de-stratification and rapid gravity filter. Bristol Water SoC, paragraph 1164.

solution. The DWI issued two letters that 'commend for support' the proposals.[441]

6.205 We reviewed DWI's letters and noted that while DWI supported the scheme for inclusion in Bristol Water's business plan, DWI did not support it as a drinking water quality enhancement scheme and recommended additional consideration of catchment management.[442] However, DWI agreed that Bristol Water had provided some evidence of deterioration of raw water quality, in particular algal counts, and that DWI agreed that there was evidence that the treatment works was unable to operate at design capacity as a result of raw water quality challenges.

6.206 In a supplementary letter, DWI stated that it recognised that the outcomes of catchment measures were uncertain and may extend into future AMPs before any benefits are realised. DWI agreed, therefore, that the proposed improvements for Cheddar should be commenced in AMP6 in order to mitigate proactively the risks to quality and sufficiency posed by the deteriorating raw water quality.

6.207 DWI also stated that there was a NEP catchment scheme in place for AMP6 to improve raw water quality at Cheddar, and therefore, DWI recognised that Bristol Water was considering catchment approaches alongside its proposals to improve water treatment. It concluded that it reiterated its support for Bristol Water's proposals to improve Cheddar WTW because of deteriorating raw water quality and future risks to drinking water quality and sufficiency. DWI therefore considered that the proposals should be included in the Company's business plan in their entirety, as written.

6.208 In FD14, Ofwat stated that it expected Bristol Water to have responded with a full strategic options appraisal for Cheddar WTW that showed how it had fully tested the need for a capital solution. Ofwat queried Bristol Water as to how it had responded, but Bristol Water only pointed to narrative in its business plan and did not provide a full strategic options appraisal. Ofwat did not regard this response as being consistent with the evidence it required to be confident that the scheme was in customers' best interests.[443]

[441] Bristol Water SoC, paragraph 1167. We note that DWI's assessment of need for schemes is not directly comparable with our assessment framework for enhancement schemes.
[442] That is, managing the quality of water entering the reservoir to reduce the level of phosphates.
[443] Ofwat, Final Price control determination notice: company specific appendix – Bristol Water, p70.

Cost estimation

6.209 Ofwat gave Bristol Water a partial pass for its cost estimation. It found that the costs of the scheme were clearly stated and Bristol Water had set out the basis of the estimate. Bristol Water had also sought independent assurance from Mott McDonald on its approach to assessing costs. Ofwat concluded that the details of the assurance were limited, but the overall estimating methodology was likely to be reasonable.[444]

6.210 Ofwat has applied an efficiency challenge to the project as set out above.

6.211 Aqua found that Bristol Water's costs lacked detail, there were inconsistencies between different documents that it had reviewed, and there was insufficient detail to compare to a benchmark.

6.212 In response to our provisional findings, Bristol Water challenged Aqua's view that there was insufficient detail on costs to allow it to benchmark the scheme appropriately and said that should we reinstate the scheme we should base any assessment of cost on CKBS and Mott MacDonald's benchmarking.[445]

Views from Aqua

6.213 Aqua found that Bristol Water had demonstrated evidence of issues arising from algae and that these needed addressing, but considered that Bristol Water had not adequately demonstrated that its proposed scheme was the most appropriate. Specifically, Aqua considered that Bristol Water had not demonstrated that:

(a) Bristol Water had investigated and understood the cause of the algal bloom with particular reference to the replacement and operation of the destratification equipment and introduction of water from the River Axe;

(b) increases in algae counts were directly linked to specific instances of reduced water quality or operational difficulty;

(c) algal bloom will continue to be an issue for Bristol Water;

(d) the scale of any issue arising from the algae requires a new treatment works;

[444] Ofwat, Bristol Water – Special Cost Claims.
[445] Bristol Water response to our provisional findings, Appendix 4.3, paragraph 63.

(e) the proposed solution was the most proportionate and appropriate; and

(f) that any additional expenditure was justified given the benefits arising from the Southern Resilience scheme.

6.214 Aqua observed that the species of algae that Bristol Water has identified as causing issues in two incidents (dinobryon)[446] was too small for the current microstrainer to filter, but that on the two occasions when the dinobryon count exceeded 5,000 cells per ml there was no evidence presented that demonstrated that increased levels of algae had caused operational difficulties.

6.215 Aqua found that Bristol Water had dismissed a reservoir management option in dealing with algal loading and that it appeared that the two options that Bristol Water had considered in any detail were the proposed solution or an alternative treatment using membranes. Aqua considered that a number of alternative solutions through combination of different treatment processes were feasible.

Our assessment

6.216 We considered the two incidents to date that had resulted in blinding of the filters at Cheddar WTW, and noted that Mott MacDonald had suggested to Bristol Water that it strengthened the analysis of the relationship between algal blooms and operational activities.

6.217 We considered that evidence on the levels of algae in the reservoir was mixed with respect of whether or not the levels of algae were increasing either by frequency of blooms or overall number of algae cells in the water. It was also not fully clear from Bristol Water's analysis whether the species that were dominant in the reservoir at a given point had an overall impact on the effectiveness of the existing water treatment works.

6.218 Bristol Water told us that one instance of dinobryon algae led to blinding of the filters,[447] but presented evidence that related to the overall level of algal blooms. Bristol Water told us that species other than dinobryon could lead to blinding of the filters. We did not consider this evidence to be compelling, given the relatively low counts of dinobryon and the lack of evidence that the largest peaks in dinobryon coincided with operational issues in the treatment

[446] Dinobryon is a unicellular flagellate algae (that is, one with a flagella or whip-like structure, or organelle, extending from the cell).
[447] Bristol Water told us that laboratory analysis of raw water samples in the 2014 incident identified a bloom of dinobryon as the cause of the filters blinding and the increased head loss.

works. Similarly, there had been no blindings during large peaks in other types of algae.

6.219 We noted the evidence provided by Aqua that there had been a sudden marked increase in algae. We were cautious in our interpretation of the data presented by Bristol Water on when the increase in algae levels had occurred, what the cause was, and the likely trend in the future.

6.220 We noted Aqua's views on the potential interaction of water from the River Axe and the replacement of destratification equipment. Bristol Water told us that the sediment in the reservoir being disturbed by destratification equipment could not be responsible for algal blooms.[448] We noted, however, that Bristol Water had identified that disruption of sediment by wind action could lead to algal growth.[449]

6.221 We did not consider that there was sufficient evidence to conclude that either of the issues identified by Aqua had led to increases in algae. A key aspect of our consideration of Cheddar WTW was that Bristol Water had failed to demonstrate that it understood the cause of the significant increases in algae counts and frequency of blooms in the period 2006 to 2008. Without understanding the sudden increase in algae, it was not clear how Bristol Water could provide evidence that a replacement WTW would be the most appropriate option.

6.222 We therefore identified that further investigation and analysis by Bristol Water could better demonstrate the reason that algae counts had increased. We next considered whether a stepped approach could be used (allowing a small amount of expenditure to finance an investigation, which could subsequently be increased according to the outcome of Bristol Water's investigations). However, we were mindful of Ofwat's desire to move away from notified items and that it wanted companies to manage their own risks.

6.223 With respect to the design of the replacement water treatment works we noted the observations of Aqua and Arup questioning whether Bristol Water's proposed solution addresses levels of nitrates and ammonia in the raw water.

6.224 We noted Aqua's view that Southern Resilience should provide relief in the event of future blindings. We did not consider that Bristol Water had presented evidence that future blindings would increase in frequency or

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[448] Bristol Water told us that the phosphates in the reservoir sediment were insoluble so could not be the cause of the growth of algae.
[449] In its feasibility report, Bristol Water stated that 'disruption of the sediment by wind action or temperature inversion can result in […] nutrients re-suspending and once again becoming available to sustain algal growth'.

duration. Should there be a significant ongoing issue relating to algal loading and blinding or any reduction in the effectiveness of the slow sand filters, we consider that an allowance for some remedial works should be allowed.

6.225 We considered the information provided by Bristol Water on Cheddar reservoir being placed in a safeguard action zone.

6.226 We noted Atkins' finding that increasing algal populations are 'confidently' attributed to historic and ongoing anthropogenic activity[450] in the inputs to Cheddar Reservoir. However, we found this was not fully consistent with Atkins finding that the decline in phosphorus inputs in recent years, associated with treatment of water from the River Axe, occurred at the same time as increases in algal populations. Atkins said that this indicated that there was no clear linkage between these elements and that other influences such as biological interactions with zooplankton and fish populations or changes in weather conditions might have been more important.

6.227 We did not find Bristol Water's use of the Atkins/EA report as conclusive evidence of the cause of the increase in algae.

6.228 We considered that Bristol Water's response to our provisional findings placed a greater emphasis on the quality of treated water as result of algal loading (through raw water deterioration) than in its statement of case, which we considered focused on the capacity of the WTW in the event of a blinding. We considered that the two could be considered in parallel, though the two issues would have separate impacts.

6.229 We noted Bristol Water's comments on establishing a view on an appropriate cost estimate in the absence of a benchmark by Aqua. We considered that Bristol Water's proposal that CKBS and Mott MacDonald's benchmarks would be an appropriate basis for any assessment of Bristol Water's cost estimate was sensible and consistent with our approach elsewhere.

6.230 We noted Ofwat's support for not making an allowance for replacing Cheddar WTW but also its view that an uncertainty mechanism was not necessary. We agreed with Ofwat that an uncertainty mechanism should not be used to compensate shareholders for cost overruns, but we did not consider that our consideration of an uncertainty mechanism in our provisional findings would act in this way. We considered that identifying the

[450] That is attributable to the actions of humans.

most suitable scheme to address the issues at Cheddar reservoir was in customers' best interests.

Uncertainty mechanism

6.231 In our provisional findings we considered the need for an uncertainty mechanism to facilitate an appropriate and timely response to the outcome of any investigation undertaken.

6.232 In response to those provisional findings,[451] Bristol Water submitted its views on three aspects, which were:

(a) the right trigger;

(b) the consideration of the solution; and

(c) the funding for the costs.

6.233 We considered these in turn.

- *Trigger*

6.234 Bristol Water suggested that metal content, colour and turbidity of treated water could be used as a trigger. It proposed two triggers, which were either a DWI notifiable event[452] or that samples over one calendar month demonstrated a concentration of any metal, turbidity or colour in the final treated water with a 95th percentile greater than 20% of the regulatory standard metal levels during a calendar month.

6.235 We asked Bristol Water for details of its previous monitoring, and noted that such a mechanism would previously have been triggered on the basis of arsenic and turbidity levels in 2013. We recognised the use of the 95th percentile as a constraint to avoid triggering the mechanism too readily, but considered that this was dependent on the statistical distribution of sample measurements. We identified the risk that the trigger could be achieved without any certainty that statutory standards would be breached. We also recognised that Bristol Water would wish to ensure compliance with drinking water standards and would reduce throughput at the works before allowing unsafe drinking water to enter supply.[453]

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[451] Bristol Water response to our provisional findings, section 4.4.1.
[452] As a result of insufficient supply.
[453] Additionally, the threshold of treated water quality at which throughput was reduced may vary depending on circumstances, such as whether throughput was reduced as a result of a head loss or taking slow sand filters offline.

6.236 We therefore considered that a mechanism that considered the quality of treated water in conjunction with the threat to the sufficiency of supply (rather than as separate metrics) was appropriate.

- *Consideration of the solution*

6.237 Bristol Water said that the DWI should be the responsible party for determining whether there was need for remedial action and that the proposed solution would be appropriate.

6.238 We considered there to be merit in the inclusion of the DWI, or at a minimum consideration of its views. However, we considered it appropriate for Ofwat to make the final decision on need. We consulted the DWI and found them to be willing to assist in ensuring that Bristol Water was able to discharge its duties.

- *Funding*

6.239 With respect to the funding of the scheme Bristol Water proposed making an application for an interim price determination (IDOK) to Ofwat, though noted there were potential timing issues.

6.240 We noted Bristol Water's concern that reference to the materiality of the scheme should not prevent it receiving funding. We recognised this risk but noted that we were constrained by the terms of its licence (which specify materiality and triviality) and were unable to vary the relevant aspects as part of our determination. To the extent that Ofwat considered it appropriate, we did not identify any concerns with Ofwat allowing additional flexibility given that it had previously made an allowance for the scheme as proposed.

6.241 We were keen, however, that any consideration of an appropriate allowance should be made on the merits of the scheme in isolation and not on the overall allowance set by this determination. We noted Bristol Water's suggestion of an independent review of the costs of the scheme. We considered this had merit, but that it would be for Ofwat to consider.

6.242 We did not consider that Ofwat's suggestion, that the reconstruction of Cheddar WTW should be financed through either the increased wholesale cost allowance or cost of capital included in our provisional findings, was consistent with our approach to the assessment and consideration of evidence presented.

6.243 Having considered Bristol Water's proposal, we then considered how a notified item would be structured. We set out in the next subsection our consideration of the feasibility of a notified item and the consultation we undertook with Bristol Water, Ofwat and the DWI.

- *Introduction of a notified item*

6.244 To establish the feasibility of a notified item we shared drafts of the notified item with Bristol Water, Ofwat and the DWI.

6.245 In developing the notified item we identified three key aspects:

(a) recognition of Ofwat's statutory role in determining any change in the wholesale cost allowance;

(b) the benefits of seeking the views of the DWI on any proposed additional works; and

(c) designing and specifying a trigger mechanism that was appropriately balanced.

6.246 Ofwat did not support the use of a notified item and said that the case for one had not been made. It said that cost sharing was available, which reduced the risk to the company, and proposed a 75% sharing rate for all relevant costs.[454]

6.247 Ofwat also proposed ODIs for both any initial allowance and the delivery of any additional works. We did not consider this to be necessary for the following reasons:

(a) First, with respect to the initial allowance, we considered that the £1 million allowance we had proposed in our provisional findings was not material enough to justify an ODI, and the nature of the work involved was such that Bristol Water should have the flexibility to undertake and respond to its investigations appropriately without any artificial constraints on the completion of the work.

(b) Secondly, it was not clear that we could specify an ODI with respect to any additional remedial works as we considered that if we set a time limit for completion of the work this would necessarily prejudge the outcome of any investigations.

[454] That is, that Bristol Water would be allowed 25% of the relevant project costs in addition to the standard 50% sharing rate.

6.248 The evidence that Ofwat presented was not sufficient to persuade us that making an allowance for the full cost of any additional work, where justified, was inappropriate. We considered that the standard cost sharing rate[455] should be used for any variation in outturn against any relevant allowance made by Ofwat.

6.249 We set out further detail of our consideration of the suitability of an ODI for Cheddar WTW in section 9.

6.250 Bristol Water did not support the inclusion of a specified maximum permitted allowance under the notified item and Ofwat said that it did not consider that it would be appropriate to include a specified maximum permitted allowance under any notified item. We decided not to include any form of cap, recognising that the costs of any scheme would be subject to scrutiny by Ofwat.

6.251 Bristol Water requested that the notified item should allow the IDOK to be sought before any initial minor capital works were completed, in the event that it was evident that those works would not be sufficient. We amended the notified item to allow an IDOK on the basis of the findings of any investigation concluded by Bristol Water.

6.252 We considered whether we should require public consultation prior to making any additional allowance. Ofwat said that such a consultation was regulatory best practice and thus there was not a need for it to be included in the notified item. We have therefore not included a specific requirement for either Bristol Water or Ofwat to undertake a public consultation.

6.253 We made additional amendments to our draft to clarify the conditions that Bristol Water would need to satisfy, the description of Bristol Water's relevant statutory duties and the respective roles of Ofwat and the DWI.

Findings

6.254 We have found that Bristol Water has sufficiently demonstrated that the presence of algae in the raw water treated at Cheddar WTW has had an impact on the operation of its treatment works on occasion. We noted that Ofwat had found that the evidence supporting the need for the Cheddar WTW scheme was finely balanced,[456] which led to Bristol Water being given

[455] The standard sharing rate is that 50% of any additional cost is borne by the company and 50% by the customer. Likewise, any cost savings relative to the allowance are shared equally.
[456] Ofwat stated that the decision to exclude an allowance for the scheme was a particularly difficult and marginal decision. Ofwat: Final Price control determination notice: company specific appendix – Bristol Water, p72.

‘the benefit of the doubt’.[457] However, we have not seen compelling evidence that it was in the interests of customers to commit to the scheme at this stage of the investigative process, given the scale of the proposed solution.

6.255 As we set out in our provisional findings, we have placed significant weight on the need to protect customers, either from water shortages or a deterioration in the quality of drinking water. We considered that outside the regulatory framework, the best outcome would be for Bristol Water to better identify the cause of the problem, as was also recommended by its consultants, to seek to address it proportionately, and to make the case for Cheddar WTW replacement at a later stage if necessary. We considered it was not in the best interests of customers to pay for a replacement WTW if that WTW was not necessary.

6.256 In reaching our final decision on whether to introduce an uncertainty mechanism, we considered the need to balance the risk of loss of supply and/or deterioration of the quality of treated water with the financial impact on customers. We placed weight on the views of the LEF in support of the scheme (though noting their concerns on the possible delay of any scheme) and CCWater in supporting our proposed approach.

6.257 We noted comments made by Ofwat that it wished to move away from notifiable items (see paragraph 6.246), but placed weight on the fact that Ofwat had made an allowance for the scheme in FD14. We did not consider Ofwat’s view that any capital improvement works should be funded by Bristol Water’s overall increased wholesale cost allowance (relative to FD14) had sufficient merit and found that this approach would not necessarily reflect customers’ best interests.

6.258 The evidence we have seen to date has not fully demonstrated that the levels of nutrients in the raw water at Cheddar reservoir are increasing or that levels of algae have increased.[458] We also found that it has not been demonstrated to us that an increase in overall algal levels beyond a specific point directly corresponds to an increased likelihood of blinding of slow sand filters.[459] We did, however, note the incidence of a number of algal blooms which had significantly affected the operation of Cheddar WTW.

[457] Ofwat response, paragraph 185.
[458] We recognised a marked increase in algal counts in 2006, but noted importantly that this coincided with a change in the provider of analysis of algae.
[459] It was also not clear if general levels of algae, rather than specific species, were relevant.

6.259 For the reasons set out above (and consistent with our provisional findings), we found that it was appropriate to allow £1 million to enable Bristol Water to conduct further investigations at Cheddar WTW and to implement some remedial works or improvements. We considered that Bristol Water's proposed approach seemed reasonable.[460]

6.260 We considered that our approach is consistent with the principle of uncertainty mechanisms outlined in Ofwat's approach to risk and reward,[461] although we recognise that Ofwat has only agreed a limited set of uncertainty mechanisms in practice. We understand that Ofwat is seeking to minimise the use of such mechanisms, but this is a preferable approach to allowing the costs for Cheddar WTW at this stage.

6.261 We recognised that the outcome of Bristol Water's investigations could demonstrate the need for a more comprehensive programme of capital works to address the quality of raw water. We considered that it was appropriate to provide an uncertainty mechanism and that a notified item would give Bristol Water the opportunity to present evidence in support of further works whilst ensuring that any additional allowance would be subject to regulatory challenge.

6.262 Our approach may lead to a delay in the completion of any capital works at Cheddar WTW, but we placed weight on the need to identify the most appropriate solution to maintain the supply of high quality drinking water to customers, given the cause of the problem is not fully understood at present. We note that the Southern Resilience scheme would provide some additional resilience to the Cheddar supply area in the short to medium term.[462]

6.263 We considered the following factors were relevant in specifying the notified item for the need for further remedial works:

(a) There has been no breach of drinking water standards to date,[463] but future blinding of filters could, in the event that anoxic conditions develop, lead to release of metals adsorbed to the sand in the filter.[464]

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460 For example, investigating the impact of covering a slow sand filter to impede the photosynthesis and growth of algae in the water above the sand.
461 Details of Ofwat's approach to risk and reward are set out on its website.
462 We recognised however, that Southern Resilience would not necessarily provide sufficient treated water during peak demand if Cheddar WTW's output was reduced to zero.
463 However, the DWI was required to be notified as the result of a service reservoir becoming empty as a result of the reduced throughput.
464 Anoxic conditions are more likely in the event of a blinding and the slow sand filter remains in use.

(b) Output at Cheddar WTW is significantly reduced during periods of high algal loading[465] and it may be necessary to make an operational decision to reduce output to ensure compliance with drinking water standards.

6.264 We considered it likely that Bristol Water would reduce the output of Cheddar WTW to avoid allowing treated water to breach drinking water standards and thus there might not be an impact on the quality of treated water, but that there may be an impact on the volume of water available to the network. Therefore we did not consider a simple threshold of water quality (such as the level of metal reaching a certain proportion of the statutory limit) to be an appropriate trigger.[466]

6.265 We instead found that, should Bristol Water's investigations find a more comprehensive programme of capital works was needed, Ofwat (taking into account the views of the DWI) should consider (in isolation from Bristol Water's overall totex allowance) whether there was evidence that:

(a) deterioration in the raw water taken by Cheddar WTW is continuing to occur and is such that, in the absence of the Additional Remedial Works, the operational capacity of Cheddar WTW is likely to be insufficient to meet consumer demand and compliance with the Legal Obligations; and

(b) the Additional Remedial Works are a demonstrably cost-effective, efficient and proportionate solution to ensure that a sufficient volume of drinking water, which meets relevant standards, is available.

6.266 We set out our notified item in Appendix 6.2.

Southern Resilience

Overview of the proposed enhancement

6.267 This project is intended to improve resilience in Bristol Water's southern supply area in the event of a loss of output from Cheddar WTW, Banwell WTW or supply from the Gloucester and Sharpness Canal, by using surplus treated water capacity and improving mains connectivity by linking the three WTWs.[467] New trunk mains (36.6km in length) and a pumping station will be

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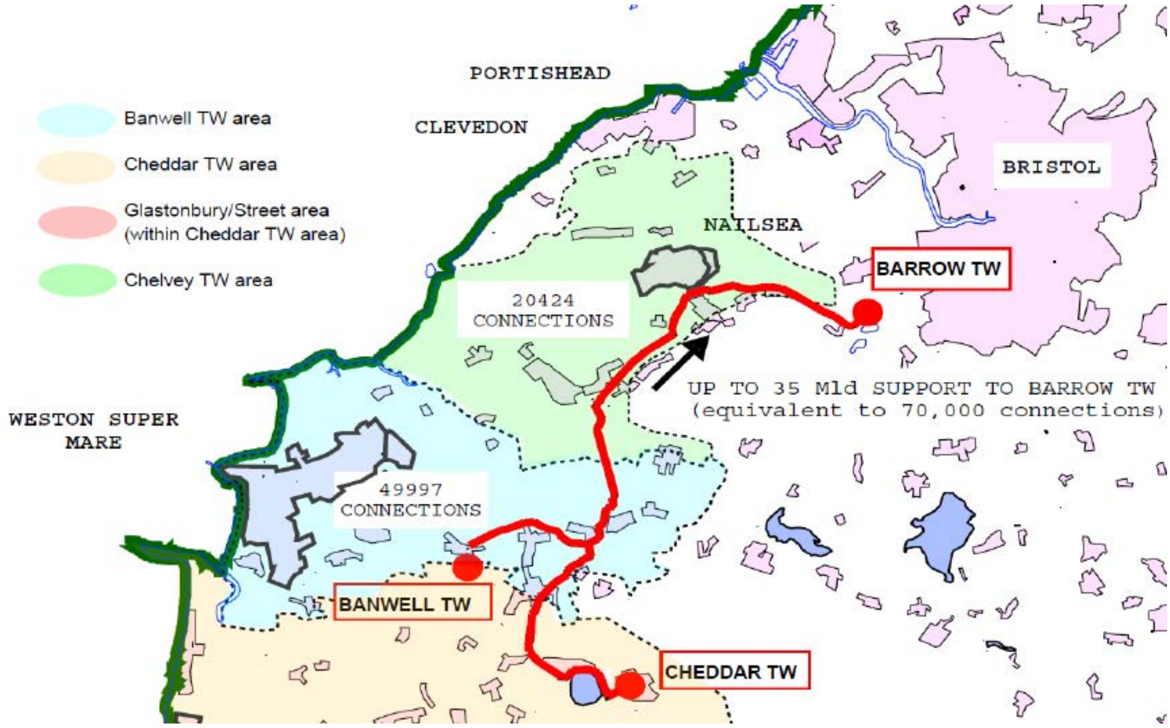
[465] This may be as a result of slow sand filters being taken offline more frequently for skimming, cleaning and subsequent ripening or as the result of head loss due to blinding of the filters. In 2014 output was reduced to 26Ml/d compared to operational capacity of 60Ml/d.
[466] We considered that while a deterioration in water quality might be demonstrated, it did not necessarily demonstrate that drinking water standards would be breached.
[467] Ofwat, Bristol Water – Special Cost Claims.

constructed to allow transfer of water from Barrow WTW to a new service reservoir at Rowberrow and supply water into the Banwell zone. Bristol Water stated that the scheme would fully support the loss of Banwell WTW, or Cheddar WTW.

6.268 This was the only 'resilience' scheme included in Bristol Water's business plan in AMP6.[468] It was included in Bristol Water's SoC at a cost of £28.1 million, which was apportioned into 'growth' and 'resilience' elements. The proposed route of the new mains is shown in Figure 6.10 below.

Figure 6.10: Illustration of Southern Resilience scheme



Source: Bristol Water Wholesale business plan, figure 49.

6.269 In our provisional findings we made an allowance for Southern Resilience, but disallowed an amount of £6 million relating to a service reservoir at Rowberrow as we provisionally found that Bristol Water had not demonstrated that it was the most appropriate location.

Responses to provisional findings

6.270 CCWater said that it supported the inclusion of the Southern Resilience scheme in Bristol Water's business plan. CCWater said it was concerned

[468] Bristol Water SoC, paragraph 1206.

about the effect of the removal of the Rowberrow reservoir would have on the integrity of the scheme.[469]

6.271 Ofwat said that it supported our provisional findings, the additional efficiencies identified by Aqua and the additional benefits of the scheme in terms of enhancing resilience in the Cheddar area.[470]

6.272 Bristol Water said it welcomed our provisional finding that an allowance should be made and supported the allocation of £22.2 million.[471] Bristol Water noted that we had excluded £6million relating to the service reservoir at Rowberrow but that its cost estimate for the reservoir was £5.4 million.[472]

6.273 Bristol Water told us that excluding the service reservoir meant there may not be sufficient water available to provide local resilience and meet growth demands. Bristol Water said that it had identified a need for a service reservoir, though this could be built at Hutton (which was at a lower elevation) at a cost of £4.3 million,[473] and that resilience storage could be provided from Barrow.[474]

Need

6.274 Bristol Water stated that the scheme was required for the delivery of its resilient supply outcome as measured by an improvement in the 'Population in centres >25,000 at risk of asset failure' performance commitments.[475] Bristol Water's enhancements to its network have reduced the number of customers in in this category[476] from over 800,000 in 2005/06 to fewer than 289,000 in 2014/15. The Southern Resilience Scheme will reduce this to 9,063.[477]

6.275 Banwell WTW currently serves 16,000 properties, and Cheddar WTW 14,000. Bristol Water expects the number of properties to increase to 40,000 and 17,000 properties respectively in 2040.[478]

6.276 Ofwat did not have had any specific concerns on need.

[469] CCWater response to our provisional findings, paragraph 3.4.
[470] Ofwat response to our provisional findings, paragraph 77.
[471] Bristol Water response to our provisional findings, paragraph 473.
[472] Bristol Water response to our provisional findings, paragraphs 473-474.
[473] Bristol Water response to our provisional findings, paragraph 475.
[474] Bristol Water response to our provisional findings, paragraph 539.
[475] Bristol Water SoC, paragraph 1207.
[476] Using a metric of only being supplied from one source of water.
[477] Bristol Water further states that over a quarter of all customers rely on a single source of supply. Bristol Water SoC, paragraph 1209.
[478] Bristol Water SoC, paragraph 1211.

6.277 We considered the potential for potable water to be transferred from Cheddar to Banwell, and vice versa, via the Winscombe transfer. Bristol Water's consultants stated in their assessment of the scheme that a peak flow from Cheddar to Banwell of 16Ml/d was theoretically achievable via this transfer. However, Bristol Water's consultants did not consider this arrangement a resilient or sustainable long-term solution, as it required two Cheddar pumps to be running at peak output. We further noted that the demand for water from customers from the two treatment works was in the order of 25-40Ml/d, indicating that the Winscombe transfer would not be sufficient in its own right should one of the two treatment works fail.

6.278 We noted that in response to customer engagement Bristol Water reduced the number of resilience schemes from two to one. Mott MacDonald noted that resilience was a matter of judgment (around acceptable levels of risk) but that it felt that the Southern Resilience scheme was well justified in terms of the risk of service loss to large numbers of customers.

6.279 We considered that Bristol Water had demonstrated that the scheme would improve resilience to its network by reducing the number of properties only served by a single source.

Most suitable option

6.280 Ofwat did not appear to have had any specific concerns on whether the proposed scheme was the most suitable option.

6.281 We considered that Bristol Water had demonstrated that the scheme was appropriately selected to deliver its objectives, but noted the views of Aqua on specific aspects of the design of the scheme that could lead to possible additional operational and service quality benefits.

6.282 We considered Bristol Water's revised proposal to build a dedicated service reservoir at Hutton with buffer storage in an existing reservoir at Barrow.[479] We noted that this would reduce the level of expenditure on the scheme, both in respect to construction costs in AMP6 and ongoing operating costs as a result of the lower elevation of the reservoir, reducing the pumping required.

6.283 We considered that a service reservoir at Barrow could provide a number of operational benefits, but noted Bristol Water's comments on the issues of

[479] Bristol Water response to our provisional findings, paragraphs 475 & 539.

locating the service reservoir at or near its existing site and the benefit of locating the reservoir near the population that it served.

Cost estimation

6.284 We reviewed the evidence available to us, principally two benchmarks undertaken at different stages of the planning process:

(a) A benchmarking exercise by CKBS calculated a benchmark of £34.8 million against Bristol Water's (then) estimated cost (before efficiencies had been applied) of £36.2 million; a difference of 4%.[480]

(b) Aqua calculated a benchmark of £29.6 million, against Bristol Water's cost of £28.1 million;[481] a difference of 5%.

6.285 We considered that Bristol Water's estimated costs for the scheme were within 5% of two independent benchmarks (one higher, one lower) and had demonstrated appropriate cost estimation for the scheme as proposed.

6.286 We considered whether the proposed service reservoir at Hutton (as proposed in response to our provisional findings) was appropriately costed. We have not commissioned any additional benchmarking given the scale of the project. Instead we considered its £4.3 million cost on a £ per Ml basis, and found it was in line with other service reservoirs included in Bristol Water's SoC.

Views of Aqua

6.287 Aqua agreed the scheme would be valuable in improving resilience in the southern area and found that the scheme had sought to deliver synergies through increasing capacity necessary for growth and improving resilience. Aqua found that, as presented, the proposed solution provided the best technical solution in terms of the estimated costs and investment drivers. However, Aqua found limited evidence that an appropriate selection process had been undertaken.

6.288 Aqua reviewed the scheme and calculated a high-level benchmark of £29.6 million compared to Black and Veatch's estimate of £32.1 million. As noted, Bristol Water has included this scheme in its SoC at £28.1 million. Aqua said that it was satisfied with Bristol Water's costing of the scheme.

[480] The latest cost estimate is £28.1 million allowing for efficiencies and reduced transfer capability.
[481] After amendments to the scheme and an efficiency challenge of 12.5%.

6.289 Aqua's review indicated that there were aspects of the design that could be amended to enhance its effectiveness, of this scheme and others including reworking the design of the scheme.

6.290 Aqua found that Bristol Water had demonstrated the need but may have overstated the reliance risks but had failed to link the need for the scheme to algal blooms at Cheddar WTW. Aqua did, however, consider that there was evidence of customer willingness to pay for the scheme.

6.291 Aqua stated that Bristol Water had not presented the case for implementing the Southern Resilience scheme by including in its justification the benefit of deferring the need for treatment enhancements at Cheddar WTW.

