The efficient costs and tariffs of the Water Corporation, Aqwest and Busselton Water

Draft Report

21 August 2017

Economic Regulation Authority
WESTERN AUSTRALIA

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Invitation to make submissions

Interested parties are invited to make submissions on the ERA's Draft Report by **4:00 pm (WST) Monday, 18 September 2017**.

Submissions are preferred as documents uploaded to the ERA's website, in electronic form, via: www.erawa.com.au/consultation

Alternatively, submissions can be lodged via:

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Executive summary

In November 2016 the Treasurer asked the ERA to conduct an inquiry into the efficient costs and tariffs for water, wastewater, drainage and irrigation services provided by the Water Corporation, Aqwest and Busselton Water, all of which are government-owned businesses. This inquiry will inform the State Government's setting of service tariffs for the five year period starting from 1 July 2018.

The State Government's decisions on the pricing of water, wastewater, drainage and irrigation services are guided by several objectives, including, but not necessarily limited to:

- recovery from property owners of the costs of providing services, including a return on public funds invested in service infrastructure;
- long-term cost efficiency in supplying water services, encouraged by prices that reflect the costs of investing in, maintaining and operating service infrastructure; and
- fair and equitable pricing of water and wastewater as essential services, reflecting needs and the capacity of customers to pay for those services.

The ERA's inquiry informs government on matters primarily relevant to the first two of these objectives.

The main findings and conclusions are set out below for each of the four supply businesses.

This is a draft report. Its findings and conclusions are provisional and subject to change. Further information will be considered by the ERA during and after the public consultation process.

Water Corporation

The Water Corporation is the principal supplier of water, wastewater, drainage and irrigation services in metropolitan and regional areas.

On 1 July 2017, the State Government increased tariffs for all water services by 6.0 per cent. With this increase in charges, the ERA estimates that, in total, the Water Corporation is recovering more revenue through its tariff charges and operating subsidies from the State Government than its efficient cost of supplying services.

Perth metropolitan services

For all services, total revenues expected to be collected by Water Corporation in 2017-18 from metropolitan customers ($1,438.3 million)[1] plus revenues received through State Government subsidies to cover concessions ($104.9 million) exceed the ERA's estimated

[1] All monetary values in this Executive Summary are in dollar values of 30 June 2018.

efficient cost of supply by $219.6 million, which is 17 per cent more than the cost of supply in the Perth area:

- For water services, Perth customers are currently charged less than the ERA's estimated efficient cost of supply by $79.9 million (or 10 per cent less).
- For wastewater services, Perth customers are charged $302.9 million (61 per cent) more than the ERA's estimated efficient cost of supply.
- For drainage services, Perth customers are charged $3.5 million (5 per cent) more than the ERA's estimated efficient cost of supply.

Re-setting all charges for all services to achieve levels of efficient cost of supply over the five year period 2018-19 to 2022-23 would require, in 2018-19:

- an increase in water charges of 4 per cent;
- a decrease in wastewater charges of 41 per cent; and
- a decrease in drainage charges of 4 per cent.

The decrease in wastewater and drainage charges would more than offset the increase in water charges. A typical Perth customer connected to both water and sewerage could be better off by an average of around $260 per annum.

Regional services

In regional areas, customers typically pay charges similar to those in Perth, but the cost of supplying water services to regional locations is generally higher.

For all services, under current pricing the estimates of total revenues collected by Water Corporation in 2017-18 from regional customers ($491.2 million) plus revenues received through the State Government subsidies to cover concessions ($41.7 million) are substantially less than the ERA's estimated efficient cost of supply of $937.1 million:

- For water services, regional customers are currently charged $374.1 million (56 per cent) less than the ERA's estimated efficient cost of supply.
- For wastewater services, regional customers are charged $25.6 million (0.5 per cent) less than the ERA's estimated efficient cost of supply.
- For drainage services, regional customers pay nothing towards the $16.3 million estimated efficient cost of supply.
- For irrigation water supply and drainage services, irrigation farmers contribute $11.4 million towards the estimated cost of supply of $41.3 million.

The Water Corporation receives a subsidy payment from the State Government to meet the additional costs of supplying services to the regions.

- In 2017-18, the subsidy needed to be paid to the Water Corporation to meet the efficient cost of regional services is estimated at $446.0 million, or 43 per cent of the efficient cost of supply.