6.292 Aqua found that the scheme demonstrated need and had been appropriately identified, costed and modelled.

6.293 Aqua said the scheme should have been further justified by identifying additional benefits of delaying building a new treatment works at Cheddar. In Aqua's view, once completed, the scheme would ensure supply to the Cheddar system in the event of an algae problem affecting the treatment capability of Cheddar WTW. Aqua further considered that the scheme would also provide Bristol Water with the opportunity to either see if its catchment management was effective or to provide the opportunity to develop better systems to control algae within the reservoir.

6.294 Aqua said the nature of the resilience aspects of the scheme were time independent (in that they respond to infrequent and uncertain events), but to the extent that the scheme relieved Cheddar WTW, it was beneficial to commence construction in AMP6.

6.295 Aqua identified the construction of a service reservoir (and particularly at Rowberrow) as one particular aspect of the design of the scheme where it had particular concern. Aqua noted that at 95m Above Ordnance Datum (AOD),[482] a service reservoir at Rowberrow would require pumping water to an elevation greater than necessary, which would increase opex, and that the capacity of the service reservoir had impacts on management of water quality. Aqua identified benefits of either changing the location of the service reservoir or amending the design of the scheme to exclude the additional service reservoir.

[482] AOD is the elevation of a location relative to the Ordnance Survey's measure of mean sea level measured at Newlyn, Cornwall.

Findings

6.296 We considered first whether need had been demonstrated. We noted the reduction in the number of households at risk of asset failure that would be achieved, but considered Mott MacDonald and Aqua's observations on whether Bristol Water's modelling matched the experience of households. We considered that the scheme could provide additional relief to the Cheddar supply area if further issues arising from algae occurred.

6.297 We next considered whether appropriate alternative options had been identified and whether the most suitable option had been chosen. We reviewed the optioneering undertaken by Bristol Water, and considered that of the options identified, Bristol Water had adopted a rational approach in choosing between them.

6.298 We considered that Aqua's observations on the chosen design identified aspects of the scheme where we did not consider we had sufficient evidence to conclude that Bristol Water had fully demonstrated that the scheme proposed was the most appropriate.

6.299 In our provisional findings, we found that Bristol Water had partially demonstrated that it had chosen the most suitable option, but we considered that further justification for a service reservoir with a substantial capacity and in the location proposed was needed. Specifically, we noted the following:

(a) The elevation of the reservoir at 95m AOD.

(b) Aqua's identification of Barrow as a possible alternative location at a lower elevation but still delivering similar operational benefits.

(c) Aqua's observations on the operational benefits of a service reservoir at Barrow (as an alternative to Bedminster).

(d) Aqua's observations on the overall capacity of service reservoirs.

6.300 In our provisional findings, we considered that Aqua's proposals might have merit and suggested that Bristol Water's scheme could be improved further; we considered Bristol Water's proposal for a service reservoir at Hutton addressed a number of the concerns identified in our provisional findings and had additional benefits with respect to the location of the service reservoir closer to the population it will serve.

6.301 We therefore considered that Bristol Water's revised proposal was a suitable option to address the strategic aims of the Southern Resilience Scheme.

6.302 We also considered Bristol Water's cost estimation. We noted that the scheme is included in Bristol Water's SoC at a cost of £28.1 million, which was lower than Aqua's estimate and considerably lower than CKBS' benchmark of £34.8 million. We therefore found that Bristol Water had demonstrated that its cost estimation had not overestimated the costs of the scheme.

6.303 In reaching our findings, we were particularly aware of the resilience duty that we and Ofwat are now subject to.[483]

6.304 We considered that Aqua's proposals may have merit and suggested that Bristol Water's scheme could be improved further; however, we recognise that Aqua's proposals have not been subject to prolonged and detailed scrutiny over the business planning cycle.

6.305 We found that Bristol Water's proposal for a service reservoir at Hutton addressed a number of the concerns identified in our provisional findings and had additional benefits with respect to the location of the service reservoir closer to the population it will serve. We have therefore included the cost of Hutton in the allowance.

6.306 We have found that the Southern Resilience scheme should be approved and given an allowance (for its growth and resilience aspects combined) of £27 million.[484]

Smaller enhancement scheme expenditure

6.307 In this subsection we summarise our assessment of smaller enhancement schemes and set out our findings for those schemes. Further detail is set out in Appendix 6.1. The schemes are grouped as follows:

(a) Raw water deterioration (paragraphs 6.308 to 6.314).

(b) Growth (paragraphs 6.315 to 6.322).

(c) National Environment Programme (NEP) (paragraphs 6.323 to 6.329).

(d) Asset reliability (paragraphs 6.330 to 6.335).

(e) New connections (paragraphs 6.336 to 6.338).

[483] See section 2.
[484] This allowance is calculated by making an allowance of £4.3 million for a service reservoir at Hutton in place of the £5.4 million relating to Rowberrow Hill which had been included in Bristol Water's SoC.

(f) Enhancements to the supply/demand balance (paragraphs 6.339 to 6.341).

Raw water deterioration

6.308 In addition to Cheddar WTW, Bristol Water included three other enhancement schemes in its SoC to address deterioration in raw water quality. The schemes and their estimated cost are as follows:

(a) Barrow WTW UV (£6.8 million).

(b) Stowey WTW pH correction (£0.8 million).

(c) Metaldehyde catchment management (£0.4 million).

6.309 Our review of these schemes found that, on balance, there was evidence of need for the schemes, and that the proposed schemes were appropriately selected. We found that evidence on Bristol Water's cost estimation was mixed.

6.310 CKBS' review indicated that Bristol Water's estimated cost of both the Barrow and Stowey schemes[485] were above an industry benchmark.[486]

6.311 Mott MacDonald reviewed the Stowey scheme's direct costs (£0.4 million out of £0.8 million post efficiency) and found them to be in the right order of magnitude. Mott MacDonald found that, over a range of schemes, indirect costs for benchmark projects were 79% of Bristol Water's estimates. We found that Bristol Water's current cost estimate was consistent with an adjustment for Mott MacDonald's findings with respect to indirect costs.

6.312 In Bristol Water's final submission, these two projects had an aggregate cost of £7.6 million (post application of efficiencies), compared to a modified CKBS benchmark of £6.4 million.[487]

6.313 With respect to cost estimation for the individual schemes we found the following:

(a) **Barrow** – we placed weight on the outcome of Bristol Water's tender and considered that its cost estimate of £6.8 million was reasonable. We noted Ofwat's challenge in response to our provisional findings that CKBS had identified a lower estimated cost but as noted placed some

[485] Metaldehyde was not included in scope.
[486] The benchmark was 19% lower.
[487] Bristol Water had reduced the cost estimate by 12% and added an element of risk to CKBS's figures.

weight on the tendered value of the contract being in excess of our allowance. We included the CKBS benchmark in our overall review of cost estimation.[488]

(b) **Stowey** – we considered the evidence from reviews by Mott MacDonald and CKBS. We considered that the level of detail in CKBS's benchmarking report was greater, but this did not necessarily indicate that we should place greater weight on this in making our assessment. We considered that Bristol Water's current estimate of £0.8 million was broadly consistent with Mott MacDonald's findings. We considered allowing the average of the two benchmarks, but given the absolute value of difference, we have allowed £0.8 million.

(c) **Metaldehyde** – we did not have any direct evidence on Bristol Water's cost estimation for Metaldehyde catchment management, and given the low value of the scheme and lack of evidence indicating that the cost estimate was inappropriate we decided to make an allowance in full of £0.4 million.

6.314 We therefore have found that an allowance of £8 million for the schemes should be made.

Growth

6.315 Bristol Water's 'Growth' schemes relate to seven capital projects, four of which relate to the construction or reinforcement of mains and three relate to the construction of three service reservoirs.[489] Growth in this specific context refers to the increasing demand occurring in existing areas of the network which can be driven by higher water usage, infill development and changes in property use.[490]

6.316 In Bristol Water's SoC, the schemes were included at a cost of £12.5 million.

6.317 We reviewed the evidence submitted by Bristol Water that set out its approach to identifying need and the areas where there was less than 12 hours' storage capacity. We further noted that Bristol Water had amended its plans for an additional service reservoir at Tetbury to be replaced by a new main.

[488] See paragraphs 6.342–6.347.
[489] In addition, some £8.4 million of the cost of the Southern Resilience scheme is included within Bristol Water's presentation of 'growth' schemes.
[490] Bristol Water SoC, paragraph 1185. Other types of expenditure relating to growth are balancing supply and demand schemes, which increase WAFU by identifying new sources of water or decreasing leakage, and new development which relates to the cost of laying mains to new developments.

6.318 We found that Bristol Water had demonstrated the need for the enhancements, and that it had taken a proportionate approach in choosing individual projects to pursue.

6.319 We found the evidence on cost estimation to be particularly finely balanced. We found clear evidence that Bristol Water's initial costing of some schemes had been overestimated (this is discussed in Appendix 6.1), but that in response to third party scrutiny it had reduced its cost estimates.[491] We considered whether seeking further evidence from our own consultants would provide any further evidence but decided against this.

6.320 We looked at the evidence on cost estimation in the round, Bristol Water's amendments to its cost estimation, and the overall conclusions of Mott MacDonald, and we found that Mott MacDonald's review of all mains schemes indicated that the level of costs requested by Bristol Water was appropriate. We noted that Bristol Water's estimate for the Windmill Hill service reservoir (prior to application of efficiencies) was within 2.6% of Mott MacDonald's (and around 10% lower post efficiency).

6.321 We noted Ofwat's suggestion of a further cost challenge to Growth schemes, but we did not find evidence to suggest that this was appropriate, or what an appropriate challenge would be.

6.322 We have found that we should approve the schemes and make an allowance of £12.5 million.

National Environment Programme

6.323 This scheme is comprised of four programmes that seek to discharge Bristol Water's obligations to address adverse environmental impacts in Bristol Water's network.

6.324 In its SoC, Bristol Water included £11 million for NEP projects with catchment management (£4 million) and eel protection (£6 million) the two largest single elements.

6.325 We reviewed the evidence presented by Bristol Water on the basis of need for the schemes. With respect to eel protection, we noted Mott MacDonald's review of Bristol Water's eel scheme and the uncertainty of: *(a)* the presence of eels; and *(b)* the cost of the scheme. We found, however, that Bristol

[491] For example, in response to Mott MacDonald's work on mains, Bristol Water reduced its estimated costs for mains projects in aggregate by 17.5%.

Water was under a legal obligation to undertake the scheme[492] and that the uncertainty would lead to an increase in costs which would need to be absorbed by Bristol Water.

6.326 We found that Bristol Water had demonstrated the statutory requirement for undertaking the NEP schemes.

6.327 We further found that the projects chosen had been selected in response to Bristol Water's statutory obligations and appeared to be appropriately selected. We found no specific issues with Bristol Water's cost estimation of the schemes other than the uncertainty over the cost of the eel scheme.

6.328 We noted Ofwat's suggestion of a further cost challenge to NEP schemes, but we did not find evidence to suggest that this was appropriate or what an appropriate challenge would be.

6.329 Given the evidence on need and the approach adopted by Bristol Water and support from EA, we have decided that the schemes should be allowed with an allowance of £11 million.

Asset reliability – discoloured water contacts

6.330 Bristol Water wishes to reduce the level of discoloured water contacts, which is caused through leaching of trunk mains. This scheme seeks to address that leaching, and thus discolouration of water, by relining 30.5km of trunk mains, which Bristol Water has identified as causing a significant number of contacts.

6.331 Bristol Water included the scheme at £10.2 million in its SoC.

6.332 We found that Bristol Water had demonstrated the need for the scheme and the basis of the enhancement to water quality appears to be rational given Bristol Water's investigations. We found that Bristol Water had appropriately investigated, identified and targeted those mains which gave rise to a relatively high proportion of contacts.

6.333 We considered the evidence on cost and found that there was evidence of challenge by Mott MacDonald. We noted, however, Aqua's finding that high levels of risk had been included in Bristol Water's costs.

[492] Bristol Water's scheme was an alternative to the statutory requirement to install screens on water intakes and Bristol Water had received an exemption from the requirement on the basis of this proposal.

6.334 We note that Bristol Water had applied a significant cost challenge to its initial estimate, but it was not clear how the issues raised by Mott MacDonald had been addressed.

6.335 In our provisional findings we made a provisional allowance of £9.54 million based on Aqua's review. Following evidence presented by Bristol Water we have found that we should make an allowance for the scheme of £10.2 million, as included in its SoC.

New connections

6.336 Bristol Water included schemes with an estimated gross cost of £25.7 million in its SoC, though once contributions by developers were considered, the net amount was some £0.4 million. We reviewed Ofwat's unit cost models and noted that in Ofwat's Final Determination these gave an allowance of £3.9 million.

6.337 We noted that Bristol Water's gross expenditure (£25.7 million) was greater than estimated by Ofwat's models (£20.0 million) but also that Bristol Water planned to be more effective at recovering its costs (98% cost recovery) than assumed by Ofwat's models (81% cost recovery). As a result, Bristol Water's net expenditure was lower than the allowance calculated by Ofwat. As it is only the net expenditure that is relevant to this determination, we have not sought to apply a cost challenge on the level of gross expenditure. Given that any allowance for new connections reflects the modelled shortfall in the recovery of costs we did not consider it appropriate to increase Bristol Water's allowance.

6.338 We have therefore made an allowance of some £0.4 million.

Enhancements to the supply/demand balance

6.339 Bristol Water included schemes with an estimated cost of £15.5 million in its SoC. We reviewed Ofwat's unit cost models and found that in Ofwat's Final Determination these gave an allowance of £24.4 million.

6.340 Given the allowance calculated by Ofwat's own model was some £8.9 million greater than Bristol Water's cost estimate, there was no evidence to indicate that Bristol Water's costs were above average.[493]

6.341 We therefore made an allowance of £15.5 million.

Overall assessment of enhancement expenditure

6.342 In reaching our provisional findings we had reviewed scheme specific evidence on £133 million of the £152 million (88%) sought by Bristol Water for enhancement expenditure. We considered that this was an appropriate level of scrutiny. We provisionally found that there was also no evidence to support any further challenge on cost estimation based on Bristol Water's own 12.5% cost challenge.[494]

6.343 In response to comments by Ofwat that we had not sufficiently challenged a significant proportion of Bristol Water's expenditure we subsequently reviewed the estimated costs of new connections and enhancements to the supply/demand balance. We have therefore now reviewed some £149.3 million (98% of the net enhancement expenditure included in Bristol Water's SoC).

6.344 Ofwat suggested that we should apply a 16% reduction to the allowance we had provisionally made for a number of minor schemes. We did not find the evidence basis for Ofwat's proposed challenge to be robust.[495] Given that most schemes were discrete (and largely disparate) projects,[496] it was not apparent to us that evidence from one or more benchmarks could readily be used to identify a systemic weakness in Bristol Water's cost estimation or scope for individual enhancement projects.

6.345 In response to Bristol Water's view that we had been inconsistent in our approach, we reviewed the value of the allowances granted against the range of specific financial benchmarks or comparative cost estimate.[497] This assessment is set out in Table 6.4 below, which sets out the upper and

[493] Given the relative difference we considered whether further allowance should be made but noted that the average cost of delivering one Ml/day of water can vary significantly by the nature of a project. We considered that Ofwat's benchmark would presumably include less cost effective approaches to improving supply/demand balance which would increase the average unit cost. We considered that increasing our allowance would increase the likelihood that costs would be inefficiently incurred and potentially skew subsequent Ofwat models.
[494] Bristol Water has applied a 12.5% efficiency challenge to all of its enhancement expenditure to make it consistent with CKBS's benchmarking. We consider that when aspects of risk excluded by CKBS in its benchmarking are accounted for, this 12.5% challenge should give comfort that in aggregate that the smallest enhancement schemes are appropriately costed.
[495] The challenge was based on CKBS' benchmarking of two projects.
[496] With the exception of new connections and some supply/demand balancing schemes, which we note are covered by Ofwat's own unit cost models.
[497] Where need for the scheme had been demonstrated.

lower bounds of cost information (which might include Bristol Water's estimate), our allowance (as set out above) and for each scheme the possible scope for adjustment relative to the maxima and minima of the range of cost estimates.

Table 6.4 Aggregate review of quantitative evidence on scheme cost

£m

	Range of cost estimates				*Scope for adjustment*	
	Lower	*Upper*	*BW SoC*	*CMA determination*	*Scope for reduction*	*Scope for increase*
Southern Resilience	28.1	29.6	28.1			
Less: Service reservoir	22.7	24.2	22.7	22.7	0.0	1.5
Growth						
Paulton Midsomer	0.4	0.5	0.5	0.5	–0.1	0.0
Windmill Hill	3.7	4.1	3.7	3.7	0.0	0.4
Relining	9.5	10.2	10.2	10.2	–0.7	0.0
New connections	0.4	*	0.4	0.4	0.0	*
Supply/Demand	15.5	*	15.5	15.5	0.0	*
Raw Water deterioration						
Stowey	0.6	0.8	0.8	0.8	–0.2	0.0
Barrow	5.8	6.8	6.8	6.8	–1.0	0.0
Total for projects with relevant cost information					–1.9	1.9

Source: CMA Analysis
* Relevant unit cost figures relating to 'new connections' and 'supply/demand' have not been included for the reasons set out in the respective discussion of these schemes.
Notes:
1. Total figures may be subject to rounding errors.
2. Southern Resilience based on the scheme proposed in SoC, adjusted by £5.4 million for the estimated cost of the Rowberrow reservoir to aid comparison.
3. This analysis does not include two tenders, which would increase the upper bound of the range of cost estimates for those schemes.

6.346 Our review found that the scope for increases to our allowance was some £1.9 million, which equalled the scope for specific cost reductions.[498]

6.347 We concluded that our review of costs did not demonstrate any systematic bias in either imposing unrealistic cost challenges or in failing to apply sufficient cost challenge. It was therefore not clear that any additional efficiency challenge would be appropriate.

Findings on enhancement expenditure

6.348 In the case of the Cheddar WTW and Southern Resilience projects, we encouraged Bristol Water to make further submissions that either demonstrated how it had adopted a strategic and proportional approach on those schemes or that amended those plans in the context of its overall

[498] See Appendix 6.1. We recognised that our review of new connections and supply/demand schemes was based on unit cost models, rather than scheme specific benchmarks and that this evidence gave comfort that the costs were not excessive but did not provide evidence that the costs for those specific schemes would be efficiently incurred. We therefore excluded their impact in our overall assessment of costs.

programme of capital maintenance and enhancement. We considered the evidence submitted by Bristol Water and have made allowances

6.349 We have not sought to impose any standard ‘efficiency challenge’ on the grounds of scope to those projects we had not reviewed in detail in our provisional findings. We considered Ofwat’s suggestion, in response to our provisional findings, of applying a further flat efficiency challenge was not a robust basis for imposing a ‘scope’ challenge. It was not clear to us on what basis Ofwat considered this necessary given that our provisional allowance had reduced the enhancement allowance made by Ofwat and that Ofwat had not sought to impose a ‘scope’ challenge.

6.350 Our approach to assessing enhancement expenditure when reaching our provisional findings had been driven by our initial review of Bristol Water’s SoC, Ofwat’s company specific appendix for the final determination and all relevant submissions from interested parties. That review did not find evidence that Ofwat had specific concerns with Bristol Water’s approach to a significant proportion of its business plan.

6.351 Given Ofwat’s concerns we again reviewed the nature of those schemes which had been subject to less scrutiny and found that there was little evidence to suggest that their scope could be challenged in a proportionate manner without reducing the benefits that those schemes intended to deliver.

6.352 We have, however, sought to obtain additional assurance over the level of expenditure for those schemes which were not directly reviewed in our provisional findings. As discussed in appendix 6.1 we took assurance on this point from Ofwat’s own unit cost modelling which is based on industry cost information and which we consider indicates that Bristol Water’s costs relating to a further £41 million of gross enhancement schemes (£16 million net) are reasonable for the nature of the enhancement delivered by the schemes.

6.353 We considered whether our overall allowance for enhancement expenditure demonstrated any inconsistency as a result of our approach of adjusting Bristol Water’s cost estimates down to a benchmark. Our evidence base on enhancement schemes was derived from three principal sources (CKBS, Mott MacDonald and Aqua), but we recognised that the findings of each were not directly comparable to one another given the stage of design at which the review was undertaken and the nature of the conclusions.

6.354 We made increases to both Southern Resilience (based on a revised scheme design) and to asset reliability (based on a review of the evidence on the cost rates for trunk mains relining). We set out an uncertainty mechanism for Cheddar WTW should further investigations demonstrate need for additional remedial works.

6.355 Our findings from our project based review are summarised in Table 6.5 below. We have made an initial allowance of £88.6 million.

Table 6.5: Summary of findings on enhancement projects

£m

		Has Bristol Water demonstrated sufficient evidence?			
Scheme	*Total in SoC*	*Need*	*Most suitable option*	*Cost*	
Cheddar 2	42.8	No	-	-	0.0
Cheddar WTW	20.8	Yes	No	-	1.0
Raw water deterioration	8.0	Yes	Yes	Yes	8.0
Southern Resilience	28.1	Yes	Yes	Partial	27.0
Growth	12.5	Yes	Yes	Yes	12.5
NEP	11.0	Yes	Yes	Yes	11.0
Asset reliability	10.2	Yes	Yes	Yes	10.2
New connections	0.4	Not assessed	Not assessed	Yes	0.4
Supply/demand balance	15.5	Not assessed	Not assessed	Yes	15.5
Lead	0.8	Not assessed	Not assessed	Not assessed	0.8
SEMD	2.2	Not assessed	Not assessed	Not assessed	2.2
Total	152.3				88.6

Source: CMA analysis.
Note: '-' indicates we have not specifically concluded on this aspect of a project.

7. Overall wholesale totex assessment

7.1 As explained in paragraph 3.38, in this section we consider the output from the three previous cost assessment sections (analysis in Sections 4, 5 and 6) to arrive at an overall view of base expenditure and totex for Bristol Water.

Wholesale cost assessment based on econometric benchmarking

7.2 The results of our econometric benchmarking assessment are shown in Table 7.1 (from paragraph 4.263). The table presents a 'build up' of our estimate of Bristol Water's wholesale base expenditure requirements from the results of our alternative econometric models, addition of policy items and consideration of special cost factors. The results of the benchmarking assessment are then compared with the Ofwat final determination and the Bristol Water business plan.

Table 7.1: Wholesale totex expenditure build up for Bristol Water 2015-2020

£m (2012/2013 prices)

	Bristol Water business plan	*Ofwat final determination*	*CMA analysis*
Base expenditure from benchmarking models (at average efficiency)		279.2	300.17
Adjustment for upper quartile efficiency		(18.2)	
Adjustment for treatment complexity (further to allowance in models)		18.2	
Adjustment for Canal and River Trust payments		6.3	8.10
Adjustment for Bristol City congestion		3.0	3.65
Adjustment for regional wage measure			5.93
Adjustment for mains renewal programme			8.64
Adjustment for RPI–1% cost trend (efficiency and input price inflation)			(15.98)
Policy items (eg business rates and pension deficit repair)		29.5	29.50
Aggregate wholesale base expenditure estimate	385	318	340.0

Source: CMA analysis (Table 4.13).

Our review of base totex from Bristol Water's business plan

7.3 Our base totex analysis of the Bristol Water business plan found that it is reasonable to expect that Bristol Water will be able to achieve additional efficiencies and/or scope reductions relative to its business plans.

7.4 Our assessment produced a range for base costs of £335 million to £359 million as summarised in Table 7.2 (from paragraph 5.236).

Table 7.2: Base totex analysis of Bristol Water business plan

£m (2013/14 prices)

	Bristol Water business plan	*Ofwat final determination*	*CMA adjustment to Bristol Water business plan*		*Range*
			Low	*High*	
Opex	228	188	–10	–10	218
IRE	76	63	–8	–4	68-72
MNI	80	67	–31	–11	49-69
Total base	385	318	–50	–25	335-359

Source: CMA analysis (Table 5.11).

Our review of enhancement totex from the Bristol Water business plan

7.5 Our findings from our review of Bristol Water's business plan forecasts for its enhancement expenditure requirements are summarised in Table 7.3 (from paragraph 6.355). We found that the allowance for enhancement expenditure should be £88.6 million.

Table 7.3: Summary of findings on enhancement projects

£m

Scheme	*Total in SoC*	*Has Bristol Water demonstrated sufficient evidence?* Need	*Most suitable option*	*Cost*	
Cheddar 2	42.8	No	-	-	0.0
Cheddar WTW	20.8	Yes	No	-	1.0
Raw water deterioration	8.0	Yes	Yes	Yes	8.0
Southern Resilience	28.1	Yes	Yes	Partial	27.0
Growth	12.5	Yes	Yes	Yes	12.5
NEP	11.0	Yes	Yes	Yes	11.0
Asset reliability	10.2	Yes	Yes	Yes	10.2
New connections	0.4	Not assessed	Not assessed	Yes	0.4
Supply/demand balance	15.5	Not assessed	Not assessed	Yes	15.5
Lead	0.8	Not assessed	Not assessed	Not assessed	0.8
SEMD	2.2	Not assessed	Not assessed	Not assessed	2.2
Total	152.3				88.6

Source: CMA analysis.
Note: '-' indicates we have not specifically concluded on this aspect of a project.

Overall totex assessment

7.6 Table 7.4 below summarises our overall assessment of totex arising from our econometric analysis and review of Bristol Water's business plan. These results range from a low case of £424 million to a high case of £448 million. We set out below our considerations in reaching an overall wholesale cost allowance.

Table 7.4: Overall assessment of totex

£m

	Bristol Water business plan	*Ofwat final determination*	*Econometric benchmarking assessment*	*CMA business plan assessment low case*	*CMA business plan assessment high case*
Wholesale base expenditure	385	318	340.0	335	359
Add enhancement expenditure	152	91	88.6	88.6	88.6
Totex	537	409	428.6	423.6	447.6

Source: CMA analysis.

Base expenditure

7.7 The estimate of Bristol Water's base expenditure requirements based on the econometric benchmarking analysis was £340 million. This lies within the range for totex arising from our assessment of Bristol Water's business plan for base expenditure of £335 million to £359 million.

7.8 Within the range we identified from our review of Bristol Water's business plan forecasts for base expenditure, the high case would give more weight to Bristol Water's forecasts and its arguments in support of those forecasts. The low case involves greater adjustments to Bristol Water's forecasts in areas where we identified concerns with the lack of evidence to support those forecasts (eg limited evidence to support increases in costs relative to AMP4 and AMP5 or to explain unit costs that appeared high relative to comparators). There is a risk that the low case could support insufficient investment, if the limitations of Bristol's business plan largely relate to the quality of supporting evidence rather than the underlying need to invest. The risk of using the high case is that customers could fund additional investment which may not be required.

7.9 We considered it important to have carried out both the econometric benchmarking analysis of base expenditure and the review of Bristol Water's business plan. We recognise that both approaches have limitations. The estimate of £340 million based on the econometric benchmarking analysis is consistent with the outcome of our review of Bristol Water's business plan.

7.10 On balance, given our objectives and approach set out in Sections 2 and 3 and the general statutory duties set out in paragraphs 2.16 to 2.18, we considered it appropriate to use the figure of £340 million for base expenditure.

7.11 The econometric benchmarking estimate is 2% below the mid-point of the range from our review of Bristol Water's business plan for base expenditure. We did not, however, consider that the mid-point from our business plan review for base expenditure should be taken as a central forecast from that review. This was not the intention behind us estimating a range. We considered it appropriate, in assessing the efficient level of expenditure, to give more weight to the estimate that made use of industry-wide benchmarking analysis, complemented by detailed further assessment to take better account of Bristol Water's needs and circumstances,[499] than to estimates derived from adjustments to Bristol Water's own expenditure forecasts.

7.12 Our estimate of £340 million for base expenditure compares with Bristol Water's planned wholesale base expenditure of £385 million. The difference of £45 million represents a 12% difference in base expenditure between our estimate and the Bristol Water plan. Our business plan review had found that it is reasonable to expect that Bristol Water should be able to spend less than it projected in its plan. We considered that a 12% reduction in cost from the Bristol Water business plan for base expenditure is achievable in the light of our analysis and the limitations we found in the Bristol Water business plan (discussed in Section 5).

Enhancement expenditure

7.13 In terms of enhancement expenditure, the differences between our estimates and Bristol Water's forecasts concerned the scope of what was required. Two projects in the Bristol Water plan were not considered necessary for AMP6:

(a) Cheddar 2 reservoir, cost £42.8 million.

(b) Cheddar WTW, cost £20.8 million (£1 million allowed, with a notified item mechanism).

7.14 Our assessment found that the Cheddar 2 investment was not demonstrated on the basis of need. The Cheddar WTW investment has not been shown to be the most suitable option. We found that without Cheddar 2, Bristol Water's planned headroom was sufficient to ensure an appropriate level of supply in the event of asset failure and to accommodate the uncertainty of climate change. Therefore, we considered that it was not in the best interests of customers to fund these projects through customer bills in AMP6. We allowed a notified item for Cheddar WTW, as we recognised that there was uncertainty over the need that may be resolved in the early part of AMP6.

[499] As noted in paragraph 4.256, we were in any event concerned about the risks of an undue emphasis on upward adjustments of special cost factors in favour of Bristol Water.

7.15 We have not adjusted the expenditure planned by Bristol Water for those enhancement projects that we considered necessary. When the enhancement projects that we decided to be unnecessary are taken out of Bristol Water's plan, our assessment of enhancement expenditure requirements is £88.6 million, which is the same as Bristol Water's business plan.[500]

Overall assessment

7.16 The estimate of base totex of £340 million from our econometric benchmarking analysis plus our estimate of enhancement totex from the Bristol Water business plan of £88.6 million gives a totex figure of £428.6 million. This compares with the totex figure in the Bristol Water business plan of £537 million and in the Ofwat final determination of £409 million.

7.17 We therefore determined that wholesale totex should be £428.6 million.

[500] This includes a further amendment of –£1.1 million for the Southern Resilience investment as revised by Bristol Water (see Table 7.3).

8. Reconciling 2010-2015 performance

Introduction

8.1 As part of PR09, Ofwat introduced mechanisms to allow for reconciling company financials at the end of the period. The implementation of these mechanisms were included in the PR14 process and were intended to be objective measures.

8.2 There are three areas for us to determine:

(a) **Historical serviceability (£4.1 million RCV adjustment)** – Ofwat set a series of outcome-based metrics aimed at ensuring that the company managed and maintained its assets so that they remain fit for purpose. If these metrics were missed or were unstable, Ofwat was able to clawback allowed spend by applying a shortfall to the RCV (reducing its value). One of the metrics concerned the number of properties experiencing an unplanned supply interruption lasting over 12 hours. Bristol Water said that although it had experienced a high number of interruptions over 12 hours in some years, this was insufficient to justify a shortfall.

(b) **2009-10 RCV capping (£4.8 million RCV adjustment)** – PR09 included a capex ceiling to prevent excessive spend being included in the RCV. This cap was designed to increase with inflation costs (based on the COPI). However, these COPI figures take two years to be finalised, so the capping level and associated impact need to be reassessed in light of the actual COPI figures.

(c) **CIS indexation methodology (£9.3 million RCV adjustment)** – in FD14, Ofwat identified that it may have been inconsistent with its treatment of RPI in applying its CIS. It said that for many companies, including Bristol Water, the resulting RCV was too large.[501] Ofwat is consulting stakeholders and considering whether to make an adjustment, which would be made at the end of PR19.

8.3 Each of these areas is discussed below.

[501] Note this is a cross-industry issue and does not only affect Bristol Water.

Historical serviceability

8.4 ‘Serviceability’ refers to an outcome-based assessment designed to ensure that companies are properly monitoring, managing, and maintaining their asset systems. Ofwat deemed that all companies had been properly funded to deliver ‘stable’ service levels by 2012.[502] In the event of a failure, a shortfall is applied to the RCV that represents a clawback of allowed monies that had been allocated to achieving the specific objectives.

8.5 Ofwat assessed Bristol Water as failing one of its serviceability indicators representing the number of properties that experienced an unplanned interruption of over 12 hours (DG3 UI>12). As a result, Bristol Water had a £4.1 million negative adjustment applied to its RCV.[503] We consider the following questions as a way of assessing the appropriate associated shortfall (if any) on Bristol Water:

(a) Did Bristol Water miss its targets?

(b) Were the target levels appropriate?

(c) Was the assessment methodology appropriate?

Did Bristol Water miss its targets?

8.6 Bristol Water’s DG3 UI>12 performance exceeded its control limit of 150 properties in 2014 and 2015 (as well as previous years), with 860 and 41,241 properties affected respectively.[504] This was clearly higher than its targets at a headline level. There were four major events over the past two years that largely contributed to this deterioration in performance.

8.7 We consider (and both Ofwat and Bristol Water agreed) that in principle, events that are beyond management’s control should be excluded from the control limits.[505] Therefore, if the four specific major events were ‘outside management control’, Bristol Water could be considered not to have breached its targets.

8.8 Bristol Water considered that these events were either exceptional due to substantial difficulties in restoring supplies or by being beyond its control.[506] However, CH2M (which provided engineering evidence to Bristol Water to assess its handling of these events) considered that the majority of them

[502] Ofwat, Final price control determination notice: policy chapter A4 – reconciling 2010-15 performance, p53.
[503] Bristol Water SoC, paragraph 1792.
[504] Bristol Water SoC, Table 123.
[505] Bristol Water SoC, paragraphs 1843–1845; Ofwat response, paragraph 500.
[506] Bristol Water SoC, paragraph 1871.

were not fully beyond its control. Only one of the four events would be reduced to less than 12 hours if the interruption time that CH2M considered was fully outside management control was removed. Bristol Water still exceeded its control limits in both 2014 and 2015 if this event was excluded. See Appendix 8.1, Table 2 for details.

8.9 In response to our provisional findings, Bristol Water stated that it is important to consider the reasonable interpretation of 'management control' at the time, which was focused on the delivery of specific outputs (rather than the outcome focus of ODIs in PR14).[507] It also stated that CH2M's assessment of management control was commissioned to consider whether the events related to any underlying problems or causes for concern (and hence if such events were 'exceptional'), rather than whether the duration or number of customers affected could be reduced.[508]

8.10 We considered that Bristol Water had used a narrow definition of 'management control', which was overly reliant on how it responded to specific events rather than considering wider controls.

8.11 CH2M's stated interpretation was that partial management control meant 'managing the repair/incident in conditions which cause general hindrance of difficulty to achieving progress […]. Examples include rapidly flooding excavation, weather conditions hindering repair.' This did not appear exceptional to us. Similarly, the idea that all 12 events that caused interruptions of over 12 hours in this period had a major exceptional element appeared unlikely.[509]

8.12 The fact that CH2M was only asked to assess the level of management control with regard to responding to the incident itself supports our view that Bristol Water focused on a narrow view of management control.

8.13 Based on the views of CH2M that the events were at least partially within management control (even using a narrower definition than we considered appropriate), and considering the limited evidence of any wider control methods being implemented (none of which appear to have been suitable for

[507] Bristol Water response to our provisional findings, paragraphs 696–697.
[508] Bristol Water response to our provisional findings, paragraphs 705–706.
[509] Nearly 60% of time lost was classified as 'partial management control', with eight events having >50% classified as 'partial management control'. Based on CH2M's assessment and classification for all events >12 hours that affected ten or more properties.

use in these four events specifically), we did not consider these events to be outside management's control.[510]

8.14 We therefore found that Bristol Water had breached its targets in multiple consecutive years, and so could not be assessed as 'stable' for DG3 UI>12.

Were the target levels appropriate?

8.15 Bristol Water highlighted in its response to the draft determination for 2009 that it had proposed its control limit should have been raised to 344.[511] It supported this in part by noting that there are significant variations in values used by Ofwat for similarly sized companies.[512]

8.16 Ofwat set the target level and control limits based on the historical performance of a specific company, rather than a comparative assessment across the industry. This appeared reasonable in principle, and we considered that the methodology to calculate an appropriate level constituted part of the PR09 determination. Therefore, we considered that it was inappropriate to intervene in this area retroactively.

8.17 In practice, even if the control limit had been changed to 344, Bristol Water would still have exceeded this value in the past two years with successive increases, resulting in an assessment of serviceability below the stable level.

8.18 Therefore, we considered that the target levels and control limits appeared appropriate, and were ultimately unlikely to make a difference in the assessment of stability of DG3 UI>12 for Bristol Water in this case.

Was the assessment methodology appropriate?

8.19 Bristol Water raised a number of concerns around the serviceability assessment methodology. It said the following:

(a) The inherent high volatility of DG3 UI>12 made it a poor metric to use, and it did not fulfil the goal of representing infrastructure serviceability.[513]

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[510] For example, Bristol Water stated that following the Luckington Bridge event, it has now implemented operational procedures and checks to ensure no such cause is repeated. We would expect that these are the forms of management control that should have been used to prevent the event in the first place, particularly when operating in areas fed by a single supply resulting in higher risk of interruption. Bristol Water SoC, paragraph 1869.
[511] Bristol Water SoC, paragraph 1859.
[512] Bristol Water SoC, paragraphs 1854–1858.
[513] Bristol Water SoC, paragraph 1835.

(b) As in previous price reviews, the metrics should be considered as a basket (bursts should be considered as the 'lead' metric in weighting this), so failure in a single metric should not necessarily result in a shortfall.[514] Bristol Water highlighted that other companies also appear to have only become aware of Ofwat's change in methodology (to shortfalls for breaches in individual indicators, rather than considering a basket with lead indicator) at draft determination 2014.

(c) In support of this, Bristol Water highlighted a workshop Ofwat ran after the final determination 2009 (FD09) in which a specific example was used that it considered analogous to the current situation, where Ofwat indicated that no shortfall should be applied.[515]

(d) In response to our provisional findings, Bristol Water also commented that Ofwat's stated methodology included an annual assessment, and since this was not completed for 2011/12 and 2012/13, and that performance in 2013/14 was comparable with the example Ofwat provided in its workshop, then 2014/15 was the only year's performance for which a shortfall could be applied. This had the effect of limiting the maximum shortfall to £1.6 million.[516]

(e) Bristol Water also stated that a serviceability penalty should only be applied where a company failed to spend the money allowed to it in the previous review, or if it mis-spent that allowance and so failed to maintain its assets.

8.20 Bristol Water supplied representations made to Ofwat by other water companies at draft determination. Bristol Water stated that this was when Ofwat proposed a serviceability shortfall, having departed from its previous methodology. South East Water, Southern Water and Thames Water all raised concerns about the methodology.

8.21 Bristol Water also considered the size of the adjustment (£4.1 million) was disproportionate to the impact on customers (implying that it should have spent up to £1 million on each incident to keep it below 12 hours), particularly given that customers were compensated under the GSS (guaranteed standards scheme) where appropriate.[517] It also stated that the retroactive adjustments to the RCV was inconsistent with good regulatory practice (citing the CC in its Phoenix Natural Gas Limited (PNGL) decision in

[514] Bristol Water SoC, paragraph 1817.
[515] Bristol Water reply, paragraph 492.
[516] Bristol Water response to our provisional findings, paragraphs 666 & 692 and 714.
[517] Bristol Water response to our provisional findings, paragraphs 664–665 and 711.

2012), as it could undermine investor confidence in the regulatory environment.[518]

8.22 Ofwat stated that customers not receiving a supply of water for more than 12 hours was a clear sign of service failure. It stated that numerous documents (largely given at FD09) referred to its updated AMP5 methodology, which superseded previous guidance.[519]

8.23 Following our provisional findings, Ofwat commented that the serviceability assessment was an outcomes-based approach, the aim of which was to ensure companies maintained a serviceable network, rather than targeting prevention of specific incidents. Ofwat stated that companies should focus on maintaining and improving service to customers, rather than on spending the allowances in the price review.

8.24 Ofwat noted that the example which Bristol Water used to support its case (from a workshop in April 2010) was not an appropriate comparison with Bristol Water's performance. Ofwat stated that the example showed an improvement in its DG3 indicator in the last year of the price control, while in contrast, Bristol Water had two years of deteriorating indicator performance at the end of AMP5. On this basis, Ofwat suggested the example was not directly relevant to Bristol Water's circumstances, and should be discounted. Ofwat also highlighted that the accompanying notes section to the workshop stated that persistent failures in DG3, DG2, or any other indicator could lead to a less than stable assessment.

8.25 During its determination process, Ofwat recognised the volatility of the DG3 UI>12 measure, and as a result it implemented a 'volatility factor' between draft and final determinations that reduced any shortfall for DG3 by 25%.[520]

CMA discussion

8.26 The aim of outcome-based assessments was to allow the companies some flexibility in their management processes to provide their services. They were therefore designed as a measure of the effectiveness of the management process in determining how to achieve the required outcomes (one of which was avoiding long duration disruptions to customer supplies) and then managing their systems to ensure the desired outcomes were achieved. Spending the amount allowed at a price review is insufficient in

[518] Bristol Water response to our provisional findings, paragraph 685.
[519] Ofwat response, paragraphs 104 & 488–491.
[520] Ofwat response, paragraph 111; Ofwat final price control determination notice: policy chapter A4 – reconciling 2010-15 performance, p66.

itself, if the outcomes are not met. This is consistent with the intention of the mechanism at the time it was set.

8.27 The choice of serviceability indicators was part of the PR09 determination, and consequently we considered it inappropriate to intervene in this area retroactively. We noted that Bristol Water exceeded its upper control limit for DG3 UI>12 in three out of the five years in the period (and was within 4% of exceeding the limit on the fourth year), indicating that it is unlikely that it was the natural annual volatility of the metric that caused the breaches.

8.28 We also noted Bristol Water's comment around the volatility between events such that a single event can result in a breach of the control limit on its own.[521] We considered that this reflected the differential impact a burst (or other cause of interruption) can have on customers. To the extent that delivering a stable level of service to customers is important, it appeared appropriate to reflect this risk differential in the asset serviceability assessment.

8.29 In assessing the Ofwat workshop, the Ofwat example provided shows a breach of the control limit by four times the limit before recovering, whereas Bristol Water breached its control limit by 275 times with no evidence of recovery at the time of assessment. We therefore put limited weight on the comparability of Bristol Water's situation and the workshop example. See Appendix 8.1 for details.

8.30 We would expect any guidance at the start of AMP5 to supersede previous documents (as it applies to AMP5 itself), and Ofwat has highlighted passages that refer to the updated methodology. In our view, there was sufficient guidance (albeit with limited signposting) around the updated methodology to expect Bristol Water to have been aware of it. See Appendix 8.1, for passages from Ofwat's documents that highlight this.

8.31 We noted Bristol Water's comments regarding regulatory precedent and good regulatory practice. We agree that changes to the RCV require good justification. In this particular case, we considered that these adjustments were properly signalled, and consistent with the forward-looking guidance at the time (including through additional engagement with the companies). In our view they were well justified, and should have no detrimental effect on investor confidence.

8.32 We found the assessment methodology to be sufficiently clear for Bristol Water to be expected to comply with it. In addition, we considered there was

[521] Bristol Water response to our provisional findings, paragraphs 683–684.

nothing that suggests it would be proportionate for the CMA to substitute an alternative methodology.

8.33 When Ofwat ceased collecting annual June returns from the companies, it also stopped making an in-year assessment of the company's serviceability performance. We did not consider that this placed a lower requirement on Bristol Water to maintain its assets at a serviceable level. We considered Bristol Water's stated view that since an annual assessment was not carried out in the period no shortfall should be applied, ran contrary to the intentions of the mechanism at the time (a principle Bristol Water supported).[522] It was also a possible misinterpretation of the guidance itself.[523]

8.34 Regarding the proportionality of the shortfall, we noted that this was calibrated based on the level of asset investment which was allowed, and the methodology set out in advance.[524] We considered that to make statements regarding spend per incident appeared to miss the point of the regime, which was designed to reflect the health of the underlying assets. It is consequently disconnected from the impact of any specific events.

8.35 We found that Bristol Water breached the appropriate control limits on the DG3 UI>12 indicator for serviceability and, following the guidance in PR09, it was due to incur a serviceability shortfall.

8.36 In our view, the calculation of the associated shortfall was laid out in PR09, and we considered that it would be inappropriate for us retroactively to adjust this. Therefore, we found that Ofwat's £4.1 million reduction to the RCV should remain.

2009-10 RCV capping

8.37 For price setting periods up to and including 2005-10, Ofwat made capital expenditure subject to a 'ceiling on investment' or 'cap' before being added to the RCV. If a company spent more than assumed in the determination, some of the excess amounts would not be included in the RCV.[525]

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[522] With regard to the definition of management control, Bristol Water stated that 'the CMA must consider what was a reasonable interpretation of management control for companies to take at that time, ie in the context of what was set at FD09'. Bristol Water response to our provisional findings, paragraph 696.
[523] Guidance that 'a company should assume it is at risk of a shortfall adjustment at the next price review if we assess serviceability as less than stable in any year from the 2012 June return (or equivalent) onwards' could be interpreted as in-year assessment or subsequently (as Ofwat now states). Bristol Water response to our provisional findings, paragraph 691.
[524] For example, in PR09/38: 'We said in PR09/06: Setting price limits – logging down and shortfalling that we would base any shortfall on a proportion (up to a maximum of 50%) of the present value (PV) of the capital maintenance expenditure assumptions we made at the 2004 price review, for the relevant sub-service.'
[525] Ofwat response, paragraph 473.

8.38 At PR09, Ofwat (and subsequently the CC) used the latest information on COPI to inflate its PR04 assumption on this cap.[526] Using this information, Bristol Water was judged to have exceeded its allowed capex by £17 million.[527] This resulted in it hitting the cap, and £1.8 million was not allowed to be added to the RCV (at the time).[528] Bristol Water stated that this was now worth £4.8 million.[529]

8.39 However, at the time of PR09, certain numbers used were still estimates for the final year in which the determination was being made (2009-10 for FD09). This resulted in the need for an adjustment in subsequent price controls to reconcile to actual figures. Specifically for the CC10 determination, the COPI figures were still estimates (this can be the case for up to two years after their initial release).[530]

8.40 Bristol Water and Ofwat disagreed over the appropriate COPI figures to use in this reconciliation, primarily due to the COPI series being revised in 2010. The original series that Ofwat used (subsequently referenced as '1995 COPI') was discontinued and a new index (subsequently referenced as '2005 COPI') was produced.[531] See Appendix 8.1, for a comparison of the 1995 COPI and 2005 COPI series.

8.41 Bristol Water said that it used the provisional 1995 COPI figures to assess how much capex it could spend without breaching the cap. This was aligned with the incentive regime in place at the time. Subsequent revisions therefore acted as a retrospective adjustment.[532]

8.42 Bristol Water also stated that Ofwat's calculation of the RCV adjustment did not take into account previous RCV capping. It said that, therefore, the associated £0.9 million adjustment should be removed.[533]

CMA discussion

8.43 Data for both the original 1995 COPI series and the updated 2005 COPI series were available for this period, so it was possible to use either dataset for this purpose. Therefore, we considered the key question was which of

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[526] Ofwat response, paragraph 474.
[527] Bristol Water SoC, paragraph 354.
[528] Bristol Water SoC, paragraph 359.
[529] Bristol Water reply, paragraph 620.
[530] Ofwat response, paragraph 474.
[531] COPI notes and website.
[532] Bristol Water response to our provisional findings, paragraphs 719–720.
[533] Bristol Water response to our provisional findings, paragraph 725.

the two datasets most accurately reflects the original intention, which was to act as a cost inflation measure on the capex cap.

8.44 We also considered that the original intention of the reconciliation process was to allow for actual (rather than business plan forecast) capex, and any amendments for ‘logging up and down’ to update the provisional figures to their finalised versions for the necessary years was not intended to make substantial retroactive changes to the price control.[534]

8.45 Bristol Water was aware of the reconciliation process, and that the COPI estimate would be revised. Its submissions indicated to us that it made an active decision to spend capex up to the capping limit, knowing that this cap could move if the revised COPI figures differed from its original estimate. Therefore we did not consider any adjustment applied to be a retroactive change which Bristol Water could not predict, but simply the implementation of a known true-up mechanism.

8.46 Guidance issued by the Department for Business, Innovation & Skills (BIS) around the time of the first revision to COPI stated that for existing arrangements, the original series (1995 COPI) should be used up to Q2 2010.[535] Doing so would imply using the original series for the whole time period in dispute.

8.47 We also contemplated whether using 2005 COPI would improve the accuracy of the series, but we considered that any benefits would be small (see Appendix 8.1).

8.48 Bristol Water commented about a £0.9 million overlap between RCV capping and shortfalling (see paragraph 8.42). This was a question around the interaction of the RCV capping with another AMP5 mechanism (shortfalling). Shortfalling was a mechanism designed to reconcile how much money the company actually spent in the final year with the estimated amount it had been allowed to add to its RCV.

8.49 We noted that most of this £0.9 million shortfall (£630,000) was due to a difference between estimated and actual IRE, which was excluded from the cap on investment (consistent with PR09 approach), and therefore could not conflict with the RCV cap adjustment.[536] The remainder was largely from above ground assets, which could have potentially interacted with the RCV

[534] Ofwat described the logging down process where ‘changes in obligations, standards or demands not previously recognised in price limits reduce costs or where outputs already financed in price limits are no longer required’. PR04 Framework and Approach, paragraph 9.14 and Annex 4.
[535] COPI notes and definitions (methodology and revision policy).
[536] Bristol Water RCV midnight adjustment model, tab ‘Calc 1 - outperformance adj’, cell J60; adjusted for inflation.

cap. However, we noted that if the underspend (which resulted in a shortfall) had occurred in an earlier year in the period, it would have had the same overall effect on RCV additions, but would not have resulted in any risk of double-counting in 2009-10. This indicated that the £0.9 million shortfall remained appropriate.

8.50 Therefore, we considered it appropriate to retain the 1995 COPI series across the period in question. On this basis, adopting Ofwat's methodology would result in the most up-to-date figures from this series being used. We did not consider it correct to adjust this for the effect of shortfalling in the same year. We therefore found that the £4.8 million adjustment to RCV that Ofwat implemented should be retained.

CIS indexation methodology

8.51 The CIS process included a comparison of the allowed capex level with actual spend for AMP5. In FD14, Ofwat identified that it had been inconsistent with its treatment of RPI in this regard, but proposed not to make any changes at that late time in the process.[537] See Appendix 8.1 for additional details on Ofwat and Bristol Water's views on the CIS indexation methodology.

8.52 Ofwat undertook a consultation on its approach to address this issue, which closed in May. In the consultation, Ofwat proposed to remove the amount remaining in the RCV at the end of PR19 (ie net of run-off), but not to claw back any other benefits received.[538]

8.53 Ofwat estimated that this represents £9.3 million of RCV for Bristol Water, which (allowing for run-off over the period) would be £6.9 million at the end of PR19.[539]

CMA discussion

8.54 We had the option to include this in our determination work, or to allow Ofwat to handle it through its ongoing consultation process. Anglian Water also submitted representations on the methodology. This reinforced the merit of a broader consultation across water companies to determine this issue.

[537] Ofwat response, paragraph 513.
[538] Ofwat response, paragraph 515.
[539] Ofwat response, paragraph 515.

8.55 We found that, given the circumstances and limited materiality of the issue for Bristol Water (relative to other areas of investigation), it was prudent to allow Ofwat to conduct its industry-wide process without intervention from us.

8.56 In response to this conclusion in our provisional findings, Bristol Water stated that it considered this to be appropriate.[540]

[540] Bristol Water response to our provisional findings, paragraph 670.

9. Outcome delivery incentives

9.1 In this section, we discuss measures called ODIs that were set in PR14 to incentivise performance against measurable outcomes to benefit customers.

Introduction

9.2 For PR14, Ofwat went through a process to incentivise outcome performance. This was designed to reduce direct regulatory oversight and give companies flexibility in their approach to managing resources, while focusing on directly benefiting customers in areas they care about.

9.3 The intention behind the design of these incentives was that they should be based on customer research and agreed with the LEF. Companies were asked to develop a list of metrics and targets, based on the customer research, in order to provide broad specified outcomes (eg 'Reliable Supply'). This also included deciding the type of reward/penalty that was appropriate for exceeding/failing (eg financial, reputational, etc) and setting the size of any financial incentives. Collectively, these are referred to as ODIs.

9.4 Ofwat released guidance on how the financial incentives should be calculated, which was dependent on customers' stated willingness to pay around a particular outcome.[541]

9.5 Ofwat encouraged the use of both rewards and penalties in its ODIs, as well as suggesting the use of deadbands (performance limits within which no reward or penalty is applied) and caps/collars (the maximum size of rewards and penalties respectively), where appropriate.

Ofwat's framework and intervention methodology

9.6 While encouraging companies to develop their own ODIs and targets, Ofwat chose to intervene in some of these areas, particularly regarding the target levels of service required. It stated that horizontal benchmarking was particularly appropriate when customers were unaware of the level of service that other companies were providing, so were not able to assess accurately Bristol Water's relative performance for themselves.[542]

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[541] For example, Ofwat (July 2013), Final methodology and expectations for companies' business plans, Appendix 1: Integrating the calibration of outcome delivery and cost performance incentives.
[542] Ofwat response, paragraph 433.

9.7 When intervening, Ofwat generally set company targets to historical industry upper quartile performance.[543] It said that customers have paid for upper quartile performance, and so deserved to receive it.[544] In some instances (eg leakage) Ofwat did not estimate upper quartile performance from cross-industry data, instead basing the targets on analysis of economic performance levels. It said that it was well established that economic leakage levels differed significantly by area (eg due to water scarcity), which had not been demonstrated for other ODIs.[545]

9.8 Ofwat chose to intervene in three areas of Bristol Water's wholesale performance targets (out of 15), setting more challenging target levels than Bristol Water had originally proposed. All of these targets involved a financial incentive. Bristol Water estimated that the expected impact of these ODI changes was a penalty of £3.2 million in total.[546,547]

9.9 Ofwat said that it was reasonable to expect both upper quartile cost-efficiency and also upper quartile performance targets because it expected companies to continue to improve both aspects across AMP6. This was combined with the fact that performance levels were set at historical upper quartile levels.[548]

9.10 See Appendix 9.1 for the figures (targets, deadbands, caps and collars) that Bristol Water originally set, and Ofwat's subsequent interventions.

9.11 Ofwat also said that Bristol Water benefited from horizontal benchmarking in one area that was not highlighted in the Bristol Water SoC. At draft determination, Bristol Water had proposed relatively large maximum penalties for two asset health ODIs compared to the rest of the industry. Ofwat suggested that Bristol Water review these penalty levels in light of this evidence. Bristol Water estimated that this resulted in a lowering of the maximum associated penalty from £38.9 million to £19.5 million (although the likely figure would be significantly less).[549]

[543] Based on data from April 2011 to March 2014; Ofwat response, paragraph 436.
[544] Ofwat response, paragraphs 96–98.
[545] Ofwat response, paragraph 438.
[546] Based on P50/expected performance (where P[XX] represents the confidence level, ie the percentage chance that the company will exceed this performance level); Bristol Water SoC, paragraph 1885 and Table 127.
[547] The incentives used to calculate ODIs are affected by the menu choice, so will change if Bristol Water has a different cost sharing rate from FD14.
[548] Based on April 2011 to March 2014; Ofwat response, paragraph 436.
[549] These are based on the maximum penalty. The P10 (the 10th percentile case) penalty was reduced from £8 million to £6 million.

Views on Ofwat's approach

9.12 Both CCWater and the LEF commended the overall approach of improved engagement with customers, in particular the use of outcomes and ODIs.[550,551]

9.13 Bristol Water was supportive of the introduction of ODIs and of the broad framework applied in PR14.[552] However, it told us that it was concerned about Ofwat's use of horizontal benchmarking for a number of reasons:[553]

(a) Benchmarking did not take into account customers' preferences.

(b) Ofwat assumed that upper quartile efficiency service could be delivered by upper quartile efficiency cost companies.

(c) Ofwat was inconsistent when choosing to exclude certain metrics (eg it chose to exclude leakage from horizontal benchmarking as this was set at an economic level).

(d) Performance was often driven by historical decisions, which did not necessarily target (or fund) companies at an upper quartile level.

(e) Some of the benchmarked targets set were unrealistic given Bristol Water's current position, and a two year glide path that Ofwat used was insufficient time to achieve the necessary changes.[554]

9.14 Dŵr Cymru Welsh Water provided additional representations, voicing concerns about the ODI methodology used:[555]

(a) Horizontal benchmarking was introduced late in the process, with limited time to consider its validity or impact.

(b) The approach ignored the views of customers.

(c) It also had the effect of potentially undermining ownership of the company's business plan (which Ofwat was keen to foster throughout the process), particularly since the estimated costs and performance targets were inextricably linked.

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550 Summary of hearing with CCWater, paragraph 3.
551 Summary of hearing with LEF, paragraph 3.
552 Bristol Water SoC, paragraph 1934.
553 Bristol Water SoC, paragraph 1929.
554 Bristol Water SoC, paragraph 1931.
555 Dŵr Cymru Welsh Water submission.

CMA approach to ODIs

9.15 We agreed that the ODI framework should be able to deliver real benefits to customers while providing Bristol Water with both the flexibility and incentives to improve performance, where appropriate through investment.

9.16 In general, we were supportive of Ofwat's emphasis on outcomes that matter to consumers, the use of performance commitments, and allowing diversity across companies in the identification of desired outcomes and in the specification of performance commitments and delivery incentives. However, there were some risks of inconsistencies in the way Ofwat had applied these principles:

(a) The theoretical basis on which ODIs were designed appears to assume that the target is set at the economic level for the metric. The framework included some consideration for if the target is below this level,[556] but for Ofwat to consider that upper quartile performance (historical or otherwise) would match economic levels appeared unlikely to us in general.

(b) Ofwat emphasised the importance of using ODIs to focus on outcomes for customers, rather than policing inputs/outputs, which regulators had previously attempted to do. However, not all the ODIs appear to adhere to this principle. For example, at the Ofwat final determination, Bristol Water had an ODI associated with the delivery of Cheddar WTW improvement (discussed in more detail in paragraph 9.72) which was an output-focused measure (targeted at a specific scheme). This appeared to be a way to mitigate risks associated with the removal of the logging up/down mechanism that was used in previous price reviews.

(c) In developing its ODI framework, Ofwat strongly encouraged companies to include financial rewards in some of their metrics. However, both CCWater[557] and the LEF suggested that it was not appropriate to fund financial rewards for out-performance through higher customer bills. Bristol Water's customers also rejected the concept of rewards being funded through an increase in bills.[558]

9.17 In the context of our determination, we found that no intervention was appropriate in these areas, as we were sufficiently supportive of the overall

[556] For example, 'if a performance commitment was below the ELS [economic level of service] then companies should consider basing the ODI on costs only'. Bristol Water SoC, paragraph 1953.
[557] Summary of hearing with CCWater, paragraph 17.
[558] Summary of hearing with CCWater, paragraph 17.

framework, and the impacts of the concerns raised were not particularly material.

9.18 For example, following Ofwat's guidance, Bristol Water included six ODIs with financial rewards. The maximum potential reward from these was around £2.5 million yearly (a total of £12.3 million across the period),[559] and this would require Bristol Water to deliver service quality at least at the capped performance level on every metric.

9.19 Given the relatively small scale of these rewards compared with the size of potential penalties (£55.7 million in the period, of which £18.8 million are in the ODIs with rewards),[560] we decided that it would not be proportionate to make an intervention in this regard during our determination. However, we would encourage Ofwat to take more account of the customer views in this area in future price reviews when designing its risk/reward framework, a principle which Ofwat has supported.[561] See Appendix 9.1 for additional detail on the use of rewards in ODIs.

9.20 Therefore, the rest of this section is focused on a small number of scheme-specific ODIs, and Ofwat's interventions on horizontal benchmarking. Ofwat intervened to change the targets agreed with customers in respect of:

(a) unplanned customer minutes lost;

(b) mean zonal compliance (MZC); and

(c) negative water quality contacts.

9.21 At the end of the section, we discuss a number of ODIs related to specific enhancement schemes which may require adjustments due to the changes between Ofwat's final determination and our determination.

9.22 We also noted that Bristol Water's ODI rates were recalibrated from Ofwat's initial final determination based on its menu choice at the time (as this affected the cost sharing mechanisms). Since our determination included a cost sharing rate of 50%, it may be necessary to repeat this exercise following our determination. Ofwat said that this is something which could be

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[559] Excludes SIM rewards that are not yet determined as based on Ofwat methodology. Bristol Water SoC, Table 124.
[560] Includes 'asset reliability' (£19.5 million maximum penalty), which would be implemented as an RCV adjustment. Excludes SIM rewards that are not yet determined as based on Ofwat methodology. Bristol Water SoC, Table 124.
[561] Ofwat response to our provisional findings, paragraph 152.

completed outside of our determination, and intended to liaise with Bristol Water to accomplish this.

Unplanned customer minutes lost

9.23 Bristol Water chose to adopt a different metric for 'reliable supply' than Ofwat's key performance indicators (KPI) (one of only two companies to do so).[562] Specifically, Bristol Water chose to use 'unplanned interruptions of all durations', rather than 'all interruptions >3 hours' as its measure of performance.[563]

9.24 This made horizontal comparison with other water companies more difficult, particularly since it appeared that some other companies' systems were unable to capture interruptions of all durations; therefore comparable data was not available.[564]

9.25 Bristol Water targeted a reduction from 13.7 minutes/property/year to 12.2 by 2019/20, a reduction of 1.5 minutes over five years.[565] This was based on its Stage 1 customer research, which showed that customers were equally supportive of a 'maintain' (no change) and a 'slight improvement' (20% reduction) package. Having selected the mid-point of these (a 10% reduction), Bristol Water stated this was tested in Stage 2 and was considered as acceptable by 98% of household customers.[566]

9.26 Ofwat estimated an implied upper quartile performance based on the ratio between Bristol Water's own performance in the two different metrics, and then applying this to the industry upper quartile. This was originally performed using a single year of data,[567] and gave an implied upper quartile performance of 7.2 minutes/property/year.

9.27 Having set a target of 7.2 minutes/property/year, Ofwat allowed a glidepath of two years to achieve this. Ofwat also introduced a reward deadband set at its upper quartile level and a penalty deadband at current performance, both for two years, after which the deadbands are removed. The reward cap and penalty collar retained Bristol Water's original gap to the deadbands (1.3 and 1 minutes/property/year respectively).[568]

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562 Thames Water was the other exception that used 'all interruptions >4 hours'; Ofwat response, paragraph 448; Bristol Water reply, paragraph 549.
563 Bristol Water SoC, paragraph 1965.
564 Bristol Water SoC, paragraph 1979.
565 Bristol Water SoC, Table 128 and paragraph 1966.
566 Bristol Water SoC, paragraph 1988.
567 For the Bristol Water ratio, while the upper quartile calculation of 'planned interruptions > 3 hours' was based on three years.
568 Ofwat response, paragraph 447.

9.28 Throughout our determination process, both Ofwat and Bristol Water proposed numerous alternative methodologies supporting different estimates for the upper quartile figure, and these are described in detail in Appendix 9.1.

Discussion

9.29 We considered the potential for replacing Bristol Water's metric with Ofwat's KPI, and then using the upper quartile target, which was supported by the full industry data. However, we put weight on the LEF's engagement, and we considered that the LEF was aware of this choice of metric, and approved it. To change this metric now would be disregarding its views.

9.30 We estimated the historical upper quartile performance level as being 10.2 minutes/property/year, based on a combination of partial industry data for 2012/13, and Bristol Water's own internal data for a consistent period. Our approach is described in more detail in Appendix 9.1.

9.31 We recognised that this was an approximation due to data limitations. Nevertheless, in our view it was the most robust estimation methodology using the data which was available, as it limited the assumptions required.

9.32 We therefore intervened to raise the reward deadband to our estimate of the upper quartile level of 10.18, while retaining Bristol Water's target from its business plan. This will ensure that Bristol Water's customers would only be charged for a significant improvement (likely to require innovation) rather than less significant changes or chance.

9.33 We retained the absolute gap in performance to the reward cap, which kept the maximum reward available at the level proposed in Bristol Water's business plan.