Re-setting all charges for all services to achieve levels of efficient cost of supply over the five year period 2018-19 to 2022-23 would require, in 2018-19:

- increasing water charges by 125 per cent;
- increasing wastewater charges by 0.5 per cent;

- setting drainage charges to recover $16.3 million (drainage services are currently provided free of charge); and
- increasing revenues to recover the current shortfall of $29.9 million on the costs of irrigation services.

If these charges were re-set to cover costs, the cost of subsidising regional services in the country would fall to just the $64.4 million needed to cover tariff concessions for country residents.

The Terms of Reference require the ERA to calculate these efficient costs. The ERA recognises that governments choose for policy reasons to subsidise country services. The ERA is not recommending that these subsidies are removed, but is providing information to inform the Government's pricing decisions.

Aqwest

Aqwest supplies water services to the Bunbury area.

The ERA has estimated that, in total, Aqwest is recovering more revenue through tariffs than the efficient cost of supplying services.

The ERA estimates that in 2017-18 Aqwest will collect $2.3 million (16.5 per cent) more from customers than the efficient cost of supply.

Re-setting charges for services to achieve levels of efficient cost of supply over the five year period 2018-19 to 2022-23 would require, in 2018-19, a decrease in charges of 7.9 per cent.

Busselton Water

Busselton Water supplies water services in the Busselton area.

The ERA has estimated that, in total, Busselton Water is recovering more revenue through service tariffs than the efficient cost of supply of services.

The ERA estimates that in 2017-18 Busselton Water will collect $1.1 million (11.0 per cent) more revenue from customers than the efficient cost of supply.

Re-setting charges for services to achieve levels of efficient cost of supply over the five year period 2018-19 to 2022-23 would require, in 2018-19, a decrease in charges of 11.3 per cent.

The structure of charges for water services

Customers pay for water, wastewater and drainage services through a range of different tariffs and charges. The ERA considers that some changes in the basis and structure of some of these charges may improve future decisions on the provision and use of water services.

Water services for household customers currently have several charge steps, so that the price per kilolitre of water used increases as consumption increases. The ERA considers that a single per unit price for water consumption based on the long-term cost of supply

would provide more consistent incentives for customers to save water, and reduce the future cost of water services.

Wastewater services for household customers are currently paid for by rates levied on property owners as a percentage of the value of the property (assessed as the gross rental value). The ERA considers that a single value rate for all property owners, based on the average cost of providing wastewater services, may provide an increased incentive for future investment in new technologies and business models for using wastewater.

Drainage services are currently paid for by rates levied on households and businesses in about 40 per cent of the metropolitan area. Rates are determined as a percentage of the value of the gross rental value of the property. The ERA considers there would be administrative advantages in changing this rate to a single value. Consideration could also be given to levying a new, additional drainage charge on all of the Water Corporation's customers in the metropolitan area. The purpose of this charge would be to share the costs of drainage that provides benefits to the public, such as improved water quality in the Swan River, amongst all those that benefit.

Recommendations and findings

Key recommendations and findings

1. The Water Corporation's forecast revenue for 2017-18, from its tariff charges and the State Government's operating subsidy, is estimated to exceed its efficient costs by $219.6 million.

   The main contributor to the excess is the forecast revenue earned from metropolitan wastewater customers, which is estimated to be $302.9 million higher than the efficient costs of the metropolitan wastewater network. This more than offsets an estimated under-recovery of efficient costs for potable water services in the metropolitan area of $79.9 million, and for drainage services in the metropolitan area, of $3.5 million.

   For country services, under current pricing, the estimate of tariff revenues collected by the Water Corporation, in 2017-18, is $491.2 million. This is substantially less than the ERA's estimated efficient cost of supply, of $937.1 million. The State Government therefore will provide an estimated subsidy of $446.0 million to country customers, under its Uniform Tariff Cap policy, to meet the shortfall. However, even with this subsidy, the Water Corporation is not receiving revenue for the country regions in excess of its costs. (Chapter 6)

2. The Water Corporation's tariff levels in the metropolitan area – following the recent 6.0 per cent increase for 2017-18 – are not reflective of efficient costs. Instead, to be cost-reflective, tariff levels in the metropolitan area in 2018-19 would need to:

   - for water, increase by 4 per cent;
   - for drainage, decrease by 4 per cent; and
   - for wastewater, decrease by 41 per cent.