9.34 This resulted in a revised set of ODI targets for all unplanned customer minutes lost, as shown in Table 9.1.

Table 9.1: ODIs for all unplanned customer minutes lost

	Current	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*
Reward cap		8.9	8.9	8.9	8.9	8.9
Reward deadband		10.2	10.2	10.2	10.2	10.2
Target	13.7	13.4	13.1	12.8	12.5	12.2
Penalty deadband		14.4	14.1	13.8	13.5	13.2
Penalty collar		15.4	15.1	14.8	14.5	14.2

Source: CMA analysis.

Mean zonal compliance

9.35 The MZC metric is a water quality compliance measure based on a series of 39 parameters determined by DWI (eg levels of lead, nitrate levels, coliforms present, etc). It is calculated based on sampling each parameter at supply points and customers' taps in a number of specified zones. The MZC is then based on the mean average results from these samples.[569]

9.36 In December 2013, one of these parameters was tightened. Specifically, the allowed lead level was reduced from 25µg/l to 10µg/l.[570]

9.37 Ofwat highlighted that MZC was required by the DWI and was not a 'performance target'; instead it represented a minimum standard that must be achieved. If substantive improvement works were required to address this, they were included in statutory instruments for the licensee, and were funded in FD14.[571]

9.38 Although Ofwat and Bristol Water agreed on the standard that should be targeted, they disagreed on the penalty deadband and penalty collar. Ofwat intervened at final determination to increase Bristol Water's values for these from 99.94% and 99.93% (for the penalty deadband and penalty collar respectively) by 0.01% each.[572]

9.39 Bristol Water stated that Ofwat's figures were based on historical industry performance. This calculation was based on the old lead standard, and hence did not accurately reflect performance against the new standard. It believed that its own performance level under the new lead standards was 99.94%; so this was the level it set as the bottom of the penalty deadband.[573] Bristol Water also said that it had a higher proportion of lead communication pipes than the industry average, implying that these could be contributing to MZC failures.

9.40 Bristol Water also raised a concern around the methodology used for assessing MZC. It stated that the metric was strongly affected by the sampling frequency and size of the zone any infringement was found in. Some metrics were sampled more frequently than others, and the number of samples taken in a zone was based on the population present. Therefore,

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[569] Bristol Water Company-Specific Appendix, p142.
[570] Bristol Water SoC, paragraph 2035.
[571] Ofwat response, paragraph 461.
[572] Bristol Water SoC, paragraphs 2039 and 2041, footnote 1280.
[573] Bristol Water SoC, paragraph 2031.

the MZC value was particularly sensitive to failures in low sample frequency parameters, and small zones.[574]

9.41 Ofwat provided analysis to support its view that there was no relationship between mean zonal compliance performance and the size of water supply zones (based on average population). It also stated that in any event, Bristol Water had relatively large water supply zones.[575]

Discussion

9.42 Neither Ofwat nor Bristol Water conducted an industry upper quartile performance calculation using historical data for the new lead standard. Bristol Water based its estimates on its own performance alone, while Ofwat used the old lead standard. With insufficient data to complete this ourselves, we could not categorically state which figures would more accurately represent Ofwat's stated methodology.

9.43 MZC represented a health and safety factor for the customers of Bristol Water; hence the involvement of the DWI. Bristol Water stated that it had a very low risk in this area, which we would expect to result in a willingness to invest in improving this area.

9.44 We also noted that Bristol Water received around £4.8 million in PR09 to fund two lead reduction schemes,[576] which was substantially above the largest MZC ODI penalty that Bristol Water could incur (£1.4 million for the full period).[577] We would expect Bristol Water to have improved its lead compliance through the completion of these schemes, and hence to be performing ahead of historical levels. If it fails to do so, a penalty to claw back some of this allowed spend appears appropriate.

9.45 Ofwat highlighted that the first year of MZC data under the new lead standard had recently been released, and that the industry upper quartile had remained at 99.97%. Bristol Water's performance, however, had worsened and it had become the second lowest performer out of the water companies.[578] See Appendix 9.1 for additional details on this.

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[574] Bristol Water SoC, paragraph 2046; DWI (May 2013), Calculation and composition of indices published in the Chief Inspector's Report.
[575] Ofwat response to our provisional findings, paragraph 157.
[576] Sherborne treatment works (£4.65 million) and 50% of requested lead communication pipes replacements (£0.33 million x 0.5 = £0.165 million).
[577] Based on penalty of £0.284 million per 0.01% yearly; assuming a full 0.01% penalty applied for all five years; Bristol Water specific appendix, pp141–142.
[578] DWI 2014 water company statistics.

9.46 We were not persuaded that this was an area where there was evidence that Bristol Water should be unable to achieve industry targets, particularly as other companies with a higher share of lead communication pipes were able to do so (see Appendix 9.1 for details).

9.47 We therefore found that Ofwat's levels for the penalty deadband and collar are appropriate. This resulted in an ODI control for mean zonal compliance as shown in Table 9.2.

Table 9.2: ODIs for MZC

						%
	Current case (in SoC)	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*
Standard	99.96	99.96	99.96	100	100	100
Penalty deadband		99.95	99.95	99.95	99.95	99.95
Penalty collar		99.94	99.94	99.94	99.94	99.94

Source: CMA analysis.

9.48 Bristol Water and Ofwat both accepted these ODI figures as being appropriate, based on our provisional findings.[579]

9.49 Regarding the sensitivity to smaller zones and lower frequencies, MZC was a metric that was recognised and used across a range of performance measures and by a number of different entities (particularly the DWI). We believed that to intervene here and not elsewhere in the regulatory regime could introduce serious inconsistencies for a disproportionately small gain. Combined with Ofwat's additional analysis, and the fact that no obvious alternative methodologies presented themselves, we did not consider it appropriate to intervene in this area.

Negative water quality contacts

9.50 This metric reflects the number of complaints Bristol Water receives regarding the quality of its water supply, including appearance, taste, and odour.

9.51 Bristol Water stated that it had set its targets based on the results of its customer research, and was focused on reducing discoloured water contacts.[580] Bristol Water stated that it had taken action to reduce taste/odour contacts in the past, and based on this experience, was unlikely to identify any additional cost-beneficial investments to reduce this further.[581]

[579] Bristol Water response to our provisional findings, paragraph 741; Ofwat response to our provisional findings, paragraph 155.
[580] Bristol Water SoC, paragraph 2014.
[581] Bristol Water SoC, paragraph 2022.

In particular, it referenced the potential for reducing taste complaints through a process of chloramination.

9.52 Bristol Water stated that its cost-benefit analysis showed that although it could have targeted further beneficial improvements, customers were unwilling to pay for them,[582] and so it chose to constrain additional work due to the impact on affordability.[583] It stated that further investment would be inconsistent with customer preferences and would require significant additional investment which had not been funded.[584]

9.53 Bristol Water therefore calculated the level of improvement consistent with the customer acceptability research as 14%, implying a target of 2,221 by the end of AMP6.[585]

9.54 Ofwat said that Bristol Water's customers were not sufficiently aware of the level of service that other companies' customers were receiving; hence, it was appropriate to intervene on their behalf.[586] Ofwat used historical upper quartile analysis (for three years) to derive a target of 1,439 complaints.[587,588]

9.55 Appendix 9.1 includes additional details on Bristol Water's number and type of negative water quality contacts over time, showing that discolouration complaints made up nearly half of all complaints.

9.56 Following our provisional findings, Ofwat stated that Bristol Water was a relatively poor performer on this measure (12th best performer in 2014)[589] with many companies already outperforming its proposed 2019/20 target,[590] and that this proposed target was the least demanding of any company with this ODI.[591]

9.57 Ofwat was also critical of Bristol Water's customer engagement in this area, stating aspects as potentially misleading.[592] Customers' views may have been different if they were better informed. Regardless of the information

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[582] Bristol Water SoC, paragraphs 2018–2019.
[583] Bristol Water SoC, paragraph 2005.
[584] Bristol Water SoC, paragraph 2029.
[585] Bristol Water SoC, paragraph 2018.
[586] Ofwat response, paragraph 458.
[587] Estimated as 1.23 complaints per 1,000 population served; Ofwat, FD14 final price control determination notice: policy chapter A2 – outcomes, p41.
[588] Bristol Water SoC, Table 133. This would appear to be 1.23 * 1.17 million population, which we assume is a more accurate Bristol Water population figure.
[589] Ofwat response to our provisional findings, paragraph 161.
[590] Ofwat response to our provisional findings, paragraph 162.
[591] Ofwat response to our provisional findings, paragraph 163 and Figure 6.
[592] Ofwat response to our provisional findings, paragraph 168.

provided, Ofwat stated that some customer research had indicated a willingness to pay more than the level Bristol Water proposed.[593]

Discussion

9.58 Bristol Water primarily made its case based on arguments that it was not in a position to reduce complaints further. This included the requirement for substantial investment to reduce either taste/odour complaints (through chloramination) or discoloured water complaints (through mains relining). Bristol Water did not give a reason why it should naturally have a higher number of these complaints than other water companies.

9.59 However, we considered that if the aim of the ODIs is to provide an incentive to deliver outcomes which customers value in a cost-efficient manner, then Bristol Water's customers' willingness to pay should be a relevant concern.[594] Ofwat's comment that customer willingness to pay could be higher appeared to be based on a small section from a report in 2012,[595] which we would expect to have been built on and refined in subsequent years in developing the business plan. In particular, we noted Bristol Water's multiple iterations of customer research when constructing its Business Plan. On this basis, we considered that Bristol Water's target was more reflective of customer preferences.

9.60 Bristol Water's target was also supported by the LEF (which also consulted on the customer research being completed) based on its interpretation of customer willingness to pay, although it did not support the funding of rewards through higher customer bills.[596]

9.61 We also noted Bristol Water's statement that it provided customers with information on industry performance to help them judge relative performance when considering willingness to pay, although we noted that this was necessarily rather simplistic in its nature (see Appendix 9.1). We would also have expected the LEF to provide more of a cross-industry view on behalf of consumers.

9.62 Although we considered that Bristol Water's targets set relatively low aspirations for improvement (most targets up to and including 2018/19 were

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[593] Ofwat response to our provisional findings, paragraph 169.
[594] 'Companies have developed a set of outcomes that reflect what their customers need, want and can afford, and they have committed to delivering these'; Ofwat, FD14 final price control determination notice: policy chapter A2 – outcomes, p2.
[595] Ofwat response to our provisional findings, paragraph 169 and footnote 43.
[596] LEF submission, p7.

below 2013 actual performance),[597] we were of the opinion that customer views are relevant. In the context of this target, it appeared that Ofwat's intervention may only be achievable through a level of investment beyond the economic level (for that metric, including customer benefit).

9.63 As noted in a paragraph 9.16, an upper quartile comparative analysis would not necessarily represent the economic level which a company should target. We considered Ofwat's evidence, that Bristol Water appeared to be at the industry mean performance level (in terms of absolute average performance) in the period 2011/13, despite only being ranked 12th.[598]

9.64 We also considered Ofwat's comment that Bristol Water's proposed target was below that of all other companies with this ODI. We found this argument to be circular, since the target for seven of the nine other companies was set by Ofwat's own intervention (of 1.23 contacts / 1,000 population).[599]

9.65 Therefore we considered it appropriate to retain Bristol Water's target, but to raise the reward deadband to the upper quartile level. This will ensure that Bristol Water's customers would only be charged for a significant improvement (likely to require innovation) rather than small changes or chance.

9.66 This approach is consistent with our treatment of the 'unplanned customer minutes lost' ODI.

9.67 This resulted in an ODI control for negative water quality contacts as shown in Table 9.3.

Table 9.3: ODIs for negative water quality contacts

	Current	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*
Reward cap		1,276	1,276	1,276	1,276	1,276
Reward deadband		1,439	1,439	1,439	1,439	1,439
Target	2,450	2,422	2,409	2,322	2,275	2,221
Penalty deadband		2,422	2,409	2,322	2,275	2,221
Penalty collar		2,477	2,464	2,377	2,330	2,276

Source: CMA analysis.

[597] Bristol Water highlighted that the 2013 contacts were particularly low due to benign climatic conditions in that year.
[598] CMA analysis based on Ofwat response to our provisional findings, Figure 5. 2011-13 is Ofwat's chosen period for performance assessment.
[599] Ofwat final price control determination notice: policy chapter A2 – outcomes, p39.

Scheme-specific ODIs

9.68 A number of Bristol Water's ODIs were set to ensure that the totex allowed for specific major schemes would be clawed back if those schemes were not delivered. These included:

(a) Cheddar 2 reservoir; and

(b) Cheddar WTW.

9.69 These ODIs were calibrated based on the level of totex allowed in the determination. If our determination changed this totex level (or removed the scheme entirely), then it would be consistent to reflect this in the performance commitments/ODIs. Bristol Water highlighted two ODIs for which this applied (Cheddar 2 reservoir and Cheddar WTW).[600]

Cheddar 2 reservoir

9.70 Bristol Water included this in its business plan, but it was removed by Ofwat in its final determination following the removal of the costs for the scheme from the allowed totex.[601]

9.71 Since we did not allow any totex for Cheddar 2 reservoir in our final determination, no changes to the ODI framework from Ofwat's final determination were necessary.

Cheddar WTW

9.72 Ofwat's final determination allowed Bristol Water funds to complete work at Cheddar WTW, and included an ODI in case these works were not delivered.

9.73 Our determination removed most of Bristol Water's planned investment in Cheddar WTW, while introducing a notified item. Therefore we have removed this ODI from our final determination.

9.74 Keeping an ODI (or including its reintroduction as part of the notified item) would not only be relatively complex (such as defining 'solution delivered'), but would also require implementation within AMP6. This could place Bristol Water in a situation where it was unable to deliver the solution within the time required and faced a penalty through no fault of its own (eg if the notified item was only triggered in 2019). Similarly, it could be seen as

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[600] Bristol Water response to our provisional findings, paragraph 746.
[601] Bristol Water company-specific appendix, p121.

putting inappropriate time pressures on Bristol Water to 'rush' to identify the optimum solution, rather than taking the necessary time to do so.

9.75 We acknowledged that this did present the possibility of Bristol Water triggering the notified item, and then keeping a proportion of the provided money rather than spending the full amount on the scheme.[602] For this reason, Ofwat proposed that we put in place an ODI for any assumed investment under a notified item.

9.76 We considered there were a number of mitigations to this risk:

(a) Bristol Water will have to demonstrate need for the investment under the notified item to comply with its statutory obligations.

(b) Ofwat will perform an updated assessment of reasonable costs as part of any application under the notified item.

(c) If Bristol Water demonstrates need to invest and reasonable costs, but still underspends, customers would receive 50% of the difference, under the totex sharing incentive.

9.77 We would expect Bristol Water to retain the incentive to underspend from this level due to efficiency improvements. If the difference is due to other reasons (ie Bristol Water reduces the scope of investment after triggering the notified item), and given that Ofwat will have assessed the investment as reasonable, management would be effectively risking breaching its legal obligations and incurring penalties on other ODIs.

9.78 In principle, this risk to service would be already addressed by the inclusion of other ODIs. In theory, the penalty collars associated with these ODIs could result in situation where, having already hit its penalty collar, Bristol Water would have lower incentives to invest further in improving these areas. We would expect Ofwat to consider any impact on ODI penalty collar for interruptions and related areas in future price reviews if the notified item is triggered. We decided that we did not need to include an ODI as part of our determination.

[602] We note that this could be for good reasons, such as uncovering greater efficiencies during the process.

10. Cost of capital

Introduction

10.1 As discussed in Section 3, we followed Ofwat's approach to determining the total revenue required to cover Bristol Water's operating and financing costs, which is consistent with the standard approach to economic regulation in the UK. This approach calculates the revenue required by Bristol Water to cover its efficiently-incurred costs, including a reasonable return for investors.

10.2 The standard approach to defining what represents a reasonable return, which we follow within this determination, is to make an estimate of Bristol Water's cost of capital.[603]

Overall approach to the cost of capital

10.3 It is consistent with standard regulatory practice that, in the water industry, it is for the companies to decide on their approach to financing. Within each regulatory period, companies are expected to accept the risks associated with the actual cost of finance relative to regulatory assumptions.

10.4 Consistent with this approach, when calculating the cost of capital, the relevant costs are those assumed for a (notional) efficient company. As a result, these are likely to be different from those incurred by an actual company such as Bristol Water, for a number of reasons, including the timing of financing decisions, and company decisions on the level of debt and equity.

10.5 In establishing the costs of an efficient company, we considered that it was important to have regard to the actual financing costs incurred by water companies. This reflects the reasonable expectation that investors will, on average, be able to recover their efficiently-incurred financing costs. This suggests the need for caution prior to making any assumptions which might imply that, taken in the round, investors in the sector would not be expected to recover their financing costs.

10.6 An important part of this analysis is the application of a consistent approach to setting the assumptions which form the basis of the calculation of the cost of capital. Both debt and equity investors make long-term financing decisions, including debt financing of up to 30 years' maturity. This reflects

[603] The absolute return on capital is calculated as the cost of capital multiplied by the RCV (with some adjustments, eg to account for tax and the timing of the return).

investors' expectations not just in respect of the immediate regulatory period, but of a consistent approach over the longer term.

10.7 This is reflected in the estimated scale of returns for regulated networks, which are relatively low in comparison to many commercial businesses. We understand, for example, drawing on statements from credit rating agencies,[604] that this reflects the stable regulatory environment. In particular, the financing environment is influenced by the stable approach to the estimation of the cost of capital, applied by both sector regulators and also in previous CC/CMA decisions.

10.8 Taking these factors into consideration, our approach to defining the cost of capital for Bristol Water gives weight to:

(a) current market conditions, including projections of financing costs over the regulatory period;

(b) actual financing costs incurred by water companies in general, and Bristol Water in particular; and

(c) relevant precedent from previous regulatory decisions, including previous CC/CMA decisions.

10.9 On this basis, we apply the standard regulatory framework for defining and applying the cost of capital, which is discussed briefly below and in further detail in Appendix 10.1. We then consider an appropriate measure for each of the components of the cost of capital.

Overview of components

10.10 The cost of capital is a weighted average of two components, which are:

(a) the cost of debt (including both existing/embedded debt and new debt); and

(b) the cost of equity, which is the expected return required to induce the marginal investor to purchase shares in the business.

10.11 The return required by the marginal investor will depend on other aspects of the price control determination, for example projections of totex. If, for example, the totex projections are relatively generous and consequently the

[604] For example, 'Stability and predictability of the regulatory environment is a key factor in our Global Regulated Water Utilities rating methodology. Under this methodology, the framework of the water sector in England and Wales currently scores at Aaa, reflecting our assessment of the regulatory regime as independent and well established, with a more than 20-year track record of being predictable, stable and transparent.' Moody's UK water sector review, 2012.

market expects the company to outperform, this will affect the marginal investor's view of associated risk and therefore the implied return on capital. As part of our determination, we made central projections of totex and other elements in the price control (which we interpret as expected values). Consequently, we assumed that we can estimate the cost of capital without considering effects from totex or other elements.

10.12 The weightings (proportion of debt and equity, known as gearing) reflect the relative importance of each type of financing in the company's capital structure.

10.13 Both Ofwat and Bristol Water calculated the required return as the sum of the cost of capital and projected corporation tax payments, where the projected tax payments are calculated within a financial model. We used the same approach. This involved calculating a simple weighted average of the cost of debt and cost of equity (sometimes referred to as the 'vanilla WACC') and feeding it into a financial model. This figure is estimated in real terms (relative to RPI), since investors also receive a return from RPI indexation of the RCV.[605]

10.14 The cost of debt is, in principle, observable from companies' actual financing costs. However, the cost of equity is not directly observable. The standard regulatory approach to the cost of equity is the capital asset pricing model (CAPM).

10.15 The CAPM states that the cost of equity is equal to the risk-free rate (RFR) plus the equity risk premium (ERP) multiplied by beta, where beta measures the extent to which the price of a particular share fluctuates with the market (referred to as systematic risk). The beta is usually estimated in regulatory determinations as an 'asset beta' which is independent of financial structure, and is therefore comparable across companies. This approach was used by Ofwat and Bristol Water in their submissions.

10.16 In its SoC, Bristol Water raised concerns with three elements of Ofwat's calculation, the first two of which related to Ofwat's approach to setting the cost of capital for Bristol Water specifically. Bristol Water's points were as follows:

(a) Firstly, Bristol Water said that Ofwat had not properly considered the higher costs incurred by WoCs in general, and Bristol Water in

[605] During the process leading to Ofwat's final determination, both Ofwat and the water companies used Ofwat's financial model within its 'Reservoir' modelling suite. Ofwat provided us with an Excel version of its financial model, and both Ofwat and Bristol Water provided us with the inputs to this model that generated their proposed Ks. We used this financial model to calculate our Ks and the implied financial ratios.

particular, in issuing debt. Bristol Water drew our attention both to Ofwat's approach in PR09 and the CC's approach in CC10.

(b) Secondly, Bristol Water said that consistent with CC10, an adjustment should be made to reflect the higher cost of equity associated with WoCs such as Bristol Water relative to WaSCs.

(c) Thirdly, Bristol Water said that Ofwat had made a mistake in translating its assessment of the appointee WACC into an assumed return for the wholesale business.

10.17 In reaching our determination, we decided that it was appropriate for us to consider all of the components that make up the cost of capital, and we set out our findings in the rest of this section.

10.18 Ofwat and Bristol Water made broadly similar assumptions in a number of areas; however, we made our own assessment of whether these assumptions were appropriate.

10.19 In assessing the appropriate cost of capital, we considered the following questions:

(a) **Cost of debt** – in deciding an appropriate assumption for the cost of debt in general, and embedded debt in particular, either actual financing costs or a notional (industry) financing cost could be considered relevant. We considered the following:

(i) What is the relevant notional cost of debt for Bristol Water?

(ii) What is the actual cost of debt for Bristol Water?

(iii) What is the relevance of a notional cost of debt, relative to the actual cost of debt, and therefore what is a suitable assumption for Bristol Water?

(b) **Cost of equity** – in determining the cost of equity for Bristol Water, we considered the industry data, and also the specific circumstances of Bristol Water. In CC10, an adjustment was made to the asset beta for Bristol Water to reflect additional risks faced by WoCs in general, and Bristol Water in particular. In PR14, Ofwat made a general assumption based on analysis of industry betas. In this section we consider the following:

(i) What is the asset beta for the observable comparators in the water industry?

(ii) What is the scale of any additional risk for Bristol Water over this level?

(iii) On this basis, we estimate the cost of equity for Bristol Water.

(c) **Total cost of capital (appointee)** – we calculated the cost of capital for Bristol Water, based on our estimates of each component as described above. We then considered the evidence as to whether any other changes should be made.

(d) **Total cost of capital (wholesale)** – Ofwat made an adjustment to the cost of capital to reflect the move to separate wholesale and retail regulation. We considered that it was reasonable to make a comparable adjustment.

10.20 The remainder of this section steps through each of the components of cost of capital as follows:

(a) Gearing (paragraphs 10.22 to 10.28).

(b) Cost of debt (paragraphs 10.29 to 10.136).

(c) Cost of equity (paragraphs 10.137 to 10.189).

(d) Appointee WACC (paragraphs 10.190 to 10.208).

(e) Wholesale adjustment (paragraphs 10.209 to 10.229).

10.21 In each of the five subsections listed above we set out the views of Ofwat and Bristol Water before setting out details of our assessment.[606] We then set our findings on the overall vanilla wholesale WACC in paragraph 10.230.

Gearing

Ofwat

10.22 Ofwat adopted a notional capital structure for setting returns.[607] Reflecting advice from PwC, it stated that using a notional structure provided water company management with the incentive to manage the actual financing.[608]

10.23 Ofwat stated that all companies (except one) proposed a gearing level of between 60% and 70% in their business plans. Combining these observed

[606] We gathered latest market evidence up until the end of August, and unless otherwise stated have used this in our calculations.
[607] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p8.
[608] Ofwat (July 2013), Cost of capital for PR14: Methodological considerations, p29.

gearing ratios and other regulatory benchmarks, it judged that 62.5% would be an appropriate level.[609] This figure was at the lower end of Ofwat's range, which was based on financeability analysis as well as matching company actual gearing levels more closely (the industry average was 61.1% based on an RCV weighted average).

Bristol Water

10.24 In its SoC, Bristol Water stated that its actual level of gearing was 62% in March 2013 and 68% at the end of March 2014.[610]

10.25 Although Bristol Water expected its gearing to increase slightly over the price control period, it noted that the cost of capital result was not very sensitive to specific gearing assumptions. It therefore believed that adopting Ofwat's estimate (62.5%) was reasonable.[611]

Discussion

10.26 Different levels of gearing may be associated with different levels of WACC and, in principle, an optimal level of gearing might be estimated by attempting to balance the different effects (including the risks and costs of any financial distress that might be associated with higher gearing). However, after taking into account the tax shield from more debt, the WACC is not very sensitive to the level of gearing.[612]

10.27 We considered that using an industry average (hence notional level) for gearing was an appropriate method in principle for calculating gearing in the cost of capital calculation, since it is for companies, their shareholders and management to determine the most efficient financing structure (including gearing level) to meet their circumstances.

10.28 Therefore, we used a gearing figure of 62.5%, consistent with the notional level set by Ofwat, and close to the industry average level of 61.1%.[613] We noted that Bristol Water had a gearing level comparable with this notional level.

Cost of debt

[609] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, pp8–9.
[610] Excluding preference shares; Bristol Water SoC, paragraph 1587.
[611] Bristol Water SoC, paragraphs 1588–1590.
[612] This effect was noted in Northern Ireland Electricity (2014) paragraph 13.36, and discussed in more depth in CC10 Appendix N, paragraphs 30-35 and Annex 2.
[613] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p8.

10.29 Our analysis on cost of debt is structured as follows:

(a) We consider the appropriate allowed costs for embedded/existing debt at the start of AMP6.

(b) We consider the appropriate allowed costs for new debt which Bristol Water may need to raise during the price control period.

(c) We calculate the overall allowed cost of debt based on an appropriate allowance of embedded and new debt costs.

Embedded debt

Ofwat

10.30 Ofwat supported using a notional industry cost as the starting point for its calculations in order to give all companies a strong incentive to seek financing at the best possible terms.[614]

10.31 Ofwat initially analysed current yields on historical corporate bonds for water companies, arriving at an estimated value of 2.2% (real, relative to RPI).[615]

10.32 However, Ofwat noted that many companies had underperformed this level, and investigated using iBoxx indices[616] of A and BBB corporate bonds of ten or more years, to act as a reasonable longer-term index. It stated that this indicated a real range of 2.6 to 2.8%.[617]

10.33 Taking into account non-water bonds,[618] Ofwat said that that a figure based on the higher end of the wide range of evidence (2.2 to 2.8%) was appropriate, and used a point estimate of 2.65% for embedded debt costs. Adding on an allowance for issuance fees of 0.1%, this resulted in a notional cost of debt of 2.75%.[619]

10.34 Ofwat then considered the potential for a company-specific uplift, which included the potential for a small company premium (SCP). For PR14, Ofwat

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[614] Ofwat response, paragraph 289.
[615] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p21, footnote 24.
[616] iBoxx are a widely-used set of indices designed to act as benchmarks for liquid corporate bonds. Ofwat used iBoxx A and BBB-grade GBP non-financial corporate bond indices to compare the water companies against. The same benchmark was used by Ofgem for its debt indexation within its RIIO price controls. Ofgem final determination for slow-tracked electricity distribution companies, paragraph 5.6.
[617] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p21.
[618] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p22.
[619] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p24.

implemented a new approach of introducing a two-step test, such that the companies seeking an uplift needed to show both that:[620]

(a) they faced a higher cost of financing; and

(b) there was an associated benefit to customers.

10.35 Ofwat indicated that this was based on a consideration of its relevant statutory duties for PR14, and stated that the customer benefits test was consistent with all of them.[621] It assessed customer benefits through estimation of the value of smaller companies as a comparator (using an approach that was based on the CC's approach to the merger of South Staffordshire Water and Cambridge Water),[622] as well as considering companies' SIM and ODIs.[623]

10.36 Based on the outcome of this customer benefits test, Ofwat allowed two companies (Portsmouth Water and Sembcorp Bournemouth) a 0.25% increase in their cost of debt (both embedded and new), but no others including Bristol Water.[624]

10.37 Additional detail on this customer benefits test is included in Appendix 10.1.

10.38 In response to our provisional findings, Ofwat encouraged us to consider if the downward movement in the iBoxx should result in a downward revision to the notional embedded debt cost.[625]

Bristol Water

10.39 In its SoC, Bristol Water stated that it had embedded debt costing 3.15% that was efficiently incurred, and hence it should be allowed to recover these costs.[626] It stated that smaller companies have a higher cost of debt (citing the Civil Aviation Authority (CAA) and KPMG), so using industry averages penalised them unfairly.[627]

10.40 Bristol Water also highlighted that most of this debt has been held through multiple price review periods (including the CC10 determination). By being

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[620] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p23; Ofwat (December 2014), Final price control determination – risk and reward, pp42–49.
[621] Ofwat response, paragraph 352.
[622] South Staffordshire plc / Cambridge Water plc merger inquiry (CC).
[623] Ofwat Final price control determination notice: annex 3 – benefits assessment of an uplift on the cost of capital, p5.
[624] Ofwat (December 2014), Final price control determination – risk and reward, p49.
[625] Ofwat response to our provisional findings, paragraph 200.
[626] Bristol Water SoC, paragraphs 1570–1571.
[627] Bristol Water SoC, paragraphs 1679–1680 and 1764.

allowed at that time, Bristol Water considered the debt has been implicitly recognised as being efficiently incurred. KPMG had also independently assessed the more expensive tranches and considered that it was efficiently incurred given market conditions at the time.[628]

10.41 Given recent falls in interest rates, Bristol Water stated that it had considered refinancing options in order to lower debt costs, but believed that (and had been given advice that) this would have a limited impact on reducing costs whilst exposing it to additional risks in AMP6 or beyond.[629]

10.42 Bristol Water believed that the customer benefits component of the test was inappropriate for a number of reasons, but particularly as it may place one of Ofwat's primary statutory duties (consumer duty)[630] above another (financing duty).[631,632]

10.43 Bristol Water stated that even if the customer benefits test were to be applied, then it provided sufficient customer benefits to be allowed a company-specific uplift.[633]

10.44 In response to our provisional findings, Bristol Water stated that the SCP we had estimated was too low since, as a smaller company, it issued debt less frequently and so was more exposed to timing risk than WaSCs.[634]

10.45 Bristol Water also considered that our assumption on notional cost of debt was unreasonably low since it excluded cash handling costs. It also provided evidence of the higher embedded debt costs of a range of comparator WOCs.[635]

Discussion

10.46 Bristol Water's parent company is owned by Capstone Infrastructure Corporation (50%), Agbar (30%) and Itochu Corporation of Japan (20%).[636] Under the regulatory regime for water, Bristol Water, like other water companies, is treated as a 'ring-fenced' company.[637] In particular, Bristol

[628] Bristol Water SoC, paragraphs 1682–1683.
[629] Bristol Water SoC, paragraphs 1686–1691.
[630] 'To further the consumer objective'.
[631] 'Relevant undertakers are able (in particular, by securing reasonable returns on their capital) to finance the proper carrying out of those functions'.
[632] Bristol Water SoC, paragraph 1768.
[633] Bristol Water SoC, paragraph 1763.
[634] Bristol Water response to our provisional findings, paragraph 838.
[635] Bristol Water response to our provisional findings, section 8.3.1.2.
[636] Bristol Water website, and as discussed further in Section 2.
[637] This is set out in section 6A of the Licence: Bristol Water plc is the 'Appointee', and is the subject of the obligations the Licence contains, in particular the ring-fencing obligations in Licence Condition F6A.

Water is required at all times to conduct its regulated business as if it were substantially a free-standing business and a separate public limited company. Bristol Water is also required to use all reasonable endeavours to ensure that it maintains at all times an investment grade issuer credit rating.[638]

10.47 We were therefore concerned with the cost of capital of Bristol Water as a stand-alone ring-fenced company.

10.48 As a result, in assessing the cost of embedded debt, we generally do not take account of the cost of financing of other Group companies, unless there is good reason to do otherwise. Bristol Water had significant levels of intercompany debt. We consider this further below.

10.49 In addition, we support Ofwat's use of a notional cost of embedded debt in the context of a multi-company framework. As well as being consistent with other regulators (eg Ofgem), this has the benefits of allocating risk/reward to the people best able to manage it (ie management), incentivising efficient methods and timings of raising debt, and removing incentives to obfuscate actual debt costs through complex arrangements and capital structures.

10.50 In the context of our determination, we did not seek to undermine this approach, but were in a position to conduct a more detailed examination of the company in question. We therefore considered that it was appropriate for us to consider both the notional level, consistent with the approach that Ofwat used and also the specific actual costs incurred by Bristol Water. The latter provided a cross-check as to whether the notional level derived from industry costs was reasonable for a company such as Bristol Water.

- *Notional cost of embedded debt*

10.51 As discussed above, Ofwat calculated the real notional cost of debt for the industry as 2.75%, broken down into 2.65% actual cost of debt at an industry level, together with 0.1% of issuance fees.

10.52 We reviewed Ofwat's calculation. As Ofwat itself stated, its calculation was relatively conservative, as it selected a point value of 2.75% from a range of 2.3 to 2.9% (including issuance costs) in its evidence base. This was a conservative assumption based on putting more weight on the iBoxx index analysis than the review of actual bond issuances made by water companies.

[638] This also applies to any associated company as issuer of corporate debt on its behalf.

10.53 Bristol Water stated that this level was below the embedded debt costs reported by WoCs in their December 2013 plans which were 3.5 to 3.8% (real).[639] However, given that Ofwat stated that this was based on only four WoCs, and at that point had not been subject to any challenge or investigation (for example Bristol Water was the lowest quoted figure with a stated actual embedded debt cost at the time of 3.46%, which we review in paragraphs 10.87 to 10.102),[640] we would be concerned about placing any weight on these figures.

10.54 We therefore adopted a similar approach to Ofwat, considering:

(a) the WaSC bond costs, adjusted for a suitable premium to reflect the higher financing costs typically incurred by WoCs; and

(b) a historical iBoxx average estimate, adjusted to reflect evidence on the differential between WoC financing costs and the iBoxx index.

- *WaSC cost of debt*

10.55 Based on Ofwat's analysis, nominal WaSC bond costs have been 5.05%, while the ten-year iBoxx average which Ofwat used indicated a nominal yield of 5.53%.[641] We considered that this range of evidence represented a reasonable starting point for estimating the notional embedded debt costs of a WaSC.

10.56 Regarding Ofwat's comments on the use of updated market data, we agreed that it was appropriate to include the latest market data in cases where we were trying to reflect the most up-to-date evidence on market estimates for a particular parameter.

10.57 However, we did not consider that changes in the iBoxx over the past six months would have any impact on the embedded debt costs of companies as at 1 April 2015. Therefore, although the initial choice of the correct period to use requires an element of judgement, it would be inconsistent to continuously revise this period without additional evidence to support why circumstances have changed. We therefore considered it appropriate to use a notional WaSC embedded debt cost over the same period Ofwat considered.

[639] Bristol Water response to our provisional findings, paragraphs 831–832.
[640] This differs to the level proposed in its subsequent SoC to the CMA.
[641] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p21, footnote 24, with further CMA analysis.

10.58 Both Ofwat's comparator dataset and the iBoxx analysis were based on nominal indices, as the greatest source of data was nominal data, although in practice companies tend to issue a combination of real and nominal debt. However, the WACC within the price control reflected a real cost of debt estimate.

10.59 To convert our analysis of nominal embedded debt costs to a real cost of debt therefore requires an estimate of the relevant RPI. The analysis above has generally considered debt costs over a ten-year period, which is consistent with regulatory precedent. In our provisional findings, we considered that an RPI assumption drawing on five- to ten-year market data was most appropriate, and assumed RPI of 2.6%.

10.60 Our assumption was not the same approach as taken by either Ofwat or Bristol Water in their submissions:

(a) Ofwat considered that a long-term RPI projection of 2.8% was most appropriate, as this would be considered with the implied RPI within long-term bonds.

(b) Bristol Water considered that for the five-year price control period, the correct approach was to use five-year RPI projections of approximately 2.4%. In Bristol Water's view, this would best ensure that the allowed cost of debt would match the actual cost of debt.

10.61 We considered that both these arguments had merit, but also a risk of regulatory inconsistency with the overall approach to the cost of capital. Use of a longer-term RPI, as suggested by Ofwat, would give little weight to projections of real financing costs on nominal fixed-rate debt over the relevant period, and might result in a divergence between allowed and actual financing costs over multiple periods. On the other hand, the use only of short-term RPI projections, as suggested by Bristol Water, risks giving insufficient weight to underlying trends in the real cost of debt over time. As discussed in paragraph 10.6, a stable approach to the cost of capital over regulatory periods is consistent with investors making long-term financing decisions. The notional real cost of debt should be generally expected to be more stable and more reflective of a premium over the underlying real risk-free rate. This is in the context that a material proportion of debt (33% within Ofwat's assumptions, and higher for Bristol Water) is index-linked. In estimating the notional real cost of debt, we therefore considered it was appropriate to have regard to a medium-term measure of RPI.

10.62 On balance, we considered it appropriate to estimate a real cost of debt for a notional company based on RPI assumptions using a narrow range from five- to ten-year projections. Latest market data indicated that a suitable assumption for a ten-year notional RPI would be 2.7%.[642] The latest evidence for five-year RPI over AMP6 suggested 2.4%.[643] We assumed a range of 2.5 to 2.6% for the RPI of notional embedded debt.

10.63 Associating the lower RPI number with the top of the range and vice versa[644] results in a wide range for a real estimate for WaSCs of 2.4 to 2.95%. We note that the lower end of this range is more consistent with observed WaSC data than the higher end, indicating that WaSCs appear to have generally outperformed the iBoxx. We consider in the next section observed data for WaSCs and WoCs, and in particular WoCs comparable to Bristol Water. On this basis, we estimated the differential between the efficient cost for a notional WoC compared to a notional WaSC (this differential is the SCP). We also tested where from this wide range would be most appropriate in making an assumption for the WaSC cost of debt for our determination.

- *Small company premium*

10.64 In PR09 and CC10, Ofwat and the CC assumed an SCP for WoCs of 0.4%. The aim of the SCP is to ensure that we set a level for the cost of capital which a small company could reasonably achieve. The need for an SCP is predicated on the assumption that smaller companies, will, on average, face a higher cost of debt than larger companies.

10.65 This principle was supported by Ofwat's own analysis in PR14.[645] If the cost of debt for both small and large companies were used to decide the cost of debt for all companies then, in the absence of an SCP, smaller companies would tend to face an assumed cost of debt that is lower than their actual financing costs on average, over time. In contrast, larger companies would tend to face an assumed cost of debt that is higher than their actual financing costs on average, over time.

10.66 In PR14, Ofwat estimated the SCP as being 0.25%. This reflected a reduction since the 0.4% used in PR09. Ofwat's analysis was partly based on analysis by PwC, which compared the adjusted cost of the Artesian

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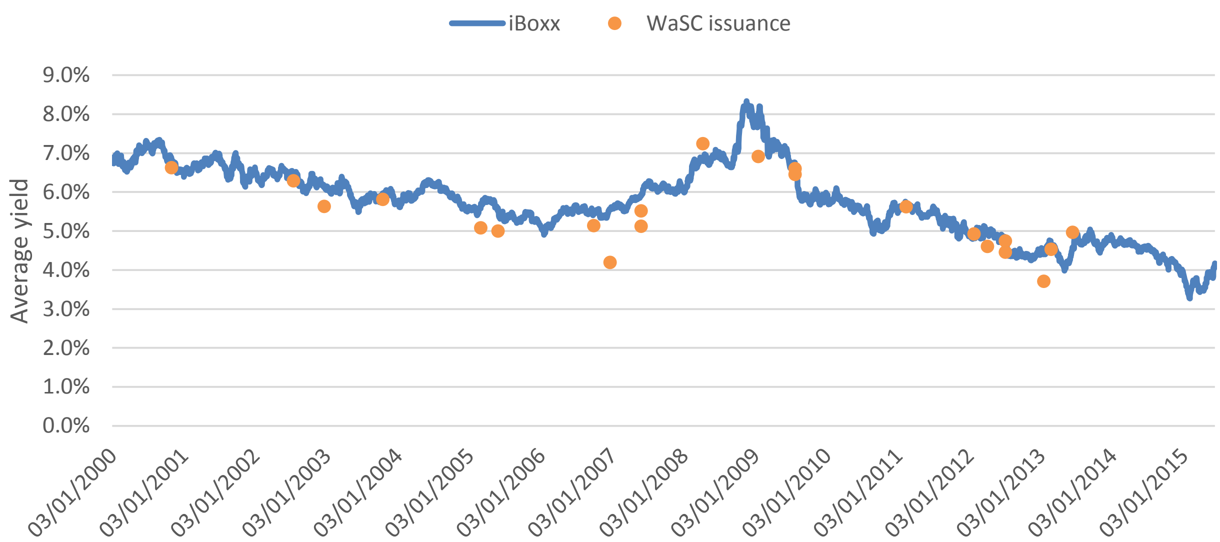
[642] Difference in nominal and real spot curves over past two years (2.99%) based on BoE yield curves, and applying a 0.3% reduction due to inflation risk premium on ten-year gilts; BoE quarterly bulletin 2012, Q3, Volume 52, number 3.
[643] OBR economic and fiscal outlook.
[644] This gives the widest range for the estimated debt costs. Calculations based on the Fisher equation.
[645] 'While the six smaller WoCs […] did not face higher equity costs, they did face higher debt costs equivalent to 15 basis points on the WACC', Ofwat, Final price control: policy chapter A7 – risk and reward, p43.

issuances[646] for WoCs to the average iBoxx index.[647] It concluded that the Artesian debt had an effective cost of 0.11% over the real iBoxx at the times of issuance.[648]

10.67 In estimating the size of an SCP, we considered how this analysis of the cost of WoC bonds relative to the iBoxx index compared with an equivalent analysis of WaSC issuance spread on fixed rate bonds vs the same index.[649] This is shown in Figure 10.1 below.

Figure 10.1: WaSC fixed bond issuance vs iBoxx



Source: CMA analysis.

10.68 The weighted average spread of these bonds was 0.26% below the iBoxx at the time of issuance. This was consistent with our estimate at provisional findings.

10.69 Adding the WoC premium compared against the iBoxx index of 0.11% (paragraph 10.66) to the WASC spread against the iBoxx index of 0.26% (paragraph 10.68) would imply an SCP of 0.37%. This was consistent with the estimate of 0.4% that we had used for our provisional findings. We used the figure of 0.4% for our final determination.

10.70 Regarding additional costs associated with the timing of issuances, we considered that WoCs had sufficient flexibility around timing to be expected to manage their costs. We noted that this was consistent with Bristol Water's

[646] Artesian debt was monoline-insurer wrapped debt issuances which a number of WoCs (including Bristol Water) used in mid-2000s to access the bond markets.
[647] PwC made adjustments to the coupon data to try and reflect the effective cost of the debt, PwC company specific adjustments to the WACC, p14.
[648] PwC company specific adjustments to the WACC, p14.
[649] Uses 22 WaSC bonds with >10 years remaining (2 manually excluded).

own financing, where it was able to avoid issuing debt at times of increasing financing costs.

10.71 This estimate of 0.4% for the SCP was consistent with CC10, and we saw no reason that the size of the SCP would have increased since then. Indeed, at CC10 we noted Ofwat's comments that WoCs had struggled to access the conventional bond market (except the two largest),[650] which contrasts with some recent experience such as Bristol Water itself issuing a bond in 2011. Therefore, with greater access to the bond markets, this could imply that any change in the SCP would likely be downwards rather than upwards. The figure of 0.4% was also consistent with Ofwat's estimate from PR09 and CCWater's 2014 estimates.[651]

10.72 Ofwat applied a customer benefits test before allowing an SCP. We consider the customer benefits test in further detail in Appendix 10.1. Overall, we found the following:

(a) We were unconvinced that there was a causal link between the cost of debt required to finance the companies, and the benefits outlined by Ofwat.

(b) As a result, we were not persuaded that the customer benefits test, as applied by Ofwat, was necessary to meet our duty to customers. We note that customers of small companies would notionally pay more as a result of the SCP. However, there are many reasons why bills are different for customers of smaller companies.[652] It was not clear to us that this implied a need to adjust the approach to the cost of capital.

(c) Regulatory consistency has a beneficial effect, particularly when considering cost of capital given the long-term nature of financing. We were concerned that removing the SCP from the notional cost of embedded debt calculation (without evidence of changing market conditions) raised the risk of stranded costs. In particular, it ran contrary to the reasonable expectation of investors that they could, on average over time, recover the cost of efficiently incurred debt.

10.73 In response to our provisional findings,[653] Ofwat disagreed with our interpretation of the customer benefits test. Our understanding of Ofwat's view was that:

650 CC10, Appendix N, paragraph 39.
651 CCWater commissioned Economic Consulting Associates (ECA) to complete a report on cost of capital in February 2014, which estimated the SCP as being 0.3 to 0.4%; ECA cost of capital report, p43.
652 In practice, on average, bills are lower in smaller company regions.
653 Ofwat response to our provisional findings, paragraphs 175–192.

(a) the new special water merger regime reduces the disincentive on companies to merge if appropriate, to avoid the higher costs associated with smaller companies; and

(b) in that context, the customer benefits test was required to ensure that customers only pay a premium where companies can be shown to demonstrate clear benefits as a comparator.

10.74 Ofwat was in the position of considering how to set a cost of capital for 18 companies of different sizes. It will not necessarily be the case that any approach to the cost of capital will exactly reflect the costs associated with individual companies.

10.75 However, in our view the primary consideration in setting the cost of capital was whether efficient companies could finance their functions. Ofwat accepted that small companies have, on average, a higher cost of capital. While this remains the case, our starting point would be that this should be taken in to account in the assumption on the cost of finance.

10.76 If Ofwat was concerned that the other companies were not efficient, and therefore did not represent good comparators, then we would generally expect this to be reflected within the price control settlement in its determination of efficient costs. The investors in such less efficient companies would then earn below the cost of capital if the companies are unable to improve efficiency to be consistent with the upper quartile level assumed by Ofwat in setting totex allowances.[654]

10.77 The changes in the water merger regime may increase the possibility for any less efficient smaller companies to be acquired by larger WoCs or WaSCs. It seems to us that the change to the water merger regime creates increased opportunities for water mergers, whether or not there is an adjustment to the cost of capital to reflect higher costs actually incurred by investors in small companies.

10.78 Ofwat's customer benefits test also appeared to us to give significant weight to a particular scenario for the impact of a merger.[655] Whether any merger would actually result in the estimated customer effects is subject to a wide range of uncertainty and would also depend on the circumstances of the particular merger. It seemed to us that there were a wide range of factors which would determine whether WoCs should merge or stay independent, including the relative value placed on the companies by different potential

[654] Assuming that actual performance is otherwise in line with Ofwat's assumptions.
[655] For example, Ofwat did not include analysis of the effect on the precision of its econometric models within its customer benefits test.

owners. On balance, we were not persuaded that it was better to assume that smaller companies should be expected to reduce their financing costs through merging, if they did not meet Ofwat's customer benefits test.

10.79 In summary, we did not consider that there was a clear link between the relative position of small companies within the benchmarking and the efficient level of the cost of capital. We did not apply a customer benefits test.

- *Bristol Water cost of debt*

10.80 We concluded that the use of a 0.4% SCP was appropriate. This was based on the differential between WaSC debt (issued at a discount to iBoxx) and WoC debt (issued at a small premium to iBoxx).

10.81 To estimate the notional embedded debt costs for a WoC, we considered a range based on the evidence discussed above:

(a) A lower bound based on the average real WaSC performance (2.4%) + SCP (0.4%). This was consistent with Ofwat's view that actual WaSC performance was a relevant starting point for embedded debt at the industry level.

(b) A higher bound based on the real iBoxx average (2.95%) + WoC premium (0.11%). Since the SCP represents the difference between WoC and WaSC costs, and WaSCs have outperformed the iBoxx, it would not be appropriate to add this SCP on top of the iBoxx average.

This was equivalent to a real range for WoC embedded cost of debt of 2.8 to 3.05%. The range is narrower than the wide range for the WaSC cost of debt above, and is more consistent with the bottom half of that range. The data indicated that WaSCs have consistently outperformed the iBoxx index, and therefore that a notional WaSC cost of debt would be expected to be below the iBoxx index level. This was consistent with Ofwat's conclusions.

10.82 Including a 0.1% issuance cost resulted in a real notional range for embedded debt of 2.9 to 3.15%.

10.83 We note that this approach did not include separate values for cash holding costs. To include an additional amount for such costs could be inconsistent with the notional financing cost analysis, which is itself based on a notional financing structure assuming long-term bonds only.

10.84 For the purposes of this determination, we noted that the notional approach also does not take into account the savings that a notional company may make from assuming a small portion of short-term debt, which is currently cheaper than long-term debt, and is likely to remain so over AMP6.

10.85 We did not support Bristol Water's views that the analysis of embedded debt costs should include an element of short term debt, since our analysis was based on a review of WaSC bonds and the iBoxx index, neither of which included short term debt.[656] We also noted Bristol Water's arguments that raising short term debt to offset the benefits would require large amounts, but considered the analysis to be predicated on much higher associated yields compared with those actually experienced, such as the recent FFL bank loan.[657]

10.86 We therefore considered that the benefit from small amounts of short term debt was likely to offset any cash holding costs, therefore the net impact was likely to be small in practice. This was consistent with Ofwat's approach at PR14, and its subsequent views.[658]

- *Bristol Water actual cost of embedded debt*

10.87 We also considered the actual cost of embedded debt issued by Bristol Water. The calculation of the cost of debt should be 'all-in', ie including fees, and we sought to include fees in our calculation. Bristol Water's debt is summarised as follows:

(a) Much of Bristol Water's debt was in the form of 'Artesian' financing[659] issued in a structure alongside other water companies from 2003-2005. This debt, while relatively low-cost at the time, is now relatively expensive, and had a 27 to 30 year maturity at issuance.

(b) The remainder of Bristol Water's debt financing related to a mixture of bond issues and bank debt, including a recent borrowing under the Bank of England's 'Funding for Lending' (FFL) scheme.

(c) Bristol Water had also issued preference shares. It has included these shares in its calculation of its actual cost of debt. However, preference shares have both debt and equity-like features. For example, they have

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[656] Bristol Water response to our provisional findings, paragraph 850.
[657] Bristol Water response to our provisional findings, paragraph 850.
[658] Ofwat response, paragraph 310.
[659] Artesian debt was designed to allow the smaller WoCs to access the bond markets under more favourable terms. This included pooling together the demands of the WoCs to achieve more scale as well as using a monoline insurer wrap to improve the credit rating.

a pre-determined payment amount similar to debt; however, they are of indefinite maturity, which is similar to equity.

10.88 Bristol Water provided the following assessment of its actual cost of debt in its SoC (assuming RPI of 2.46%), as shown in Table 10.1.[660]

Table 10.1: Bristol Water's assessment of its actual cost of debt, 31 Dec 2014

	£m		*%*
	Amount	*Interest rate*	*Real rate*
Index-linked debt	170.5	3.39	3.39
Fixed rate debt (including preference shares)	81.6	6.36	3.90
FFL loan	50.0	2.40	-0.06
Variable	12.5	1.22	0.12
Blended cost of debt			2.84
Cash balance and issuance costs			+0.30
Total cost of embedded debt			3.14

Source: Bristol Water SoC, Table 114.

10.89 In setting an assumption for the cost of capital, we took into account both the need to ensure that Bristol Water can finance its activities and the interests of customers.

10.90 Therefore, in reviewing Bristol Water's actual cost of debt, we considered the need to adjust Bristol Water's calculation of the cost of debt to reflect these regulatory objectives. We characterise this as deciding an efficient and consistently measured actual cost of debt for Bristol Water. We considered the following (with more detailed discussion in Appendix 10.1):

(a) Inflation estimates, and calculations.

(b) Differentials between coupon and yield.

(c) Preference shares.

(d) Non-operational financing (eg financing of shareholder distributions).

(e) Scale of cash holding and issuance costs.

10.91 Converting between nominal and real interest rates requires an estimate for RPI inflation over the period in question. The actual associated costs Bristol Water will incur over this period are purely dependent on the RPI it experiences, therefore, we considered that the five-year RPI estimate was the most appropriate to use here. Based on the latest OBR forecasts (July 2015),[661] we assumed a level of 2.42% for RPI when estimating actual

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660 Assumes a Libor relative to RPI of –1.1%.
661 OBR economic and fiscal outlook.

embedded debt. When using this inflation figure, we applied the Fisher equation[662] to estimate real interest rates. We note this differs from Bristol Water's assumption, which was based on subtracting the inflation figure.[663] This is discussed in more detail in Appendix 10.1.

10.92 Bristol Water provided its evidence on the basis of coupon payable. A more appropriate measure was the 'all-in' yield, which reflects actual financing cost incurred in respect of the amount of financing including any premium or discount achieved at the point of issuance. This better reflects the actual cost of debt for Bristol Water. This was particularly important for the Artesian bond issuance, which makes up around 60% of Bristol Water's embedded debt.

10.93 Bristol Water's evidence also included the cost of financing preference shares. Our WACC was based on a simpler capital structure with only debt and equity. Therefore, our assessment of preference shares, consistent with CC10, was that the objective of identifying the embedded cost of debt was to consider securities that were clearly 'debt-like'. As described in our overall approach (summarised in paragraphs 10.3 to 10.9 above), it was for Bristol Water to determine its financial structure. Our objective in reviewing the actual cost of debt was to understand the actual financing cost of that portion of Bristol Water's financing which was directly comparable to our notional cost of embedded debt.

10.94 We therefore gave most weight to the cost of debt excluding preference shares, as preference shares are not directly comparable to these debt benchmarks.

10.95 Another way of describing this in the context of a regulatory cost of capital is that we assumed a notional level of debt financing (a gearing ratio), with a cost of debt associated with that financing. We assumed that this debt financing was standard bond or bank financing, with an investment-grade credit rating, and calculated a cost of debt accordingly. We then assumed a required return for the remainder of the financing on the basis of a single cost of equity. It was for Bristol Water to determine its actual structure for raising finance, including its choice of whether to use alternative forms of financing such as preference shares in addition to equity. If we were to assume the use of preference shares, this would affect our assumptions in other parameters, including gearing level.

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[662] Real rate = (nominal +1) / (inflation + 1) - 1.

[663] For example, Bristol Water SoC, Table 114: 'IL Debt' appears to use straight subtraction to estimate a real rate of 3.90% from a nominal 6.36% and an interest rate of 2.46%; using the Fisher equation results in 3.81%.

10.96 We also considered whether there was a case for adjustments to reflect non-operational financing. Bristol Water's gearing has differed from Ofwat's assumptions over the period. This reflected normal practice; that debt is borrowed irregularly. However, it could also have been the case that some of this debt was relatively expensive, and was not incurred for the purpose of delivering customer outcomes. In this case, there would be an argument for excluding this debt from the embedded debt calculation.

10.97 To assess the impact of excluding non-operational financing, we considered how Bristol Water's gearing had moved compared against Ofwat's assumptions over the period. We found that Bristol Water's gearing had fluctuated moderately. The main differential was in mid/late 2000s where Bristol borrowed significantly to finance shareholder distributions. At the time, Bristol Water's gearing rose to 75%.[664] Bristol Water's prevailing gearing was 68% (excluding preference shares, as reported), compared to the notional gearing level of 62.5%.[665] During much of AMP5, prior to the borrowing under the FFL scheme which appears to clearly represent efficient financing, Bristol Water's gearing was consistent with Ofwat's assumptions for AMP6.

10.98 We therefore considered two options, which were:

(a) to include Bristol Water's financing costs, excluding preference shares, and allocate these proportionately to the appointed business when calculating the level of embedded debt for a company with assumed 62.5% gearing; or

(b) to include Bristol Water's financing costs, but, to the extent that they have both resulted in higher costs and were used for shareholder distributions, exclude a proportion of the 2003-2005 borrowings when calculating the level of embedded debt for a company with assumed 62.5% gearing.

10.99 Appendix 10.1 provides further details on the impact of the adjustments arising from these two options; the difference between them was relatively small.

10.100 There were additional costs not included in coupon considerations from both the issuance of bonds (or debt in general), and ongoing costs associated with complying with debt covenants/managing liquidity, the level of which may be influenced by the need to hold additional cash or retain draw-down

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664 For example, Bristol Water 2009 annual report, p1.
665 As of March 2014, based on annual accounts and stated in Bristol Water SoC, paragraph 1587.

facilities. Our view (as discussed in Appendix 10.1) was that a rate of 0.1% for issuance costs and 0.1 to 0.2% for cash holding costs was consistent with both regulatory precedent and the evidence for Bristol Water specifically.

10.101 The result of these adjustments can be seen in Table 10.2 below.

Table 10.2: Actual cost of embedded debt calculation and comparison

		%
	Bristol Water	*CMA*
Weighted Average Current Cost	2.84	2.84
Remove preference shares		–0.13
Adjust for yields of Artesian debt		–0.17
Remove Artesian used for parent loan		-0.07 to 0
Issuance costs	+0.10	+0.10
Cash holding costs	+0.20	+0.10 to 0.20
Actual cost of embedded debt	3.14	2.7 to 2.85

Source: CMA analysis.

10.102 On this basis, we estimated the actual cost of embedded debt for Bristol Water as being 2.7 to 2.85%.

- *Relevance of notional and actual cost of embedded debt*

10.103 If we were simply to take Bristol Water's actual costs of embedded debt as an input to our calculation of the cost of capital for Bristol Water, this would risk creating a cost 'pass-through' environment, with significant weakening of incentives for efficiency. We considered that this would be against consumers' interests.

10.104 We therefore started from the same position as Ofwat of reviewing notional debt costs from across the industry. We then reviewed actual debt costs for Bristol Water, as part of a cross-check of our notional cost of debt. Our analysis suggested that Bristol Water has in practice incurred lower debt costs than a notional water company. In that context, using the higher level of notional embedded debt costs would result in higher bills for customers and could be argued to be greater than necessary to fulfil our financing duty.

10.105 The CC/CMA's approach in the past has generally been to give weight to both notional and actual cost of embedded debt.[666]

[666] 'We estimated the real cost of Bristol Water's existing debt […] at 3.83%, which was very close to Ofwat's projected cost of existing debt of 3.8% [...]. In this case, therefore, the approach to existing fixed-rate debt makes little difference to the WACC.' CC10, Appendix N, paragraph 47.

10.106 We also noted that Bristol Water's outperformance on actual debt was largely as a result of the low cost of debt on the FFL loan which was only recently taken out. We would not wish to take an approach which could be perceived as giving excessive weight to a company's actual short-term debt costs and therefore providing disincentives to efficient financing.

10.107 Nevertheless, in the context of this determination and the ranges identified for notional and actual embedded cost of debt, we considered that it was reasonable for customers to share some of the benefit of Bristol Water's lower actual cost of debt, whilst applying a range consistent with our assessment of the notional cost of debt.

10.108 Therefore, given:

(a) the notional level of 2.9 to 3.15%; and

(b) the lower actual cost of debt of 2.7 to 2.85%;

we found that a range for the cost of embedded debt of 2.85 to 3.05% would be reasonable, with a point estimate of the mid-point 2.95%.

New debt

Ofwat

10.109 As in its analysis of embedded debt costs, Ofwat stated that it was necessary to give all companies a strong incentive to seek financing at the best possible terms, and hence Ofwat used a notional industry cost as the starting point for its calculations for the costs of new debt.[667]

10.110 In its initial guidance, Ofwat considered iBoxx A and BBB bonds of 10+ years, and observed a nominal cost of debt of around 4.6 to 5%. Using an RPI assumption of 2.8%, this implied a range of new debt of 1.8 to 2.2%, with a mid-point of 2%. It then stated that forward expectations indicate interest rates will increase during the PR14 period, and estimated that this would have an impact of around 0.6%, which implied a range of 2.4 to 2.8%.[668] Ofwat stated that it gave greater weight to the upper end of this range giving a final estimated range of 2.6 to 2.8%.[669]

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[667] Ofwat response, paragraph 289.
[668] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p21.
[669] Ofwat response, paragraph 283.

10.111 In its final determination, Ofwat noted the significant downward movement in the capital markets, resulting in current real market yields of 1.35 to 1.55%. With no change in expectations of future trends, it altered its cost of new debt to a 2% point estimate (the RPI assumptions remained unchanged).[670]

Bristol Water

10.112 In its SoC, Bristol Water had taken a slightly different methodology to Ofwat, but also arrived at a figure of 2%, relying on a different estimation for inflation. Bristol Water also commented that Ofwat had not recognised the higher cost it faced relative to WaSCs for raising new debt.[671]

10.113 Bristol Water estimated the implied cost of new debt by estimating the gilt rate, and including an appropriate spread on top of this for a WoC. It stated that:

(a) using analysis of 20-year gilt rates gave a nominal rate of 2.7%. Based on an inflation assumption of 2.46%, this gave an underlying gilt rate of 0.25%;[672] and

(b) to calculate the expected spread above gilt rates, it considered the current spread of Bristol Water bonds, the spread of bonds from other water company bonds, and WaSC issuances with an associated premium. Together, these indicated a 1.62 to 2.1% spread, from which it picked a point estimate of 1.75%.[673]

10.114 In total, this resulted in a 2% cost of new debt.[674]

10.115 Following our provisional findings, Bristol Water reviewed a number of factors in its calculation of new debt, and concluded that the updated figure was 2.5% (including 0.3% for issuance and cash holding).[675]

CMA analysis

10.116 We considered the approach of deriving a notional cost of new debt for Bristol Water. To do so, we examined both the latest available market data

[670] For the companies which Ofwat allowed a company-specific uplift (or SCP), the allowance was equivalent to 2.25%; Ofwat (December 2014), Final price control determination – risk and reward, p39.
[671] Bristol Water SoC, paragraph 1571 and footnote 1024.
[672] Bristol Water SoC, paragraphs 1660–1661.
[673] Bristol Water SoC, paragraphs 1664 and 1673.
[674] Bristol Water SoC, paragraph 1674.
[675] Bristol Water response to our provisional findings, paragraphs 963–964.

on appropriate nominal corporate bond index (iBoxx), and issuance spreads over relevant gilt yields. These are described in detail in Appendix 10.1.

10.117 The iBoxx approach was as follows:

(a) The iBoxx has a one-year average nominal estimate of 3.81 to 4.05%. Based on an RPI of 2.7%,[676] this resulted in a real estimate of 1.1 to 1.3%.

(b) Including an allowance for expected base rate increases (0.3%), the WoC premium over iBoxx (0.1%) and issuance costs (0.1%) resulted in an estimate of 1.6 to 1.8%.

10.118 The gilt approach was as follows:

(a) 20-year forward gilt rates estimated averages over the past 12 months were –0.59% (real, relative to RPI).[677]

(b) We considered that Bristol Water's proposed spread above this of 1.62 to 2.1% appeared reasonable for new long-term debt.

(c) Including a 0.1% issuance cost on this results in an estimate of 1.15 to 1.6%.

Other forms of debt

10.119 There was also the possibility of raising new bank debt, which may be particularly attractive due to schemes which lower the costs such as FFL (which Bristol Water has already used once).

10.120 However, Bristol Water highlighted that its covenants on existing bonds limited the amount of debt which can mature in any given short-term period, limiting its ability to draw additional short-term bank debt. Bristol Water estimated the remaining level of short term debt it could draw as around £30 million.

10.121 As with estimations of notional embedded debt, we did not explicitly include the savings a company can make by using short-term debt, but we considered that this would largely be offset by any additional costs for cash holding. We considered this consistent with our assessment of notional

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[676] Consistent with a ten-year RPI estimate.
[677] We compared to the equivalent rates for ten-year gilts, which were broadly comparable at –0.53%.

embedded debt costs, and regulatory precedent from the NIE determination.[678]

Implied cost of new debt

10.122 The approaches summarised above provided the following estimates for the cost of new debt:

(a) iBoxx-based estimate: 1.6 to 1.8%.