   For the rest of the review period, tariffs in the metropolitan area could then remain the same in real terms, and the Water Corporation would be able to recover its efficient costs. (Chapter 6)

3. If the revenue earned in the Water Corporation's metropolitan area in 2017-18 was to cover the efficient cost of service and no more, revenue from the operating subsidy and over-recovery in the metropolitan area, combined, would fall from $770.4 million to $497.9 million in 2017-18:

   - The operating subsidy would decrease from $550.8 million to $497.9 million.
   - The revenue from metropolitan services could fall by $219.6 million, while still recovering efficient costs. (Chapter 6)

4. Aqwest's expected revenue in 2017-18 is estimated to exceed its efficient revenue by $2.3 million, or by 16.5 per cent. (Chapter 6)

5. Aqwest's tariffs – following recent increases – are not reflective of efficient costs. Instead, to be cost-reflective, Aqwest's tariffs in 2018-19 would need to decline by 7.9 per cent. (Chapter 6)

6. Busselton Water's revenue in 2017-18 exceeds its efficient revenue by $1.1 million, or by 11.0 per cent. (Chapter 6)

7. Busselton Water's tariffs – following recent increases – are not reflective of efficient costs. Instead, to be cost-reflective, Busselton Water's tariffs in 2018-19 would need to decline by 11.3 per cent. (Chapter 6)

8. Efficient tariffs require consideration of both the level and structure of tariffs.

    - The structure of tariffs refers to the mix of different charges that make up the total bill for each service. The water corporations' current tariff structures are unnecessarily complex. Developing simpler tariff structures would be less costly for the water corporations to implement and facilitate better customer understanding of the costs of consuming water services.

    - Changing the levels of the water corporation's tariffs to make them more cost-reflective could, for some water services, allow for reforms to tariff structures to be implemented, without leaving customers worse off. However, given the impact that tariff structure reform could have on customers' bills, the views of, and financial effect on customers need to be considered prior to any changes being made. The Water Corporation is currently engaging with customers about their needs and expectations around the price of water services. That engagement could focus on simplifying tariff structures and aligning them with efficient costs.

    - How tariffs for individual services are set, and in particular the degree of flexibility given to the water corporations to set their own tariffs, is a threshold issue when considering tariff reform. Providing the water corporations with more flexibility to set their own tariffs could lead to more efficient outcomes, given that they are best placed to gauge how their customers will respond to changes. Changing from price cap control to a revenue cap would allow the water corporations to set tariffs for individual services, in contrast to the current arrangements where the Minister for Water sets the price control tariffs. However, appropriate constraints would still be required to protect customers from bill shock and ensure the State Government's equity objectives are met. (Chapter 6)

Water tariffs

9. The Water Corporation's residential water tariffs have three usage tiers for metropolitan customers and four usage tiers for country customers. Aqwest's residential water tariffs have four usage tiers and Busselton Water's residential water tariffs have six usage tiers. A single usage tier is preferable to multiple usage tiers because it promotes economic efficiency, by signalling the cost of new water supplies. However, the effect on customers' bills and implementation of the Uniform Tariff Cap policy would need to be considered prior to any reduction in the number of usage tiers. If the effect on customers' bills is found to be substantial, consideration would need to be given to how to phase in any changes in order to avoid bill shock.

    The ERA recognises that the State Government has objectives for water pricing that are broader than just efficiency objectives, and that three usage tiers may therefore continue to be adopted in the metropolitan area. The ERA has developed a lower, mean and upper estimate of the Long Run Marginal Cost of water that can be used to inform the level of tariffs for the three metropolitan usage tiers, as follows, in 2017-18 dollars:

    - Lower estimate: $0.97/kL, compared to $1.68/kL currently;

    - Mean estimate: $2.32/kL, compared to $2.24/kL currently; and

    - Higher estimate: $3.60/kL, compared to $3.17/kL currently.