(b) Gilt rates plus WoC spread estimate: 1.15 to 1.6%.

10.123 The differences between these estimates was partially due to the level of risk associated with issuing different types of long term debt. The forward-looking iBoxx estimate was based on nominal rates, converted using inflation estimates for AMP6, while the estimate based on gilt rates plus a spread used real rates as determined by market expectations. This would therefore reflect the notional real cost within AMP6 of issuing fixed rate nominal and index-linked debt respectively.

10.124 For a notional cost of new debt, we would consider it reasonable to assume that a company would issue a combination of index-linked and fixed rate debt. However, it would be difficult to forecast the exact mix of each that a company is likely to achieve, particularly since WoCs have historically found it more difficult to issued index-linked debt. Therefore, we considered it appropriate to use the level Ofwat has assumed in its financial modelling of 33% index-linked debt. We therefore found that 1.6% represented an appropriate cost for new debt for Bristol Water.[679]

Overall cost of debt

Ofwat

10.125 Ofwat used a weighted average of new and embedded debt, at a 25%:75% ratio to give an overall estimated cost of debt. This split was based on the submitted business plans of the WaSCs and WoCs.[680]

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[678] The CC allowed NIE a 0.2% increase on new debt to cover issuance costs and fees (including for interest rate hedges), but no explicit allowance for cash handling costs. The allowance for hedging instruments may have been due to the CC not allowing any forward-looking adjustment for expected rate changes at the time; CC NIE report, paragraph 13.76.
[679] Calculated based on a weighted average of the midpoints of each range (2.05% and 1.25%, with a 66% and 33% weighting respectively); Bristol Water SoC, Table 114.
[680] January 2014, Setting price controls for 2015-20 – risk and reward guidance, p20.

Bristol Water

10.126 In its SoC, Bristol Water suggested using opening and expected closing levels of debt. It said that the ratio approach would ignore the increase in embedded debt costs over the period.[681] This resulted in an overall cost of debt of 3.15% using its estimates for allowed costs of embedded and new debt.[682] Bristol Water acknowledged that this was a different approach from that normally adopted by regulators.[683]

10.127 In responding to comments from Ofwat, Bristol Water subsequently undertook similar analysis, but on an annual basis (rather than only considering opening and closing levels). This resulted in an estimate for the total cost of debt of 3.1%.[684]

10.128 In response to our provisional findings, which used a notional split of new and embedded debt (25%:75%), Bristol Water stated that using such a notional basis has no incentive advantages, and in this case would result in an incorrect estimate for the overall cost of debt. In particular, it highlighted that a notional approach would not take account of retirements during the period.

10.129 Bristol Water therefore argued that we should use a split of embedded and new of 15%:85% to more accurately reflect its own expectations.[685]

Discussion

10.130 It is difficult to make accurate estimates of the amount of new debt a specific company will raise during a future period. The quantum of new issuance is likely to be dependent both on the price review itself (which may influence the amount the company needs to borrow), and on management's decisions (eg when and how dividends are paid).

10.131 The price review will also (largely) dictate the change in RCV, and hence may influence the degree to which risk of gearing up/down could limit/encourage the issuance of new debt.

10.132 We considered that the amount of new debt taken in any particular period remains a decision for management, and hence not for the regulator to second-guess. Therefore any associated risk with taking too much/little

[681] Bristol Water SoC, paragraph 1733.
[682] Bristol Water SoC, paragraph 1732.
[683] Bristol Water SoC, paragraphs 1733–1734.
[684] Bristol Water Reply to Ofwat's response, paragraph 403.
[685] Bristol Water response to our provisional findings, paragraph 976.

should lie with management too. This would support using a notional level of new vs embedded debt.

10.133 Although Bristol Water stated that there were no advantages in terms of incentives from using a notional level of new debt vs embedded debt, we did not consider this to be correct. In particular, consistently using a notional level for all companies across multiple price reviews establishes a framework in which the choice of debt issuance is decoupled from the regulatory review.

10.134 Given all the above, we saw insufficient merit in Bristol Water's arguments to justify a departure from regulatory precedent in using a constant assumption for the cost of capital through the period based on a notional weighting of the evidence for the cost of debt, including both forward-looking and embedded debt costs.

10.135 Ofwat's ratio of 25%:75% (for new and embedded debt respectively) was based on the average of the industry, so we considered that this represented an appropriate basis on which to calculate an allowed cost of debt.

10.136 Using an estimated cost of new debt of 1.6%, and a cost of embedded debt of 2.85 to 3.05% (with a point estimate of 2.95%), resulted in an allowed cost of debt for Bristol Water of 2.54 to 2.69%, with a point estimate of 2.61%.

Cost of equity

10.137 Our analysis on the cost of equity was structured around the components of the CAPM which are as follows:

(a) A firm-specific measure of investors' exposure to systematic risk (equity beta or β).

(b) The risk-free rate (R_f).

(c) The total expected return on the market portfolio (R_m).

10.138 These can then be used to calculate the implied cost of equity as shown in Equation 1 below:

Equation 1: Cost of equity: $C_e = R_f + \beta \times (R_m - R_f)$

Asset beta

Ofwat

10.139 Ofwat calculated that, since 2000, the public water companies (Pennon Group, Severn Trent, and United Utilities) had asset betas[686] predominantly in the range 0.2 to 0.3 (assuming a debt beta of 0).[687]

10.140 Combining this with betas of other regulated utilities, as well as considering the performance of water companies during the financial crisis and recession, Ofwat concluded that an asset beta of 0.3 was a good empirical estimate.[688] It also referenced the ranges that the CC/CMA estimated for the WaSC beta in CC10 (0.21 to 0.31) and NIE (0.25 to 0.3), indicating that 0.3 was a fair estimate for WaSCs.[689,690]

10.141 CC10 had concluded that an uplift to the WaSC beta was appropriate in setting the asset beta for Bristol Water. PwC produced a report for PR14 which reviewed the evidence for an uplift on the asset beta for WoCs relative to WaSCs. PwC noted that actual observed volatility of returns for WoCs had been materially higher (around double) that for WaSCs. However, it concluded that there was no forward-looking evidence for an uplift to be applied in PR14.[691] Among other factors, PwC noted that:

(a) Ofwat was seeking to reduce the difference between the risks faced by WoCs and WaSCs in the future;

(b) for some risks (such as operating cost risk), the formulation of the CAPM suggests that these should not theoretically result in a higher asset beta in any case (eg the associated risks are not systematic); and

(c) observed market-asset ratios (MARs) did not imply a premium for WoCs relative to WaSCs;

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686 'Beta' in this section generally refers to the asset beta of a company, which represents the beta of a company with zero gearing (except where explicitly referred to as the equity beta).
687 Ofwat (December 2014), Final price control determination – risk and reward, pp34–36.
688 Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p18.
689 Ofwat (December 2014), Final price control determination – risk and reward, pp35–36.
690 Ofwat (December 2014), PwC Updated evidence on the WACC for PR14 – A report prepared for Ofwat, pp 32–33.
691 August 2014, PwC company specific adjustments to the WACC, pp30–33.

10.142 Ofwat therefore concluded that no differential was appropriate in setting the asset beta for WoCs, and that using the average observed WaSC beta of 0.3 for all water companies was appropriate.[692]

Bristol Water

10.143 Bristol Water stated that the asset beta estimated in CC10 remained appropriate.[693] This included both the estimate for WaSCs, and then applying a beta uplift to adjust for its view of the greater risk associated with Bristol Water relative to the WaSCs used as comparators.

10.144 Bristol Water highlighted that the observed asset betas have generally increased since the CC10 assessment, so it concluded that the overall estimated WaSCs asset beta should be no lower than that assumed in CC10.[694]

10.145 In its SoC, Bristol Water acknowledged that Ofwat's asset beta of 0.3 was not an unreasonable estimate for WaSCs. However, it believed that its own asset beta was higher than this due to three factors:[695]

(a) higher operational gearing/risk;

(b) costs associated with greater illiquidity; and

(c) smaller size.

10.146 Bristol Water argued that the CC believed that these reasons justified a premium in 2010 and it should remain valid unless there was new compelling evidence to the contrary.

Discussion

10.147 Consistent with its own approach at FD09, Ofwat did not make any adjustment for WoCs. It rejected the CC10 approach of making an adjustment for operational gearing or other specific differences between companies.

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692 'The six smaller WoCs […] did not face higher equity costs'. Ofwat, Final price control: policy chapter A7 – risk and reward, p43.
693 Bristol Water SoC, paragraph 1602.
694 Bristol Water SoC, paragraph 1610.
695 Bristol Water SoC, paragraphs 1614–1615.

10.148 We reviewed the evidence provided by Ofwat regarding a company-specific uplift to betas, and performed our own analysis of betas in the water industry. Our approach includes some differences to Ofwat's. In particular:

(a) we used the latest available data sets;

(b) we did not use a Blume adjustment in calculating water company betas;[696] and

(c) we used a wide range of sampling frequencies and looked across a range of periods in estimating the beta of comparator companies.

10.149 See Appendix 10.1 for details on the beta analysis completed, and additional detail on the assumptions used, such as the range and sampling frequency. This resulted in beta estimates shown below in Table 10.3:

Table 10.3: Mean average beta of public WaSCs, to end August 2015

	Single day (28/08/2015)	*Last year*	*Last 2 years*	*Last 5 years*
2-year daily	0.397	0.299	0.274	0.270
2-year weekly	0.372	0.396	0.361	0.285
5-year weekly	0.297	0.279	0.269	0.304
5-year monthly	0.257	0.216	0.195	0.186

Source: CMA analysis, Bloomberg.

10.150 The different frequency/sampling for large public water companies' betas gave a wide range of beta estimates of around 0.186 to 0.397. We noted that half the observations were within a narrower range of 0.27 to 0.3. We used this narrower range in coming to a range for the asset beta.[697] This analysis was based on a debt beta of 0, although as noted in CC10,[698] PR14,[699] and NIE,[700] the debt beta has very little impact on the overall cost of capital if Bristol Water's gearing level (and the level of gearing used to calculate the WACC) is similar to the comparators used to estimate the asset beta.[701]

10.151 We also considered whether an uplift to this was appropriate to reflect increased risks faced by Bristol Water relative to WaSCs. We considered:

[696] A Blume adjustment is an attempt to adjust for forecast future betas based on historical observations. This is discussed further in Appendix 10.1.
[697] We also conducted this analysis based on an unweighted portfolio of the three public comparators and the results are very similar, with the same tightened range (0.26 to 0.31) of the middle observations.
[698] CC10, Appendix N, paragraph 117 (c) and footnotes 13 & 66.
[699] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, footnote 18.
[700] NIE14, pp13–6, footnote 5.
[701] Net debt/RCV of comparators is (to 31 March 2015): 59% for United Utilities, 61.4% for Severn Trent (p45), and 62% for South West Water (major constituent of Pennon Group, p11) versus a gearing of 62.5% in the WACC calculation.

(a) our financing duty, which would indicate caution against setting the cost of capital too low, and in particular potentially excluding costs actually incurred;

(b) evidence from CC10, which indicated that higher operational gearing of WoCs, including Bristol Water, should in theory lead to a higher asset beta; and

(c) evidence from Bristol Water and Ofwat which discussed the differential between WaSC and WoC risks resulting from their differences in operational gearing, and the effect on asset betas.

10.152 Again, we gave weight to consistency in our assessment of whether an amendment to the asset beta to reflect the risks faced by Bristol Water was appropriate. CC10 applied an uplift of 18% based on a measure of Bristol Water's operational gearing relative to comparator WaSCs. Our review of the operational characteristics of Bristol Water compared to the observable comparators suggested that there had been no material change since CC10 and Bristol Water continued to display higher operational gearing. In our provisional findings, we therefore proposed to follow the calculation applied in CC10, which indicated an uplift of 13% for Bristol Water, based on AMP6 data.

10.153 In response to our provisional findings, Ofwat provided further arguments to support its assessment that no uplift was required. It considered that the evidence of differentials in the range of actual returns between WaSC and WoC profitability was not relevant. It also considered that our approach (based on CC10) was unstable.[702]

10.154 Bristol Water provided other examples of approaches which would have supported an outcome more consistent with the scale of the conclusion from CC10 (ie an 18% uplift), or potentially higher.

10.155 We acknowledged that there was judgement associated with making such an adjustment, and that there was no single way to measure the effect on the asset beta. One approach was to assume a single asset beta for all companies. This would provide consistency and a clear message to investors. However, it was highly unlikely that the underlying cost of capital would be the same for all companies. In the context of our determination for Bristol Water, we considered that it was proportionate to assess whether any

[702] Ofwat response to our provisional findings, paragraphs 214–230.

difference between Bristol Water's cost of capital and the wider industry should be reflected within the assumption for the asset beta.

10.156 We considered that our analysis, Bristol Water's analysis, and some of the data provided by Ofwat pointed to the risks being higher for WoCs than for WaSCs. The impact of greater risk on beta was harder to measure.

10.157 In the context of betas for WaSCs which are accepted to be significant and clearly positive, we considered that it was unlikely that the effect on beta was zero. Another way of explaining this is that while the effect could be zero, this would require none of the increased risks identified to be systematic in nature. This seemed unlikely, since those risks are a major part of the consequence of investment in a water business.

10.158 We accepted that Ofwat had provided examples from market data that would be consistent with a zero adjustment, including on Dee Valley's observed WoC betas and on market-asset and gearing ratios. However, we were unconvinced of how much weight should be placed on parts of this evidence base. For example, Ofwat provided analysis that average WoC gearing has risen since PR09. This conclusion was driven by the creation of Affinity Water within a highly-geared structure. We did not consider that the re-gearing of a large WoC could be directly translated into an assessment of the relative betas of WoCs and WaSCs.

10.159 Our approach followed precedent from Ofwat and previous CC determinations of using more statistically robust market data as a starting point, and applying judgment in how to interpret that data.

10.160 Our starting point was to apply a 13% uplift, based on applying the operational gearing methodology used in CC10 to the latest available data. We considered that the evidence provided was broadly balanced and would suggest that 13% was a suitable point estimate from a range:

(a) As acknowledged in CC10, the operational gearing approach may over-state the beta adjustment, as some aspects of systematic risk may be unrelated to the operational risks reflected in such a measure.

(b) As highlighted by Bristol Water, there are a number of alternative measures which could have been applied, some of which would result in an adjustment higher than 13%.

10.161 This evidence could be used to estimate a range for the asset beta uplift. However, we were persuaded that any range would include 13%, and that there was no compelling evidence that this did not represent a suitable point estimate. In addition, we considered that this provided a range for the asset beta for Bristol Water that remained consistent both with regulatory precedent and with the range of evidence on the asset beta of water companies more generally.

10.162 Applying a 13% adjustment to our range for the comparators' asset beta gives an estimated asset beta for Bristol Water of 0.3 to 0.34. While other potential measures for the adjustment would be feasible, we considered that this range represented an appropriate balance of the evidence. See Appendix 10.1 for further details on the beta uplift analysis.

10.163 Since we took a wide range of evidence into consideration, including the costs associated with Bristol Water's higher operational gearing, we considered that the mid-point of this range was a reasonable point estimate. We therefore used an asset beta of 0.32.

10.164 The implied asset beta range (including comparison with precedent from CC10 and NIE) and use of the midpoint are discussed further in Appendix 10.1, particularly with regard to choice of the overall WACC estimate within its range.

10.165 As with the cost of debt, we did not consider that it was appropriate to apply a customer benefits test to the uplift of Bristol Water's asset beta.

Risk-free rate

Ofwat

10.166 Ofwat estimated that, using current yields adjusted for forward-looking expectations, the RFR was in a range of 0.75 to 1.25%, with a point estimate of 1.25%.[703]

10.167 Ofwat also produced a chart showing how index-linked gilt yields had evolved over time, with regulatory precedents overlaid, which is reproduced as Figure 10.2 below.

[703] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p15.

Figure 10.2: Yield on index-linked gilts and regulatory precedents on the real risk-free rate (2008-2013)

Source: Ofwat risk and reward guidance, January 2014, p15.

Bristol Water

10.168 In its SoC, Bristol Water stated that it had assumed a RFR of 1.25%, in line with Ofwat's guidance.[704]

10.169 It also noted that current gilt costs may be below this level, but believed this was due to temporary market distortions that would not continue over the period. It stated that it has continued to assume a rate of 1.25%, although it noted that the exact decomposition of total market return into RFR and ERP has a limited impact on the WACC.[705]

Discussion

10.170 We analysed the market evidence for the RFR based on long- and short-dated index-linked and nominal gilt yields.

10.171 This evidence indicated that gilt yields remained very low, often around 0% (details on this are included in Appendix 10.1).

[704] Bristol Water SoC, paragraph 1598.
[705] Bristol Water SoC, paragraphs 1599–1600.

10.172 These market conditions have been similar for the past three years (as seen in Figure 10.2, above), and we put weight on regulatory precedent on the RFR from this period, in particular the CC/CMA determination in NIE 2014. This would support an RFR of between 1 and 1.5%.

10.173 We therefore found that a point estimate rate of 1.25% (which was also used by Ofwat and Bristol Water) was an appropriate figure for the RFR.

10.174 We also noted that since we were estimating a total equity market return (see paragraph 10.176) which we subsequently split into a RFR and an equity market premium, the exact figure used for the RFR has a limited effect on the overall WACC. For example, selecting a RFR of 1% and retaining the total equity market return would result in a change in the WACC of only 0.01 to 0.02%.

Equity market return and risk premium

10.175 The expected market return is the return that investors require for investing in equities. The ERP is the part of this return that compensates them for the additional risk associated with investing in equities, rather than in risk-free assets.

10.176 The ERP can be used for the (R_m – R_f) term in the CAPM formula, and it is common to calculate the ERP by estimating the equity market return (R_m), and then subtracting the RFR (R_f). This is because there are more potential data sources for the equity market return than for the ERP itself.

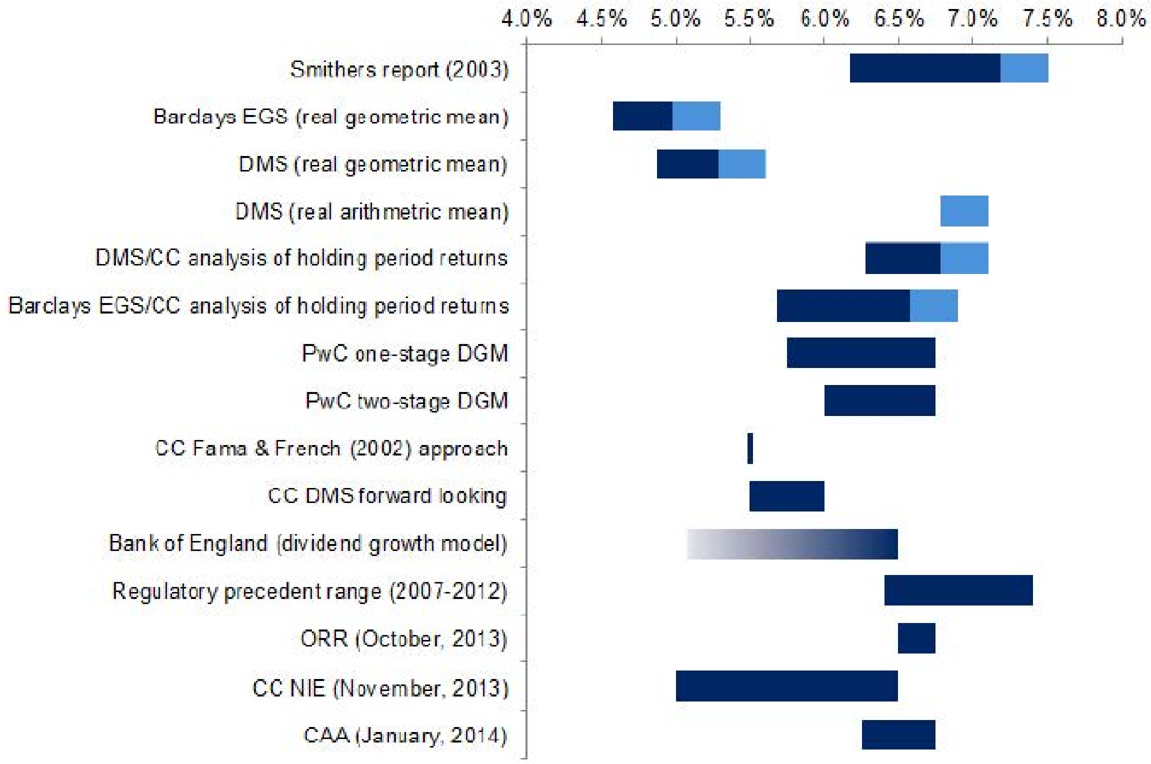
Ofwat

10.177 Ofwat stated that it considered a number of sources including historical equity returns and dividend growth models when determining the equity market return.[706] Ofwat noted that changes in ONS RPI calculation methodology resulted in the need to reduce figures from historical studies.[707]

10.178 Ofwat also looked to regulatory precedent in the form of recent findings/preliminary findings of the CC/CMA, Office of Rail and Road (ORR), CAA, and Ofgem, as can be seen in Figure 10.3 below.

[706] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p12.
[707] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p12.

Figure 10.3: Equity market return evidence



Source: Ofwat (January 2014), Risk and reward guidance, p13.
Note: Dark blue bars represent range adjusted for change in RPI formula effect. Light blue shows top end before this adjustment.

10.179 This resulted in guidance of an equity market return of 6.25 to 6.75%, with a point estimate of 6.75% (equivalent to an ERP of 5.5%). In its final determination, it kept this figure, although noted that this was at the top end of recent regulatory precedent.[708]

Bristol Water

10.180 Bristol Water stated that it initially assumed an equity market return of 6.75% to match Ofwat's guidance.[709]

10.181 Following the CC/CMA's determination for NIE of 6.5% equity market return (equivalent to 5.25% for the ERP), Bristol Water adjusted its estimates to match this.[710]

[708] Ofwat (December 2014), Final price control determination – risk and reward, p34.
[709] Bristol Water SoC, paragraph 1593.
[710] Bristol Water SoC, paragraph 1597.

10.182 Bristol Water also referenced an Oxera report from January 2015 that concluded that the evidence on equity market returns had not materially altered since the time of the NIE decision.[711]

Discussion

10.183 There is no universally accepted method for deriving the equity market return or the ERP. Both concepts are concerned with investors' *ex ante* expectations of returns, which are largely unobservable. The academic literature on the subject is large and can be categorised into three types:

(a) Studies that assume that historical realised returns are equal to investors' expectations ('historical *ex post* approaches').

(b) Studies that fit models of stock returns to historical data to separate out *ex ante* expectations from *ex post* good or bad fortune ('historical *ex ante* approaches').

(c) Studies that use current market prices and surveys of market participants to derive current forward-looking expectations ('forward-looking approaches').

10.184 All of the above methods had a large degree of uncertainty associated with them, and any answers from these analyses require a large number of assumptions and significant amounts of regulatory judgement. Combined with the limited disagreement between the parties, we considered it both appropriate and proportionate in this case to place most weight on regulatory precedent.

10.185 For this determination, we considered that NIE (2014) represented an appropriate comparison for estimating the equity market return, as well as being published within the last 18 months, and hence was relatively up to date. NIE estimated an equity market return of 5 to 6.5%, placing more weight on the upper end of the range, and ultimately using 6.5%.

10.186 Therefore, we decided that an equity market return of 6.5% and an RFR of 1.25% are appropriate. Consequently the associated ERP was 5.25%.[712,713]

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[711] Bristol Water SoC, paragraph 1596.
[712] ERP is calculated as equity market return less the RFR.
[713] We note that an equity market return of 6.5% and a RFR of 1.25% are both within the NIE determination ranges (of 5 to 6.5% and 1 to 1.5% respectively). In the NIE determination, the CC subsequently associated the tops and bottoms of these ranges to derive an implied narrow ERP range of 4 to 5%, although we note that a wider range for the ERP could also be supported (up to 3.5%-5.5%).

Overall cost of equity

10.187 The asset beta of 0.32 was equivalent to an equity beta of 0.85, assuming 62.5% gearing level.[714]

10.188 Using a RFR of 1.25%, ERP of 5.25%, and an equity beta of 0.85 in the CAPM ($C_e = R_f + \beta \times (R_m - R_f)$) results in the following calculation:

Equation 2: 1.25% + (0.85 x 5.25%) = 5.73%

10.189 Therefore we an estimated cost of equity of 5.73%.

Appointee WACC

WACC point selection within range

10.190 Bristol Water said that using the mid-point of the range estimated for elements of cost of capital (particularly with regard to the asset beta) could negatively impact customer welfare. It supported this by noting 'well-established arguments', as well as precedent from the CC Airports price review in 2007.[715]

10.191 We were aware of the customer welfare arguments for the use of an estimate above the mid-point of any range. In summary, the argument was that, if the WACC were to be too high, customers would pay slightly more, but if the WACC were to be too low, there would be a risk of underinvestment or financial distress, which could result in a greater detriment to customers than the slightly higher costs.

10.192 Although we generally used the midpoint of our ranges, there were a number of areas in which we made prudent upward adjustments for Bristol Water relative to observable market evidence. Examples included a debt SCP, an equity beta uplift, and the inclusion of a forward-looking uplift in areas of new debt. This gave us some assurance that even accounting for the inherent potential errors in market observations, this was a reasonable WACC for Bristol Water.

10.193 The financeability assessment we conducted (including the impact of downside shock) indicated that Bristol Water was in a position to avoid financial distress with the WACC set at the mid-point of the range. This is explained in more detail in Section 11 below.

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[714] Equity beta = asset beta / (1 - gearing); assumes a debt beta of 0.
[715] Bristol Water response to our provisional findings, paragraphs 1017 & 1021–1022.

10.194 Finally, we considered that the risk of underinvestment to the detriment of consumers, if our estimated WACC was lower than the 'true WACC', was lower in the case of our determination than in many precedent situations. This was due to a number of mechanisms in the regulatory framework for Bristol Water, including the following:

(a) The use of a totex approach, with cash allowances based on a combination of PAYG and RCV run-off, reduced the link between investment and returns on the RCV. The value added to the RCV (and hence receiving a return based on the WACC) would be dependent on total spend, rather than the Bristol Water's decisions around specific investment projects.

(b) Regardless of the exact level of the allowed WACC, Bristol Water would be required to carry out appropriate investment through a combination of the price control outcomes, ODIs and its statutory duties.

(c) In addition, the approach to the ex ante cost assessment was less dependent on the companies identifying investment opportunities within their business plan. This was as a result of both the increased use of benchmarking and the greater role of customers and outcomes in developing plans.

(d) Our assessment of wholesale totex provided a reasonable forward-looking allowance for Bristol Water's wholesale expenditure requirements. The use of totex cost sharing incentives with a rate of 50% meant that, regardless of the exact level of the allowed WACC, there was no intention that Bristol Water would be fully remunerated for the precise level of expenditure that it incurs or for its marginal investment decisions.

10.195 Bristol Water said that a WACC estimate set below the 'true WACC' might influence some marginal investment decisions. We considered 'marginal investments' to be areas which were not fundamental to consumer welfare and that, in any event, such marginal investment decisions were Bristol Water's responsibility to manage in the light of the outcomes required of it from our price control determination and its statutory duties.

10.196 We noted that Ofwat stated that it would be concerned if the WACC was low enough to dissuade investment at an industry level in the longer term. However, Ofwat was content on the basis that recent MARs were above 1 and this did not seem an issue in the context of our determination.

Appointee WACC range and point estimates

10.197 Based on our analysis above, we calculated a range for Bristol Water's cost of capital as 3.63 to 3.93%. As discussed, we took a balanced approach to the data and therefore found that using the mid-point of our cost of equity and cost of debt ranges was an appropriate point estimate (3.78%).[716] The components of our cost of capital estimates and those of Bristol Water and Ofwat are summarised in Table 10.4 below.

Table 10.4: Estimated cost of capital for Bristol Water

%

	CC10	*Ofwat*	*Bristol Water*	*CMA range*	*CMA point estimate*
Gearing	60.00	62.50	62.50	62.50	62.50
Cost of debt	3.9	2.59	3.15	2.54-2.69	2.61
Cost of equity	6.6	5.65	6.40	5.45-6.01	5.73
Appointee WACC	5.0	3.74	4.37	3.63-3.93	3.78
Cost of capital components					
Cost of embedded debt	3.8	2.75	3.15	2.85-3.05	2.95
Cost of new debt	4.0	2.00	2.00	1.60	1.60
RFR	2.0	1.25	1.25	1.25	1.25
ERP	5.0	5.50	5.25	5.25	5.25
Asset beta	0.37	0.30	0.37	0.30-0.34	0.32

Source: CC calculations.

10.198 Our cost of capital was very similar to Ofwat's. We allowed Bristol Water a debt SCP and an uplift in its asset beta from the public comparators. This was offset by a lower estimated equity market return, aligned with recent CC/CMA precedent (NIE14), and by our choice of the cost of capital from around the middle of the ranges that we had identified for the individual parameters. In some cases, such as the asset beta and the cost of debt, Ofwat had chosen a figure from the top of the range.

10.199 Our assessment of the cost of capital was focused on developing a reasonable estimate for Bristol Water. As part of this process, we produced some figures for other water companies, and groups of water companies (eg WoCs and WaSCs). Although a review of the figures could infer that a lower cost of capital would be appropriate for the WaSCs, a direct read-across would not be appropriate, as a number of other factors would need to be taken into consideration. There have been numerous instances (eg when selecting within ranges) which have required regulatory judgements specific to Bristol Water and hence this determination applied to it alone.

[716] The range for cost of capital was based on associating the low end of our cost of embedded debt range with the low end of our asset beta range (and equivalently with the high end). All other components used the CMA's estimated point estimate.

10.200 For example, our assessment that it was appropriate to consider the middle of the range identified above was based on our view that this was consistent with the different sources of evidence that we considered. We considered a broad spectrum of evidence, both from industry data and also the specific circumstances of Bristol Water. This included cross-checking our cost of capital through the use of market-asset ratios, as discussed below. Our assessment of that evidence was that there was limited risk that the cost of capital would be a set at a level which was too low.[717] We also did not consider that there were any particular circumstances or incentives which would support a higher cost of capital. Therefore, on balance, we considered that it was consistent with our statutory duties to set the cost of capital at a level consistent with the middle of the range.

Market asset ratios

10.201 In principle, the market prices of asset transactions relative to the regulatory asset value (either M&A activity or traded share prices) can also provide an indication of the value of the cost of capital as a whole, and in particular whether the cost of equity appears to be consistent with observed market evidence. We can therefore use it to cross-check this level of cost of capital. The use of market asset ratios (MARs) to estimate actual expected returns on capital was comparable to the use of dividend growth models. Both require a number of assumptions around projections of future growth in returns.

10.202 In the case of MARs, there are a number of assumptions required, the largest of which are:

(a) investor assumptions on future trends in the cost of capital beyond the current review;

(b) investor assumptions on the potential for outperformance on other aspects of the regulatory framework; and

(c) implied values for other parts of the business, where the traded shares include both unregulated and regulated businesses.

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[717] We also noted the cost of capital set in August 2015 for the Thames Tideway Tunnel was 2.497%, however this figure was not directly comparable to the estimates here due to differing circumstances (eg no embedded debt); Ofwat press release, 24 August 2015.

10.203 M&A valuations of shares in actual licenced businesses will minimise the impact of *(c)*, where those businesses have limited unregulated businesses. For example, see the following:

(a) Pennon Group's recent acquisition of Bournemouth Water for £100 million cash consideration implied an enterprise value of £192 million, while the RCV was around £150 million. This resulted in an EV/RCV ratio of around 1.25x.[718,719]

(b) Although it took place during previous price control periods, Ofwat highlighted that Bristol Water's own shareholders purchased their stakes at valuation ratios to RCV of 1.51x (Agbar, 2006), 1.22x (Capstone, 2011), and 1.25x (Itochu, 2012).[720]

(c) Sumitomo's purchase of Sutton and East Surrey Water has been estimated to be at a valuation ratio of over 1.3x.[721]

(d) The publically traded water companies currently have EV/RCV ratios of 1.3x to 1.6x, as can be seen in Table 10.5 below.

Table 10.5: EV/RCV valuations of publically traded water companies, 2015

	£m		
	Enterprise value	*RCV*	*EV/RCV*
Severn Trent	9,678	7,324	1.32x
United Utilities	12,764	9,565	1.33x
Dee Valley Water	111	69	1.61x

Source: Bloomberg; Ofwat.
Notes:
1. Pennon Group RCV only includes South West Water, but the enterprise value would include the rest of the Group. Therefore, the EV/RCV is artificially inflated, and so we excluded from this table.
2. Enterprise values are FY15, except for Dee Valley, which is FY14. RCV values are based on Ofwat final determination figures for 2015/16 for both wholesale water and wastewater.

10.204 In the context of these premia, it was useful to assess evidence on actual outperformance on areas other than the cost of capital. As highlighted in the PwC analysis, some of the WoCs achieved outperformance of the cost of equity of as much as 3% (1.2% on the RCV). More typical was a potential for outperformance by 0.5 to 1% for high performing WoCs.[722] Ofwat also stated

[718] We note here that Bournemouth Water had a 0.15% higher cost of capital than the other WoCs due to being allowed an uplift on its cost of debt. On the basis that this was likely only to persist for one period following acquisition, this was consistent with an effect on the premium of less than 1%.
[719] London Stock Exchange; Singapore Business Review. The headline premium was 1.28x. This has been adjusted to reflect Bournemouth Water's ownership of small unregulated businesses.
[720] Ofwat response, paragraph 332.
[721] See, for example, 'InfraRead' (2013).
[722] Ofwat setting price controls for 2015-20 – risk and reward guidance, January 2014, pp 39–42.

that some market analysts have indicated financial outperformance as the main reason for the high MARs.[723]

10.205 For WaSCs, there was limited evidence that there has been any material outperformance.

10.206 This evidence all suggests that a significant share of any RCV premium, either based on WoC acquisition premia or WaSC share prices, in theory implies that investors expect outperformance of the WACC. A review of the WoC data as a group suggests that a realistic longer-term expectation would be that outperformance should be no more than 0.5% of RCV on average per annum, equivalent to a value of around 14% RCV premium. In other words, if Pennon, or the other recent acquirers of WoCs, are assuming 0.5% yearly return in perpetuity (around 1.25% RoRE (return on regulated equity) outperformance) from operational performance targets, this would justify a MAR of around 1.14x. To earn its return on capital, this suggested an acquiring company would require a further premium of at least 10% from outperformance on the cost of capital.

10.207 We note that KPMG, for Bristol Water, provided analysis which sought to illustrate scenarios under which the implied premium associated with cost of capital outperformance would be reduced, for example due to investor assumptions around RCV growth. KPMG's analysis illustrates the complexity in using the MARs to identify a good estimate for the WACC, and why it tends to be used primarily as a cross-check. However, we considered that KPMG's analysis did not create a realistic scenario under which there was no implied premium.[724] In particular, the effect of investor assumptions on RCV growth may be to impact the scale of implied cost of capital outperformance. An assumption of RCV growth cannot change whether there is an assumed cost of capital outperformance or underperformance.

10.208 In practice, there are a number of reasons why investors may value assets at figure greater than that implied by the RCV. The MAR is a single number which only produces a cross-check of investors' overall expectations of long-term returns on investment in water company assets. However, we

[723] Including in reports by Morgan Stanley and Agency Partners.
[724] We noted that KPMG provided one analysis which illustrated a 3.99% implied cost of capital. This appeared to be based on an assumption that investors would assume a perpetuity of real growth in the RCV and that those investors would also assume that there would be outperformance of 0.5% per annum non-financial outperformance on all new assets in addition to existing assets. We did not consider that these assumptions were realistic, as much of that outperformance would not be affected by RCV growth. Our scenario of 0.5% was intended to be illustrative of a 'high case' for outperformance, which could not be reliably translated to all future assets – as illustrated by Ofwat's own analysis that this was comparable to a 90% upside case on current assets.

were comfortable that these ratios indicated that the allowed cost of capital for Bristol Water was consistent with our statutory duties.

Wholesale adjustment

10.209 Due to the plans to open the non-household retail market to competition, Ofwat separate determinations with regard to wholesale water, retail household, and retail non-household price controls.

Ofwat

10.210 Ofwat believed that, since the retail businesses generate positive margins, these represented a return on the RCV which should be netted off the WACC to give a wholesale water WACC. This would ensure that returns on notional retail assets were not included twice (in both the margins, and the WACC).[725] These margins were determined to be 1% for household net margins, and 2.5% for non-household net margins.[726]

10.211 The aim of this was to ensure that companies were not compensated twice for a proportion of their capital – once in the retail margin, and again in the returns from capital (based on the % WACC x RCV).

10.212 Ofwat guidance stated that at the outset, existing fixed assets used to provide retail activities would remain in the wholesale RCV. Over time, the retail business would build up its own assets, and the legacy retail assets in wholesale would depreciate away.[727]

10.213 Since some risk has been transferred from the wholesale business to the retail business, Ofwat noted that the wholesale WACC should be lower than the appointee total WACC.[728]

Bristol Water

10.214 Bristol Water told us that Ofwat's use of a lower WACC for wholesale than for the appointee business was inappropriate as it argued that calculations of the impact on WACC of splitting out the retail assets was close to zero. It stated that Ofwat had used the incorrect theory and calculations,[729] and laid

[725] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p34.
[726] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, Table 2.
[727] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p34.
[728] Ofwat (January 2014), Setting price controls for 2015-20 – risk and reward guidance, p35.
[729] Bristol Water SoC, paragraph 1749.

out its views showing that the impact of WACC was +/- 0.02%, and hence not significant.[730]

10.215 Bristol Water stated that, theoretically, since the wholesale WACC should only be applied to the wholesale RCV, adjustments were only necessary if:[731]

(a) the wholesale business had a lower systematic risk than the appointed business that was sufficiently large to offset the dominance of the wholesale business in the appointed business; or

(b) the returns of the wholesale business needed to be reduced because excess profits were being made in the retail elements of the business. Bristol Water highlighted that Ofwat had stated that each price control was standalone.

10.216 In addition to Bristol Water's objection in principle to the adjustment, it stated that Ofwat had used an incorrect methodology in its calculations. Specifically:[732]

(a) the removal of indexation in retail prices increased risk to the appointee;

(b) tax and inflation were dealt with incorrectly; and

(c) Ofwat excluded return on retail assets built up over the period.

10.217 Bristol Water therefore estimated that, if a modifier was included, it should be in the region of 0.02%.[733]

Discussion

10.218 Financial theory would indicate that dividing a company into parts (retained under the same ownership) should not affect either its profitability or the returns it generates. Therefore, we were not convinced that the implementation of separate controls should in itself require any increased returns.

10.219 Bristol Water highlighted three areas which it stated as being in conflict with Ofwat's approach to the calculation of an adjustment:[734]

[730] Bristol Water SoC, paragraph 1756.
[731] Bristol Water SoC, paragraph 1741.
[732] Bristol Water SoC, paragraphs 1752–1754.
[733] Bristol Water SoC, Table 118.
[734] Bristol Water response to our provisional findings, Section 8.6.

(a) Incorrect application of a nominal return to a real wholesale cost of capital.

(b) Treatment of tax.

(c) Analysis of risk.

10.220 In response to our provisional findings, Bristol Water also proposed an alternate approach to calculating the appointee-wholesale adjustment to ensure that returns on the RCV/assets were not double-counted in both wholesale and retail.[735] These are discussed in more detail in Appendix 10.1.

10.221 Our starting point was that we considered that many of Bristol Water's proposed changes were inconsistent with the assumptions underlying the approach to the cost of capital, as they would result in the divided company generating different returns than the single entity.

10.222 The exception to this would be any additional risk from the removal of indexation in the retail price control, where, theoretically this could result in an increase in the return due to the company.

10.223 We considered that this change was relatively small in the context of the changes being made to the overall risk/reward framework as part of PR14 (eg introduction of ODIs and totex), particularly given the relatively small size of the affected costs within the retail business.[736] We therefore considered that it remained appropriate to include an adjustment to calculate the wholesale WACC.

10.224 We made one adjustment to Ofwat's wholesale-appointee adjustment based on the new investments being made during AMP6. Bristol Water estimated that the average capital in the retail business will be £3.4 million over the period, consisting of around £2 million of new assets, and around £1.4 million of working capital.[737]

10.225 Assuming that the retail business was able to generate a similar return on capital (3.7%) to the appointee business,[738] this would imply a return of around £125,000 yearly. This was equivalent to 0.03% on the wholesale

[735] Bristol Water response to our provisional findings, section 8.6.4.
[736] Bristol Water estimated the size of this impact as being 0.07% (Bristol Water SoC, p442, Table 119), while Ofwat believed it was 0.01% (Ofwat response, paragraph 281).
[737] Bristol Water reply, paragraph 445.
[738] Although this was an assumption, as the retail business is likely to face higher intrinsic risks but displays lower financial gearing to offset some of this. The result is also relatively insensitive, with any WACC figure between 3.2% and 4.4% resulting in a 0.03% adjustment.

WACC. We therefore considered that this should be removed from the adjustment Ofwat made.

10.226 In response to our provisional findings, Ofwat and Bristol Water raised some concerns relevant to this calculation relating to:

(a) the appropriate pre-adjustment return;

(b) the return on working capital; and

(c) the approach to nominal/real returns on the retail business.

10.227 Ofwat and Bristol Water's submissions in response to our provisional findings illustrated that there were a number of theoretical complexities in separating the appointee return between retail and wholesale. For example, it was not clear that the approach to remunerating working capital would be the same for a notional separated retail business as assumed within the appointee WACC.

10.228 We considered that there was potentially a case for further adjustments to reflect the treatment of working capital, but that its scale would be very small (approximately 0.01% on the WACC) and it was unclear whether the marginal adjustment would be positive or negative. On balance we decided not to make a further adjustment.

10.229 We therefore found that a wholesale-appointee adjustment of 0.11% was appropriate.

Findings on wholesale cost of capital

10.230 In summary, we decided that the wholesale cost of capital was 3.67%. This compared to Ofwat's value of 3.6% and Bristol Water's value of 4.37%.

11. Financeability and total allowed Bristol Water revenue

Introduction

11.1 In this section we assess the financeability of our determination for Bristol Water. As noted in paragraph 2.16, one of the five principal duties under Section 2(2A) of the WIA 91 is that the CMA must determine the reference in accordance with its duty to ensure that the company is able to finance the proper carrying out of its functions (in particular, by securing reasonable returns on its capital), sometimes known as the 'financing duty'.[739] Bristol Water also has a duty under Licence condition F6A.6 to use all reasonable endeavours to maintain an investment grade credit rating.[740]

11.2 The assessment of Bristol Water's ability to finance its functions (which is commonly described in regulatory determinations as 'financeability') is impacted by a number of factors in the price redetermination. For example, this includes the level of wholesale totex allowances, the assumed cost of capital and the level of RCV adjustments. It can also be influenced by the way in which investors are repaid for investment.

11.3 We begin by discussing our approach to the level of funding of investment in AMP6, which requires the determination of suitable depreciation rates, and also a PAYG rate. In combination, these rates determine the proportion of totex investment that is remunerated directly through revenues collected during AMP6 (see paragraph 2.48).[741] This needs to be determined as part of our assessment. The PAYG rate determines the proportion of the AMP6 wholesale totex allowance which is to be remunerated directly through allowed revenues during the price control period rather than through additions to the RCV. PAYG can, in principle, be used as a tool to alleviate certain aspects of financeability concerns, in combination with other tools such as the RCV run-off rate, and we examine its use in this way.

11.4 We then consider the implied financial ratios of our determination. Where financial ratios indicate potential credit concerns, we consider the reasons for these conclusions. We then draw on the credit ratio analysis (and other aspects of our determination) to assess the financeability of our determination for Bristol Water.

[739] The wording of WIA 91 is that 'relevant undertakers are able (in particular, by securing reasonable returns on their capital) to finance the proper carrying out of those functions'.
[740] The wording of the Licence is to 'use all reasonable endeavours to ensure that it, or any Associated Company as issuer of corporate debt on its behalf, maintains at all times an Issuer credit rating which is an Investment grade rating'.
[741] The balance of the totex allowance is added to the RCV, which Bristol Water receive a return on over time.

11.5 Finally, we report the effect of our findings on Bristol Water's total allowed revenue, and report our determination of K (Table 11.6), and the expected impact on customer bills.

Depreciation rates and PAYG

11.6 There are three main components that affect the in-period revenue which Bristol Water can raise from wholesale customer charges, and hence the value for K. These are:

(a) depreciation of new assets;

(b) RCV run-off rate; and

(c) PAYG.

These components work through separate mechanisms but have a combined effect of specifying the balance between revenue received in the period and net additions to the RCV.

11.7 We decided to set two of these components at levels proposed by Bristol Water (depreciation of new assets and RCV run-off), and use PAYG as a balancing factor to determine the appropriate levels of revenue for AMP6.

Depreciation of new assets

11.8 Bristol Water originally proposed using a 30-year asset life over which to depreciate its new assets (implying a rate of 3.3%). Following our provisional findings, Bristol Water stated that this had reduced to 27 years,[742] due to the changes in the scope of its original business plan vs our provisional findings (eg the removal of spend on construction of the Cheddar 2 reservoir).

11.9 Bristol Water provided evidence of its planned capital expenditure by type, along with its assumed asset life for its original business plan, and under our provisional findings. We reviewed this evidence, and agreed with Bristol Water that this supported a reduction in the average asset life of around three years. We decided that 27 years was the appropriate figure to use for the average life of new assets and therefore we used a depreciation rate for new assets of 3.7% (up from 3.3% in Ofwat's final determination).

[742] Bristol Water response to our provisional findings, paragraph 1181.

RCV run-off rate

11.10 We have not received any representation from Ofwat or Bristol Water which would support moving away from the 6% figure used in Bristol Water's business plan and subsequently adopted by Ofwat for its final determination. We therefore consider it to be appropriate to use Bristol Water's RCV run-off rate of 6%. We have not assessed in detail whether this accurately reflects the underlying economic (or accounting) conditions, as we have assessed the appropriate balance of revenue and RCV growth using PAYG.

PAYG

11.11 For Ofwat's final determination and our provisional findings, a PAYG rate of 55.3% was used (equivalent to 59.9% in year one, followed by 54.2% in years two to five). This was based on Bristol Water's proposed rate on its original business plan, but including a one year glide path.[743]

11.12 Bristol Water said that, if its totex allowance is reduced compared to its plan, this is unlikely to materially affect opex and thus will impact most on capex. As a result, opex would form a greater proportion of totex, which would lead to a higher PAYG rate. Bristol Water also said that the PAYG rate used at provisional findings was substantially lower than the figure of 66.4% which it estimated based on the methodology used in PR09 (it said 100% of IRE was expensed).[744] Bristol Water said that raising the PAYG rate to a figure above 63% would be in line with customer preferences on bill levels (based on receiving support for a significantly higher level in its business plan) [✄].

11.13 Ofwat said that it is important to recognise the impact that making changes to PAYG rates will have on both the company and its customers. It said that it had required companies to demonstrate appropriate customer support before allowing adjustments in the PAYG rate. Ofwat also considered it was correct for us to challenge Bristol Water on using PAYG to bring forward more revenue than that implied by its opex and expensed IRE (Bristol Water's own expensing policy on IRE is 25%). Ofwat commented that making a comparison of the amount of revenue allowed between the current AMP and previous ones was difficult, due to changes in both the price review framework and accounting standards for the companies.

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[743] Includes a one-year glide path, and a small yearly increase from Bristol Water's June plan submitted to Ofwat; Bristol Water company specific appendix, Table A5.8.
[744] Bristol Water response to our provisional findings, paragraph 1162.

Our approach to PAYG

11.14 When deciding the level of revenue taken in this period compared with that retained for the future, it is important to consider the impact on the company and its customers. Moving revenue between regulatory periods (eg via PAYG changes) may be NPV neutral. However, if the amounts are excessive then this would be detrimental for both the company's long-term financial position (as recognised by the credit rating agencies),[745,746] and for customers (as inter-generational differences could result in current customers paying more than their fair share).

11.15 Providing complete flexibility to the company, for example to make adjustments to explicitly target certain financial metrics in AMP6, could result in an inappropriate level of revenue being taken during the period. In particular, such approaches could result in prioritising short term cash flow at the expense of the longer term.

11.16 Bristol Water stated that the starting point for setting the PAYG rate should be the 'natural rate'. This is the rate which reflects the underlying characteristics of the company and its customer base. However, the concept of a 'natural rate' is complex, and there are a number of different potential definitions:

(a) **Economic natural rate** – this is the rate that aims to align the economic balance of totex remuneration across present and future customers. The allocation of cash flows between periods for all asset classes would be linked to the economic value created by those assets across their life. Bristol Water said that this would be a complex exercise involving estimating the phasing of customer benefits associated with every element of expenditure.[747]

(b) **RCV natural rate** – this is the rate such that the RCV at the end of the period would, excluding the effect of enhancement expenditure, be equal to its value at the beginning, after allowing for inflation. The amount of totex Bristol Water paid into its RCV (excluding enhancement) would balance the amount it is taking out across the period. This is based on

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[745] Moody's stated view: 'We believe, however, that a faster pace of cost recovery may not necessarily correspond with a fundamental improvement in a company's financial strength. This would be reflected in the credit metrics we use to assess companies' financial performance. In particular, we will calculate our adjusted ICR in such a way as to remove the effect of variations in the speed of cost recovery – whether excessively fast or excessively slow.'

[746] S&P's stated view: 'Although we do not expect to reverse any such adjustments when we calculate our ratios, excessive use of these tools could increase business risk, in our view, if we consider that a company is maximizing its near-term cash flows at the expense of long-term investment.'

[747] Bristol Water SoC, paragraphs 2330–2335.

the principle that any ongoing non-enhancement work will act to maintain the value of Bristol Water's system, without adding to it.

(c) **Accounting natural rate** – a 'natural rate' can be calculated based on the split of expenditure between those costs taken to the profit and loss account (comparable to PAYG) and those added to assets in the balance sheet from an accounting perspective (RCV additions). This figure would vary based on the choice of depreciation rate and the level of IRE which is expensed vs that which is capitalised by the company.

11.17 These methodologies can result in different implied 'natural PAYG rates', which is discussed in more detail in Appendix 11.1. The approaches discussed by the parties therefore indicate that there is no single natural PAYG rate, and the objective is to identify a rate that suitably balances our duties within this range. There may be interactions between the PAYG rate and the depreciation/RCV run-off rate in determining the cash flow in the period. We considered that the appropriate natural PAYG rate would depend on the level assumed for depreciation/RCV run-off.

11.18 Both Ofwat and Bristol Water have provided us with evidence on the effects of Ofwat's final determination and our provisional findings, both of which assumed a PAYG ratio of 55.3%.[748] Our starting point is therefore to consider whether the 55.3% figure remains appropriate both in terms of the financeability of Bristol Water, and its customers.

Financeability analysis

Our approach

11.19 We have made an assessment of Bristol Water's wholesale totex requirements (Section 7) and its financing costs (Section 10). In doing so, we have determined a reasonable level of costs that Bristol Water could be expected to incur. If these estimates are reasonable, then Bristol Water should be able to finance its functions, since it will be able to raise finance at our assumed rates, and meet its operational and investment requirements.

11.20 In response to our provisional findings, Bristol Water stated that the profile of revenues and the distribution of returns over time are also key to it being able to finance its functions.[749] This reflects that there could be timing differences between when cash costs are incurred and when these costs are

[748] Includes a one-year glide path, and a small yearly increase from Bristol Water's June plan submitted to Ofwat; Bristol Water company specific appendix, Table A5.8.
[749] Bristol Water response to our provisional findings, paragraph 1107.

recovered from customers. This could impact cash flow in a regulatory period.

11.21 We agree with Bristol Water that there are some circumstances where insufficient cash flow in a given period could result in negative consequences for both the company itself, and its customers. For instance, in respect of financing costs an example of this is a 'real/nominal mismatch', where many regulated companies have nominal, fixed rate debt that is partially funded through growth in the RCV. Such effects could be characterised as timing differences between regulatory returns and cash costs. However, the effect could be short-term cash flow problems that may result in the company being perceived poorly by investors/credit rating agencies. This could increase finance costs, and ultimately be detrimental to customers.

11.22 When considering any adjustments to address the revenue taken in this period compared with that retained for the future, it is important to consider the impact on both the company and its customers. As noted in paragraph 11.14, moving revenue between regulatory periods may be NPV neutral but could be detrimental for both the company and customers. Therefore, we do not consider it good practice to increase PAYG without justification, so have performed analysis that we consider to be consistent with Bristol Water's views by starting with a value of 55.3%, consistent with the 'natural rate'[750] for PAYG (and associated components) at a notional gearing level of 62.5%,[751] and then considering if any adjustments are needed to address either cash flow or other financeability concerns (including the long-term implications of these adjustments).

11.23 Credit ratio analysis forms part of the assessment of financeability, but needs to be considered alongside the rest of the determination. In that context, we have had regard to our analysis on wholesale totex (in Sections 4 to 7) and cost of capital (Section 10).

Relevant assumptions within credit ratio calculations

11.24 In assessing financeability, it is good regulatory practice to consider the views of the credit rating agencies, and by implication, the financial ratios they partially base their views on. This section considers the assumptions

[750] Bristol Water describes the 'natural rate' as the PAYG rate which reflects the economic balance of totex-related customer benefits between the short and long term (sometimes approximated using the accounting split of spend types) (Bristol Water SoC, paragraphs 2330–2332).
[751] Bristol Water response to our provisional findings, paragraph 1109.

required in order to test the impact of our determination on the financial ratios for Bristol Water.

11.25 Although the framework for PR14 has removed the distinction of opex and capex when setting the totex allowance, the financial modelling still requires estimates of these to be made. This is in order to estimate aspects such as operating costs and levels of capitalised IRE. Although this notional allocation will have no impact on customers, it has an effect on the estimated financial ratios from credit rating agencies.

11.26 Bristol Water said that its preferred approach to financial ratio analysis was consideration of its actual financial structure, but with a notional level of gearing.[752] Bristol Water said that to be consistent, either a notional structure should be used with a notional target credit rating of BBB+, or Bristol Water's actual financial structure should be used with Bristol Water's stated target credit metrics (either derived from Moody's and S&P's guidance material, or set explicitly in discussion with the relevant agency).

11.27 In response to our provisional findings, KPMG's report on financeability included an estimate of Bristol Water's credit ratios under an 'actual financial structure' which showed Bristol Water [✄] than under the notional structure.

11.28 Bristol Water said that, when assessing its actual position, we should consider the following:

(a) Although the level of index-linked debt affected the Moody's credit ratings, it would not improve the S&P ratios where significant breaches occurred.

(b) The actual cost of debt will be higher than the level estimated in the WACC calculation.

(c) The S&P methodology includes preference shares within calculations of interest and net debt. These should be included in addition to the 62.5% net debt assumption when calculating S&P ratios (if not already included within debt when calculating the WACC).

11.29 We considered that many parts of the credit ratio modelling were already based on notional levels either as part of good regulatory practice (eg parts of the cost of capital estimate), or due to the difficulty associated with accurately estimating the correct level (eg tax). Therefore it was impractical

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[752] Bristol Water response to our provisional findings, paragraph 1108; Bristol Water SoC, paragraph 2268; Bristol Water response hearing: 'However, we still believe the CMA should review our credit metrics to ensure we consistently meet investment grade metrics on a notional gearing basis.'

and potentially inconsistent with other aspects of the determination to conduct a full credit ratio calculation from first principles on Bristol Water's actual structure. We note that, the 'actual financial structure' which KPMG adopted as part of Bristol Water's submission appeared to have only changed the assumed gearing level, without making any other explicit changes to the notional assumptions.

Our assessment of assumptions for our financial ratio analysis

11.30 In this section we consider the suitable assumptions to be included within our financial ratio analysis. As discussed above, we draw largely on assumptions consistent with a notional financial structure, but we consider each assumption on a case-by-case basis.

11.31 We have made a notional allocation of totex to the different classes of expenditure, as well as specific years. We have based the total split of this on the base cost business plan assessment (pro-rated to match the overall totex level allowed, which could result in slight differences to the figures stated in the review of base expenditure from Bristol Water's business plan), whilst the annual profile was based on the Bristol Water business plan.[753] The results are shown in Table 11.1:

Table 11.1: Notional totex allocation for financeability

						£m
	2015-16	*2016-17*	*2017-18*	*2018-19*	*2019-20*	*AMP6 total*
Opex (incl pensions)	43.4	42.4	42.5	42.6	42.9	214
MNI	17.2	9.2	8.7	10.0	12.2	57
IRE	16.8	14.1	11.8	12.6	13.7	69
Enhancement	10.8	19.6	22.1	19.3	16.9	89
Totex	88	85	85	84	86	429

Source: CMA analysis, Bristol Water business plan.

11.32 We considered the main areas where Bristol Water's actual financial ratios could differ from the notional level:

(a) **Gearing** – both Ofwat and Bristol Water supported the use of a notional gearing level when assessing financeability. We considered this appropriate, as management should determine the appropriate level of debt to incur, and the risk of this should not be transferred to customers.

(b) **Cost of debt** – having assessed Bristol Water's cost of capital in Section 10, we considered that the allowed cost of debt was slightly

753 2015-16 spend was unchanged from the Ofwat final determination (as Bristol Water is currently experiencing this whilst the determination process takes place), with the annual profile of each other type of spend being applied for the four years 2016-17 to 2019-20.

above the actual expected levels which will be incurred. This could result in Bristol Water's actual credit metrics being better than notional levels.

(c) **Financial structure** – Bristol Water has a greater share of index-linked debt than the assumed notional company. Although this may not directly improve the S&P ratios (as stated by Bristol Water), it would nevertheless result in a more financeable company than is indicated by the notional analysis under other measures used by Moody's. Bristol Water also has preference shares which were not included in the notional financeability modelling. As with gearing, we consider that it is for management to determine the appropriate level of fixed charges (whether through debt or preference shares) to incur, and the risk of doing so should not be transferred to customers.

(d) **Target ratios** – we consider that using Bristol Water's stated targets for credit ratios, we are having regard to the company-specific circumstances of Bristol Water, which are likely to result in more demanding ratios than the notional level. An example of this is that S&P has assessed Bristol Water as having a potential higher business risk profile than the majority of its peers due to its weaker relationship with Ofwat.[754] This is likely to be a major reason that S&P has set Bristol Water an explicit FFO/Net Debt target of 10%.[755] Water companies with a lower business risk profile could support an S&P investment grade rating at a ratio as low as 6%.[756] Bristol Water has indicated that it would expect that its target credit ratio would be 9% in the absence of these company-specific concerns. We agree that this level of 9% appears to be a suitable ratio for our financial ratio assessment in AMP6. If our analysis indicated that Bristol Water might breach this ratio, we would consider further the drivers of Bristol Water's targets relative to other water companies.

11.33 We therefore considered that the most appropriate approach was to calculate the credit ratios on a largely notional basis. For example:

(a) we assume a notional gearing and financing structure (62.5% debt, 37.5% equity);

(b) we assume a notional cost of debt; and

[754] 'This notably reflects our perception of Bristol Water's weaker relationship with the regulator, Ofwat, throughout the last price review process'; S&P credit assessment.
[755] 10% at the beginning of the period, with Bristol Water expecting this to reduce to 9% by the end. See Bristol Water SoC, paragraph 2365.
[756] Based on a target 'BBB' rating for a company with 'excellent' business risk. See Bristol Water SoC, Figures 109 & 110.

(c) we compare the financial ratios under this structure to rating agency targets, consistent with a notional company broadly comparable to Bristol Water.

11.34 As discussed above, we consider that the only aspect of Bristol Water's actual financial structure that would result in a more adverse financial assessment relative to this notional assumption is the level of gearing (including the use of preference shares within the actual financing structure). However, Bristol Water has indicated that it accepts the use of a notional gearing ratio. We therefore consider that no further analysis of Bristol Water's actual financial position is required as part of our financeability assessment.

The use of credit ratios in assessing financeability

11.35 As discussed in paragraph 11.24, we consider it is good regulatory practice to consider the same credit ratio definitions as the credit rating agencies. However, we note that credit rating agencies take a number of different factors into account, only one of which is credit ratios.[757] Therefore, the calculation of ratios forms part of a broader assessment to assign credit ratings and these ratios are not applied mechanistically. We note that a set of modelling assumptions that produced inferior ratios compared with the targets in one or more years might not indicate a concern in relation to financeability.

11.36 As part of FD14, Ofwat conducted a number of credit ratio checks, which largely consisted of average estimates over the period, and a comparison between the companies.[758]

11.37 Following our provisional findings, Ofwat completed additional analysis to confirm that the inclusion/exclusion of menu choice did not have a significant impact on its assessment of financeability,[759] and it assessed Bristol Water as being financeable under both its own FD14 and our provisional findings.

11.38 Meanwhile, Bristol Water conducted an updated annual estimate of the four credit ratings it considered as being core to its relevant rating agencies.[760] In doing so, it highlighted that the S&P metric FFO/Net Debt was below its stated target in three years and the S&P metric Net Debt/EBITDA was below

[757] For example, Moody's considers regulatory environment and asset ownership model (40%), operational characteristics and asset risk (10%), stability of business model and financial structure (10%) and key credit metrics (40%); Bristol Water SoC, paragraphs 2251 & 2277.
[758] Ofwat final price control determination notice policy chapter A8 – financeability and affordability, Table A8.9.
[759] Ofwat response to our provisional findings, paragraph 238.
[760] Moody's: AICR and Net Debt/RCV. S&P: FFO/Net Debt and Net Debt/EBITDA.

its stated target for four years. Combined with the negative associated trend, Bristol Water concluded that it was not financeable under our provisional findings. These figures are shown below in Table 11.2.[761]

Table 11.2: Relevant credit rating agency metrics under provisional findings

	Credit metric	*Target*	*FY16*	*FY17*	*FY18*	*FY19*	*FY20*
Moody's	AICR	>1.40x	1.03	1.63	1.62	1.66	1.69
	Gearing (Net Debt/RCV)	<75%	62.2%	63.4%	64.1%	64.7%	64.9%
S&P	FFO/Net Debt	>10%/ 9%	11.3%	9.7%	9.2%	8.8%	8.5%
	Net Debt/EBITDA	<6x	5.95	6.34	6.47	6.58	6.69

Source: Bristol Water response to our provisional findings, Table 35.

11.39 Bristol Water highlighted that AICR breached its target in FY16 (1.03 vs target 1.40), whilst the remaining years were estimated to exceed it.[762] It is not clear that Bristol Water should have such large changes in its AICR between these years, but since Bristol Water is currently bound by Ofwat's FD14 until we complete our determination, it is unlikely that a reasonable remedy for this could be completed in-year, and we therefore considered this to be a short-term risk which the business will need to manage.

11.40 Bristol Water did not raise further concerns with the Moody's ratios for provisional findings, stating that it did not lead to significant breaches in the Moody's metrics. Bristol Water indicated that its financeability concerns were with the S&P ratios. Bristol Water indicated that it is seeking changes in PAYG to address financeability issues, which would improve the S&P credit ratios, but have only a small effect on Moody's ratios.

11.41 This is because, under Moody's stated methodology, timing differences between PAYG levels and accounting costs should only have a small effect its overall credit assessment, as it adjusts for variations in PAYG in assessing its core adjusted interest cover ratio.[763] Our review of the underlying data on AICR provided by Ofwat and Bristol Water indicated that there were no concerns with the Moody's ratios.

11.42 Therefore, our own analysis focused on the S&P ratios. When considering the weight the agency may place on individual ratios, we were particularly aware of any specific guidance or targets given to Bristol Water.

11.43 We have adjusted some of the ratio calculations from Ofwat's original methodology to account for the credit ratings agencies' own

[761] Bristol Water response to our provisional findings, Table 35 and paragraphs 1121–1124.
[762] Bristol Water response to our provisional findings, Table 35.
[763] 'In particular, we will calculate our adjusted ICR in such a way as to remove the effect of variations in the speed of cost recovery – whether excessively fast or excessively slow'; Moody's Outlook for UK Water Sector.

methodologies.[764] These adjustments result in weaker ratios than Ofwat estimated based on the same data. We consider that our approach was therefore cautious in the approach to measuring the projected level of the S&P ratios.[765,766]

11.44 Based on the PAYG rate of 55.3% (as discussed in paragraph 11.18, and equal to 59.9% in year one, followed by 54.2% in years two to five), we estimated the Bristol Water S&P credit ratios shown in Table 11.3 below.[767]

Table 11.3: Bristol Water S&P credit ratios using the PAYG rate of 55.3%, funding enhancement with debt (resulting in gearing increases)

	BW stated target	*2015-16*	*2016-17*	*2017-18*	*2018-19*	*2019-20*	*Average*
Ofwat gearing level	N/A	61.7%	63.9%	65.5%	66.8%	67.9%	65.2%
FFO/Net Debt	>10%/9%	13.7%	10.1%	9.8%	9.1%	8.9%	10.3%
Net Debt/EBITDA	<6x	5.1x	6.1x	6.4x	6.8x	6.9x	6.3x

Source: CMA analysis.

11.45 This analysis showed that ratios are broadly consistent with target levels in 2016-17. In the later years, both S&P ratios (FFO/Net Debt and Net Debt to EBITDA) weakened, with Net Debt/EBITDA being weaker than S&P's target ratios. The main cause of this is an increase in gearing which occurs within Ofwat's models. Ofwat's models assume that growth in investment over AMP6 would be funded through an increase in debt. This results in an increase in net debt and therefore a deteriorating ratio trend.

11.46 However, while practical for modelling purposes, the assumption that all enhancement growth is funded by debt is not consistent with the financial framework for PR14. Instead this assumes, through the use of constant 62.5% gearing assumption in the cost of capital calculation, that water companies will (on average) part fund RCV growth by equity. In AMP6, Bristol Water is making significant investment in enhancement which will result in RCV growth and therefore an increase in the assumed equity base. Bristol Water's investors would then earn a return on this equity consistent with the assumptions in the costs of capital.

764 FFO/Net Debt has been modified to include the indexation component of index-linked loans in FFO, and based on year end net debt. Net Debt/EBITDA has been added to Ofwat's model using the EBITDA figure and the year end net debt. Based on paragraphs 2306 and 2310 of Bristol Water SoC, and aligned with estimates in Table 171.

765 The results are ratios that are marginally weaker (approximately 0.5 to 1% FFO/Net Debt) than the equivalent ratios calculated by Ofwat. This approach appears to be aligned with the strict definition of ratios by S&P, although any interpretation of the ratios could be expected to have regard to timing differences between some of the numbers used in the ratio analysis.

766 Since other methodologies result in stronger credit ratios, if our analysis results in Bristol Water exceeding its targets, the other methodologies should exceed these targets with a greater headroom.

767 The analysis was completed before the bill reprofiling is performed, as well as before any allowed costs of Bristol Water relating to our determination were included (Phase 7 in the model), which results in a consistent treatment of revenues and costs over the period.

11.47 We have therefore conducted supporting analysis extrapolated from Ofwat's models, by maintaining gearing at 62.5% (consistent with the cost of capital assumption), thus assuming that 37.5% of the RCV growth is funded with equity. The impact of this can be seen in Table 11.4 below:[768]

Table 11.4: Impact on S&P ratios of constraining net debt growth to maintain gearing at 62.5%

	BW stated target	*2015-16*	*2016-17*	*2017-18*	*2018-19*	*2019-20*	*Average*
Year end RCV		444	470	497	525	554	
Year end net debt		274	301	326	351	376	
Ofwat gearing		61.7%	63.9%	65.5%	66.8%	67.9%	
Year end RCV		444	470	497	525	554	
Constrained net debt		278	294	311	328	346	
Implied Ofwat gearing		62.5%	62.5%	62.5%	62.5%	62.5%	
New FFO / net debt	>10%/9%	13.5%	10.3%	10.3%	9.8%	9.6%	10.7%
New net debt / EBITDA	<6x	5.1x	5.9x	6.1x	6.3x	6.4x	6.0x

Source: CMA analysis.

11.48 This analysis indicates that Bristol Water's FFO/Net Debt exceeds the 9% target in all years (with some headroom), while the Net Debt/EBITDA ratio is improved, and has an average for the period at the target of 6.0x.

11.49 Constraining gearing at 62.5% has implications on the cash available for distribution to shareholders. In order to maintain this level of gearing, net debt would need to be £30 million lower by 2019-20 relative to the scenario where all the investment is financed by debt.

11.50 One way to finance a reduction in net debt would be through a reduced dividend profile. This would reduce the notional level of cash dividends in the model, which are assumed by Ofwat to be £36 million over the period, based on a 4% dividend yield (relative to the assumed equity portion of RCV). Alternatively, new equity could be issued to fund enhancement investment in order to maintain notional dividend levels for existing shareholders. As with debt, it would be for Bristol Water to determine its actual financial profile.

11.51 In either case, the combined return to equity holders would be consistent with the cost of equity assumed within the cost of capital. For example, if RCV growth is funded through lower dividends, there would a comparable size of implied increase in regulated equity over the period.

[768] Calculations run outside of Ofwat's model, with no changes made to FFO and EBITDA figures.

Credit ratio sensitivity analysis for downside shock

11.52 We consider it good regulatory practice to consider the impact of downside shock on financial ratios. We therefore conducted a sensitivities analysis, the results of which are shown in Table 11.5 below.

Table 11.5: Credit metrics sensitivity to overspend

	BW stated target	*Base 2019-20*	*£10 million overspend*	*£20 million overspend*
FFO/Net Debt	>10%/9%	9.6%	9.0%	8.5%
Net Debt/EBITDA	<6x	6.4x	6.7x	7.0x

Source: CMA analysis.
Note: Table 11.5 reflects a sensitivity to the analysis in Table 11.4, with overspend against allowances assumed to be financed by an increase in net debt.

11.53 We note that there are a number of additional mitigating factors which indicated that a downside shock of this scale would have a less significant impact than the credit ratios show, including the following:

(a) **Cost sharing** – overspend in the period will result in weaker financial ratios, particularly in respect of those relating to cash flow. However, credit rating agencies are aware that 50% of totex overspend can be reclaimed in future periods, and are likely to have regard to this in their assessment.[769]

(b) **Use of equity** – business risk should primarily be for equity holders to bear rather than for customers. In times of financial outperformance, the equity holders will benefit. As such, it may be appropriate for equity holders to consider an injection of cash in the case of downside scenarios, particularly if this is driven by company underperformance. Customers would not be expected to pay more to cover higher financing costs associated with underperformance.

(c) **Headroom** – Bristol Water’s credit ratings are not at the lowest rating with investment grade status, and it has proposed credit ratios consistent with at least maintaining these current credit ratings and there is a degree of headroom before the risk of it breaching its licence conditions.

[769] This recovery of overspend occurs after the end of AMP6, and as such is not reflected in any of the credit ratios shown in this paper.

Comparative analysis on credit ratios

11.54 As an additional check to the above analysis on Bristol Water, a comparative analysis with other water companies provided further evidence around whether Bristol Water is financeable.

11.55 As part of the PR14 process, water companies gave assurance that their plans were financeable. Since Bristol Water will reflect many of the same risks as the other companies, this would imply that if its credit ratios were similar the industry consensus is that ratios consistent with those of Bristol Water are financeable.

11.56 Based on Ofwat's financial models for each of the water companies, we recalculated the implied credit ratios using the same methodology that we have used previously in this section. This showed that Bristol Water's ratios were stronger than many of the other water companies. For example, in the context of Bristol Water's concerns about the S&P ratios discussed above, its comparable average FFO/Net Debt was 5^{th} best out of 18, and its average Net Debt/EBITDA was also 5^{th} best out of 18. Supporting details are provided in Appendix 11.1.

11.57 Bristol Water said that it was flawed and unsafe to use this analysis as a basis for decisions. In particular, it highlighted that:

(a) Ofwat's notional assessment made assumptions about the company structure, such as totex allocation to areas such as opex and IRE, and did not account for menu choices;

(b) there were inconsistencies around changes in net debt for different companies;

(c) not showing annual trends meant it was not possible to see if trends are improving or deteriorating;

(d) there were complex specific issues that affected each company's determination;

(e) larger companies were afforded more flexibility in credit metrics than smaller companies;

(f) some companies had raised financeability concerns with Ofwat; and

(g) some companies received cost allowances that were higher than their own business plans.

11.58 Although we agree that the comparative analysis does not perfectly reflect the actual credit ratios of each company, we consider that Ofwat's notional estimate for each should present a reasonable view of the company's notional performance and hence its credit ratios. We updated the analysis to account for implied changes in gearing, by applying the restriction to the same notional level (62.5%) as we applied to Bristol Water in our analysis.

11.59 We note that since the values used in the comparative analysis were from Ofwat's final determination models, they should account for any representation from the companies around financeability concerns.

11.60 Where companies have received costs above their own business plans, although this could affect the company's views about its own financeability, we do not consider that this should have a negative impact on the implied credit ratios from Ofwat's model. This is because the modelling assumes that a company's costs have been accurately forecast, and so are spent. Therefore, the figures quoted in Appendix 11.1 remain a reasonable measure of the relative strength of Bristol Water's credit ratios.

11.61 Therefore, although it would be insufficient for us to conclude on Bristol Water's financeability on this analysis alone, we consider it a useful piece of supporting evidence. We also note that the water companies were asked to consider the impact of downside shocks when giving Ofwat financeability assurance. Water company boards considered their financing assumptions for PR14 would have included sufficient implicit headroom for any downside scenarios.

Our assessment of financeability

Conclusions on credit ratio assessment

11.62 Both Bristol Water and Ofwat provided analysis which showed that there were no concerns with Moody's key ratios for Bristol Water and so we have focussed on S&P ratios within our financeability assessment.

11.63 In Table 11.3, we provide the outputs of credit ratio analysis based on the outputs of the regulatory financial model for Bristol Water, updated for our determination. This illustrates that Bristol Water's key FFO/Net Debt ratio remains above the 9% target level throughout most of the period, only breaching this target in the final year.

11.64 In Table 11.4, we demonstrate an alternative scenario where gearing is kept at a notional 62.5% level, consistent with other aspects of the determination. Under this assumption, Bristol Water's credit ratios for FFO/net debt are above 9.5% in each year, demonstrating some headroom against target levels.

11.65 In Table 11.4, the ratio for Net Debt/EBITDA breaches Bristol Water’s stated target of 6x in the three final years of the period. In interpreting the implications of this, we considered the following:

(a) Ofwat highlighted that this is a ratio which it had not considered historically, and had not been identified as key by other companies or regulators (including Ofgem and the CAA).

(b) S&P did not give Bristol Water a specific target for this ratio, unlike FFO/Net Debt,[770] which supported the view that it was less important.

(c) Credit ratios analysis is only a part of the evidence base which a credit rating agency will use to make its assessment, and so breaches would be considered against other evidence of the company’s performance.

Therefore, we do not consider that breaches in this single ratio indicate financeability concerns in our determination.

11.66 We consider Bristol Water has sufficient headroom from downside shock, particularly as there are number of potential mitigating factors in the determination (as discussed in paragraph 11.53).

11.67 Our supporting analysis also indicates that Bristol Water has relatively strong credit ratios compared to other companies in the industry under the PR14 assumptions, all of which accepted their determinations (and the resulting ratios) as being financeable.

11.68 We have also considered how our credit ratio assessment was likely to compare with Bristol Water’s actual financing ratios. Bristol Water’s cost of debt was lower than assumed within our notional modelling, and it included a greater proportion of index-linked debt (which would improve Moody’s credit ratings). It has recently increased its gearing towards 70% (excluding preference shares), which indicated that it did not consider that it faced imminent financial concerns.

11.69 On this basis, we consider the financial ratio analysis to support the view that Bristol Water would be financeable under the assumptions made for this determination.

[770] For example, S&P credit assessment.

Conclusions on PAYG rate

11.70 The analysis above indicates that Bristol Water's financial ratio performance is sufficient based on the PAYG rate of 55.3% used within our provisional findings and Ofwat's final determination, which was originally determined based on evidence provided by Bristol Water as part of its business plan.[771]

11.71 Bristol Water indicated that the PAYG rate should have regard to underlying economic considerations, ie it should be a 'natural rate'. However, we identified that there are a wide range of potential approaches to defining a 'natural rate'. Our analysis suggests that the rate of 55.3%, originally proposed by Bristol Water, is consistent with the concept of both a RCV natural rate and an accounting natural rate (as discussed in Appendix 11.1), subject to the choice of assumption on an appropriate rate of economic depreciation for new and existing assets.

11.72 In response to our provisional findings, Bristol Water requested a higher rate, in order to improve its financeability under S&P ratios. This would increase charges to customers in AMP6 and lead to a declining RCV compared to our provisional findings. We are not persuaded that this is necessary to ensure Bristol Water is financeable. We recognise that some flexibility was intended within the choice of PAYG rate. However, our analysis does not suggest that the financial position of Bristol Water justifies the increase in PAYG proposed since Ofwat's final determination. Bristol Water has also not provided any evidence of countervailing benefits for customers from increasing the bills of current customers compared to future customers.

11.73 As a result, we have retained the 55.3% PAYG rate, as applied in both Ofwat's final determination, and our provisional findings.

Conclusions on financeability

11.74 Bristol Water faces the same financial framework as the other water companies, all of which accepted that PR14 was financeable. This is relevant, as the underlying ratios are largely driven by the financial framework, including the cost of capital.

11.75 As discussed in paragraph 11.19, we have made an assessment of Bristol Water's wholesale totex requirements and its financing costs to determine a reasonable level of costs that Bristol Water could be expected to incur. We

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[771] Includes a one-year glide path, and a small yearly increase from Bristol Water's June plan submitted to Ofwat; Bristol Water company specific appendix, Table A5.8.

have conducted cross-checks on these figures where possible, and determined a suitable level of depreciation on new assets, RCV run-off, and PAYG rate. We have completed financial ratio analysis consistent with that which would be undertaken by the credit rating agencies (in particular regarding the level of cash flow), and concluded that this supports the view that this determination is financeable for Bristol Water.

11.76 Overall, we consider that the assumptions used in conducting this analysis result in a determination under which Bristol Water is financeable and which fulfils our statutory duties.

Total allowed revenue for Bristol Water

11.77 Table 11.6 sets out our calculation of the total revenue for Bristol Water. We arrive at these figures by taking our view of:

(a) revised totex allowances;

(b) asset life for new additions to the RCV;

(c) PAYG and RCV run-off rate; and

(d) cost of capital.

We use the Ofwat financial model to calculate the impacts of our assumptions on the revenue for Bristol Water.

11.78 The financial model calculates total revenue allowed, and smooths the profile in order to keep customer bills flat from the second year onwards. The movement in total revenue between years (having adjusted for in-year RPI differences) is the value known as ‘K’. For 2015/16, Ofwat did not calculate a K, as there was no equivalent wholesale revenue for 2014/15. Ofwat set K to zero for all companies, and defined a comparable 2014/15 wholesale revenue on a consistent basis. We have followed the same approach, with a minor adjustment to the 2014/15 wholesale revenue assumption to reflect updated RPI.

Table 11.6: Total revenue calculation for Bristol Water

2012/13 prices	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*Total*
Totex (£m)	88.1	85.3	85.0	84.4	85.7	428.6
PAYG rate	59.9%	54.2%	54.2%	54.2%	54.2%	
Totex additions to RCV (£m)	35.2	38.9	38.8	38.5	39.1	190.5
RCV average	408.3	420.5	434.6	448.3	462.1	
PAYG (£m)*	53.0	46.4	46.2	45.9	46.6	238.1
Return (£m)	15.0	15.4	16.0	16.5	17.0	79.8
RCV run-off & depreciation on new assets (£m)	24.8	24.8	24.8	25.0	25.2	124.6
Tax (£m)†	3.2	1.8	1.5	1.2	1.1	8.7
Other income (£m)	–1.9	–1.9	–1.8	–1.8	–1.7	–9.1
Capital contributions from connection charges and revenue from infrastructure charges	5.5	5.6	5.5	5.4	5.3	27.4
Total	99.6	92.2	92.2	92.2	93.5	469.6
Adjustments‡	–4.6	1.1	1.5	1.7	0.6	0.3
Total allowed wholesale revenue (£m)	95.0	93.2	93.7	93.9	94.1	469.9
K%§	0.0%	–1.8%	0.5%	0.3%	0.2%	
Retail household allowed revenue (£m)¶	10.4	10.9	11.4	11.9	12.5	57.0
Retail non-household allowed revenue (£m)¶	1.5	1.5	1.6	1.6	1.6	7.8
Total revenue	106.9	105.7	106.6	107.3	108.2	534.7

Source: CMA analysis.
*PAYG (£m) includes full allocation of pension deficit repair costs (£1.6 million) and PAYG element of other totex (£427.0 million)
†Corporation tax is assumed to be 20% for 2015/16 and 2016/17, then 19% for 2017/18 onwards.
‡Due to Ofwat's determination being set for 2015/16, any differences in allowed wholesale revenue from this have been spread out evenly across subsequent years. This line also includes the adjustments for AMP5 performance measures (CIS, SIM, and RCM), and the allowed costs for Bristol Water of our determination (as discussed in Section 12).
§K% is based on the constant price total allowed wholesale revenue, inflated using year average RPI, then deflated using Nov-Nov RPI. We have updated historical RPIs and used RPI projections of 2.4% per year over the period, consistent with the cost of capital calculation. The revenue has been profiled to keep customer bills flat, so small positive figures are due to growth in customer numbers. For 2015/16, Ofwat set K as being 0 by setting the base 2014/15 wholesale revenue allowance at the financial year average revenue for 2015/16 adjusted for inflation (equivalent to £100.247 million), as discussed in Bristol Water company-specific appendix, p51. We have used Ofwat's methodology to calculate an updated figure, consistent with actual Nov 2014 RPI and our 2.4% RPI projection over the period, and have recalculated this as £100.080 million.
¶We have made no changes to Ofwat's final determination in retail. These quoted figures are indicative, and include a small estimated adjustment for non-household retail revenues related to the changes in the wholesale control.

11.79 Table 11.7 shows a comparison between our final determination and the Ofwat PR14 determination. While the level of totex allowed is less than Ofwat determined (post menu choice), the total revenue rises slightly. This reflects the impact of the Ofwat adjustment where the impact of the additional totex allowed under the menu choice is effectively removed.

Table 11.7: Comparison of CMA final determination with Ofwat FD14

		£m
2012/13 prices	*CMA final determination*	*Ofwat PR14*
Totex	428.6	437.8
PAYG rate (average)	55.3%	55.3%
Totex additions to RCV	190.5	195.9
RCV average in year	434.8	437.5
PAYG	238.1	243.5
Return	79.8	78.8
RCV run-off	124.6	123.3
Tax	8.7	4.9
Other income	(9.1)	(9.1)
Capital contributions	27.4	27.4
	469.6	468.7
Adjustments†	0.3	(1.0)
Menu adjustment	0.0	(16.9)
Total wholesale revenue	469.9	450.9
Retail household allowed revenue (£m)*	57.0	57.0
Retail non-household allowed revenue (£m)*	7.8	7.8
Total revenue	534.7	515.7

Source: CMA analysis, Bristol Water company specific appendix table A2.11.
* We have made no changes to Ofwat's final determination in retail. These quoted figures are indicative, and include a small estimated adjustment for non-household retail revenues related to the changes in the wholesale control.
† Due to Ofwat's determination being set for 2015/16, any differences in allowed wholesale revenue from this have been spread out evenly across subsequent years. This line also includes the adjustments for AMP5 performance measures (CIS, SIM, and RCM), and the allowed costs for Bristol Water of our determination (as discussed in Section 12).

11.80 We considered it prudent to conduct a final check on these revenue calculations, in the light of Bristol Water's arguments that we had set the PAYG rate too low and that it should be allowed to recover more revenue from customers during the price control period from 1 April 2015 to 31 March 2020. This was based on a comparison of its estimated in-period costs compared with allowed revenue (detailed in Appendix 11.1), and further supports our views that our determination had not unduly constrained Bristol Water's in-period revenue.

Impact on household bills

11.81 In its determination for Bristol Water, Ofwat estimated bills would reduce in real terms (ie before inflation is considered) from £191 per household customer in 2014/15 to an average of £155 across AMP6.[772] Using the same methodology as used by Ofwat suggests that the combined average household water bill for Bristol Water customers, as determined by the CMA, would be around £160 across AMP6 before inflation is considered. Bristol Water had estimated that it would reduce household customer bills from £198 in 2014/15 to an average of £187 across AMP6. Although the impact of our final determination suggests that bills would be slightly higher than under FD14, they would be substantially lower than the Bristol Water estimated bills. We consider that the small increase in bills compared with FD14 ensures that we satisfy our statutory duties and that customers receive an appropriate level of service.

[772] Bristol Water company specific appendix, Table A5.9. Note these are indicative figures only as there are separate regulatory processes, policies and rules that apply to companies' decisions on the level of individual tariffs which tend to be set annually.

12. Findings

12.1 For the reasons set out in Sections 4 to 7, we have found that wholesale totex should be £428.6 million, in line with our econometric assessment for base totex and our assessment of enhancement totex derived from our assessment of the Bristol Water business plan.

12.2 We did not consider it necessary to change the retail determinations in the Ofwat FD14 for the reasons given in paragraphs 3.10 to 3.13.

12.3 Other areas of the Ofwat determination with respect to the calculation of allowed revenues, which we have not identified or discussed separately in this report, remain the same as in the Ofwat determination. These include items such as business rates and pension deficit repair allowance, income from other sources, and capital contributions from connection charges and revenue from infrastructure charges.

12.4 For the reasons set out in Section 8:

(a) we consider that Bristol Water breached the appropriate control limits on the DG3 UI>12 indicator for serviceability and find that Ofwat's £4.1 million reduction to the RCV should remain;

(b) on the 2009-2010 RCV capping we find that the £4.8 million adjustment to RCV which Ofwat proposed should be retained; and

(c) on the CIS indexation methodology we note that this is an industry-wide issue and Ofwat is consulting on its approach. We find that it would be prudent to allow Ofwat to conduct its industry-wide process without intervention from us.

12.5 For the reasons given in Section 9:

(a) we find that it would not be proportionate to intervene in Bristol Water's use of rewards in ODIs, but would encourage Ofwat to take more account of the consumers' views in this area in future price reviews when designing its risk/reward framework;

(b) we have decided to intervene in the all unplanned customer minutes lost metric and to set the figures in Table 12.1 below;

Table 12.1: ODIs for all unplanned customer minutes lost

	Current	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*
Reward cap		8.9	8.9	8.9	8.9	8.9
Reward deadband		10.2	10.2	10.2	10.2	10.2
Target	13.7	13.4	13.1	12.8	12.5	12.2
Penalty deadband		14.4	14.1	13.8	13.5	13.2
Penalty collar		15.4	15.1	14.8	14.5	14.2

Source: CMA analysis.

(c) for MZC, we have found that the levels in Table 12.2 are appropriate;

Table 12.2: ODIs for MZC

%

	Current case (in SoC)	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*
Standard	99.96	99.96	99.96	100	100	100
Penalty deadband		99.95	99.95	99.95	99.95	99.95
Penalty collar		99.94	99.94	99.94	99.94	99.94

Source: CMA analysis.

(d) for negative water quality contacts we have found that the targets in Table 12.3 are appropriate; and

Table 12.3: ODIs for negative water quality contacts

	Current	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*
Reward cap		1,276	1,276	1,276	1,276	1,276
Reward deadband		1,439	1,439	1,439	1,439	1,439
Target	2,450	2,422	2,409	2,322	2,275	2,221
Penalty deadband		2,422	2,409	2,322	2,275	2,221
Penalty collar		2,477	2,464	2,377	2,330	2,276

Source: CMA analysis.

(e) we have removed ODI D2 associated with Cheddar WTW.

12.6 For the reasons given in Section 10 we find that the wholesale cost of capital for Bristol Water is 3.67%.

12.7 We determined that the starting point for the calculation of the wholesale price control starting on 1 April 2015 should be a maximum wholesale revenue of £100.080 million (nominal) in 2014/15. This should replace the figure of £100.247 million for 2014/15 in Ofwat's wholesale price control determination for Bristol Water.[773] We determined that the values for K used for the wholesale price control calculation for each charging year from 1 April 2015 to 1 April 2019 should be the values for K set out in Table 12.4. We

[773] Ofwat's Notification by the Water Services Regulation Authority of its determination of Price Controls for Retail Activities and for Wholesale Activities for Bristol Water plc ("the Determination"), p3.

calculated that this would provide total wholesale revenues over the period of £469.9 million. We also estimated that total revenue, after including estimates of household and non-household retail revenues arising from the retail price controls determined by Ofwat, would be £534.7 million (see Table 12.4).

12.8 We also estimated the effect of our determination on customer bills. We found that the combined average household water bill for Bristol Water customers, as determined by the CMA, would be £160 across AMP6 before inflation is considered. Although such bills would be slightly higher than under the Ofwat determination (Ofwat found bills would average £155 across AMP6 before inflation is considered), they would be substantially lower than those estimated by Bristol Water (bills were projected to be an average of £187 across AMP6 before inflation is considered).

12.9 We considered the slight increase in price compared with the Ofwat determination to be justified given our statutory duties and in the interests of customers by ensuring that they receive a suitable level of service.

Table 12.4: Total revenue calculation for Bristol Water

2012/13 prices	*2015/16*	*2016/17*	*2017/18*	*2018/19*	*2019/20*	*Total*
Total allowed wholesale revenue (£m)	95.0	93.2	93.7	93.9	94.1	469.9
K%	0%	–1.8%	0.5%	0.3%	0.2%	
Retail household allowed revenue (£m)	10.4	10.9	11.4	11.9	12.5	57.0
Retail non-household allowed revenue (£m)	1.5	1.5	1.6	1.6	1.6	7.8
Total revenue	106.9	105.7	106.6	107.3	108.2	534.7

Source: CMA analysis.

12.10 We assessed the impact of our determination on the financeability of Bristol Water. We considered that the assumptions we used (including a depreciation of new assets of 3.7%, RCV run-off of 6%, PAYG rate of 55.3%, wholesale WACC of 3.67% and gearing maintained at 62.5%) resulted in a determination under which Bristol Water was financeable and which fulfilled our statutory duties.

Costs

12.11 We are required by section 12(3A) WIA 91 to decide to what extent it is reasonable to take into account in our determination costs incurred or borne by Bristol Water in connection with our determination. In doing so, we must have regard to the extent to which, in our view, our determination is likely to support Bristol Water's (rather than Ofwat's) claims in relation to the determination.

12.12 Bristol Water's costs for our determination amounted to approximately £2.2 million. Ofwat's costs for our determination amounted to £354,000. Ofwat cannot claim any costs directly against Bristol Water, but stated that consumers should not bear any of the costs involved in the CMA's determination. It said that a company should not be provided with a perverse incentive to submit poor quality information in the price review process in the knowledge that it will have further chances to submit substantial additional evidence. Our costs (which Bristol Water will have to pay to the Secretary of State under the conditions of its Licence) amounted to approximately £700,000.

12.13 We considered that some elements of Bristol Water's own costs appeared high, but we had no grounds for believing that they had not been properly incurred, and accordingly, we took them into account in full.

12.14 We noted that a substantial part of our investigation concerned an assessment of Ofwat's econometric models, where we found a number of issues with Ofwat's specification and use of its econometric models and the accompanying special cost factor process. On the other hand, our assessment of Bristol Water's business plan identified a substantial number of areas where the planned costs appeared to be high. Our assessment of the reconciliation of 2010 to 2015 performance and outcome delivery incentives has supported both Bristol Water's and Ofwat's positions to some extent.

12.15 Overall, we decided it was reasonable to take into account in our determination approximately one-third of the aggregate of Bristol Water's costs and our costs. Accordingly, we have decided that a one-off allowance of £0.95 million should be added to Bristol Water's revenue to allow for the costs of Bristol Water's reference to the CMA.

12.16 We note that under the terms of Ofwat's Totex Incentive Scheme for AMP6, Bristol Water receives 50% of any overspend over its totex allowance. It is not our intention that any of the costs detailed in paragraph 12.12 should be eligible for cost sharing. We consider that, in calculating performance against the totex allowances, our £0.95 million award should fall outside the definition of menu totex. The actual costs incurred by Bristol Water in connection with the determination should be treated as a disallowable cost in accordance with Ofwat's PR14 Reconciliation Rulebook.[774]

[774] Ofwat PR14 Reconciliation Rulebook, p32, Note 1.

Concluding remarks

12.17 We would like to make some concluding remarks.

12.18 We are grateful for the co-operation of both Ofwat and Bristol Water in assisting us with our determination. We note that Ofwat has already begun to consult on the lessons from the PR14 process, and offer the following comments in that context.[775]

12.19 We understand why Ofwat changed its regulatory approach in PR14. In particular it sought to encourage companies to take more responsibility in understanding, and delivering against, customers' priorities. Ofwat also wanted companies to focus on outcomes, rather than inputs, and to take ownership for managing risk. We agree with this approach.

12.20 A key part of this approach is Ofwat's extension of econometric benchmarking to total wholesale expenditure (totex), which aims to address the perceived bias towards capex. We support the principle of totex benchmarking where it can be implemented effectively. Nevertheless, while to some extent PR14 could be considered a transitional review, totex benchmarking has not proved satisfactory for Bristol Water. The equations produced results that were sometimes counter-intuitive. In Bristol Water's case, Ofwat had to discard the two 'refined totex' models altogether. These issues forced Ofwat to place considerable reliance on 'special cost factors' to arrive at a more realistic totex estimate for Bristol Water. We invite Ofwat to consider why its models showed at least Bristol Water to be such a significant outlier.

12.21 For our part, in our determination, we judged it necessary to conduct separate 'bottom up' analyses of base and enhancement expenditure, through our review of the Bristol Water business plans. However, we recognise that such an approach has drawbacks, not least due to the asymmetry of information between the company and the regulator, and because the expenditure forecasts in companies' business plans may be over-stated.

12.22 For the future we consider that good quality comparative data is a prerequisite of effective totex benchmarking. We were concerned that, as explained in Section 4, some data that appeared important for detailed benchmarking analysis was not available. The limitations in the available data also hampered discussion of 'special cost factors', since it was difficult

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[775] Reflections on the price review – learning from PR14.

to identify whether a company's circumstances were truly different from those identified by the modelling.

12.23 We recognise the desirability of minimising data collection burdens on companies and the recommendations made by the Gray review. However, we consider that having this data would help Ofwat to continue to regulate effectively, especially if it is to place more emphasis on benchmarking. Moreover, successful benchmarking would reduce the need for bottom-up analysis, which can be even more burdensome.

12.24 We also invite Ofwat to consider whether it can present the outcomes of its econometric benchmarking in ways that are clearer and more intuitive. While regulation is a complex activity, and to some extent necessarily so, we consider it important to guard against over-complexity. Good regulation needs to be understood by those affected and not just be the preserve of economic specialists. This will help the regulated companies and other stakeholders to engage with Ofwat earlier and more effectively.

12.25 Finally, we note that on more than one occasion and despite a number of requests from us we were unable to obtain sufficient information from Bristol Water to justify important elements of its plan and its costs. We also identified areas of Bristol Water's business plan where we expected Bristol Water to have a better understanding of its own costs. We note the price control review began formally in December 2013, following Ofwat's extensive consultation on its proposed methodology, with the submission to Ofwat of Bristol Water's draft business plan.[776] No doubt Bristol Water will reflect on the process and the significant costs involved. In our view, Bristol Water (and any other licensee disputing a decision made by Ofwat) needs to reflect how it can more effectively assist both Ofwat and, if ultimately necessary, the CMA in their respective determinations.

[776] At that stage, Bristol Water was already expected to have undertaken extensive consultation and analysis in support of its plan.