Water service charges for metropolitan customers should continue to be set to recover the residual revenue requirement after revenue from the usage charge has been taken into account. (Chapter 6)

10. In principle, economic efficiency benefits could be obtained from relaxing the uniform Tariff Cap Policy. However, these benefits need to be weighed against the costs of adopting alternate means for the State Government to achieve its equity objectives in country areas. Where the uniform Tariff Cap Policy is retained in some form, then:

    - If a single usage tier was to be adopted in the metropolitan area, two usage tiers might need to be adopted for country schemes in order to implement the uniform Tariff Cap Policy. The tariff for water use in the first usage tier could be capped at the metropolitan level, and the tariff for water use in the second tier could be set to reflect the cost of supplying water to the particular cost class the scheme belongs to.

    - If the current multi-tiered tariff structure is maintained in metropolitan and country areas, then consideration could be given to lowering the consumption threshold for the uniform Tariff Cap Policy, for example from 350kL to 150kL in the south, and 550kL to 350kL in the north. Water consumption in country schemes in usage tiers above this amount could be set to reflect the cost of supplying water to the particular cost class the scheme belongs to.

    The policy objective of the uniform Tariff Cap Policy — and in particular whether the objective is to promote uniform tariffs for basic needs or average household consumption — is a matter for the State Government to decide. The objective of the policy in turn informs the level of consumption up to which the uniform tariff cap applies.

    Changes to the implementation of the uniform Tariff Cap Policy would have an effect on customers' bills and the operating subsidy required to fund country losses. These effects would need to be empirically assessed prior to any changes being made. If the effect on customers' bills is found to be substantial, consideration would need to be given to how to phase in any changes in order to avoid bill shock. (Chapter 6)

Wastewater tariffs

11. The efficient tariff structure for wastewater customers is a two-part tariff. However, this cannot be implemented in Western Australia because it is not currently possible to cost-effectively and reliably measure the amount of wastewater that a household discharges. The choice of tariff structure is therefore between the current Gross Rental Value approach, or an approach based on average cost. Each has implications for the sharing of costs among different households, with the latter leading to all households contributing the same amount, irrespective of their capacity to pay.

    An average cost based charge:

    - would be less costly for the Water Corporation to administer and easier for customers to understand; and

    - could lead to fewer distortions in the geographic development of the recycled wastewater sector, in an environment where recycled water has the potential to play a bigger role in delivering water — if residential wastewater tariffs vary by suburb as they do with Gross Rental Value, providers' decisions about where to invest might be influenced by the higher price received for wastewater in some suburbs over others. (Chapter 6)

12. Either or both of residential and non-residential wastewater tariffs could be decreased to ensure that only the efficient cost of service in the metropolitan area is recovered.

However, because non-residential wastewater tariffs are currently uniform across geographic locations, decreasing metropolitan non-residential wastewater tariffs would either increase country losses or lead to higher wastewater tariffs for country residential customers, if country losses are to stay the same. Any decrease in non-residential wastewater tariffs in the metropolitan area therefore should not be matched with lower country non-residential wastewater tariffs. (Chapter 6)

Drainage tariffs

13. A review of drainage pricing should be initiated, with a view to addressing the potential inequities inherent in the current approach. (Chapter 6)

14. Currently around 40 per cent of the Water Corporation's metropolitan customers are charged for drainage services, based on a Gross Rental Value annual fixed charge. The tariff structure for drainage is less likely to influence efficiency than the tariff structure for water. The effects of different tariff structures on equity therefore can be a primary consideration in setting a drainage tariff structure.

    An alternate charging approach, through a uniform fixed charge based on average cost per connection, would affect the sharing of costs among different households and businesses. The average cost method would lead to households, for example, contributing the same amount irrespective of their capacity to pay. A move to average cost charging could however be considered on the basis that it would be less costly for the Water Corporation to administer than Gross Rental Value (particularly if Gross Rental Value is discontinued for residential wastewater) and easier for customers to understand.

    Finally, adopting an additional separate drainage levy for all of the Water Corporation's metropolitan customers could mean that the costs of providing drainage services that create public benefits (e.g. that prevent flooding of parks and roads and improve water quality) are shared among all those that benefit. Such a levy would reduce the amount of drainage costs to be recovered through the existing drainage tariff, assuming this continues to be charged to the 40 per cent of metropolitan properties that are in Declared Drainage Areas. (Chapter 6)

15. In most rural communities, drainage services are provided by local councils and the costs recovered from ratepayers. Funding the costs of drainage services in the six rural drainage districts serviced by the Water Corporation from general revenues (via the Water Corporation's operating subsidy) would seem to be inconsistent with equity principles. On this basis, consideration could be given to allowing the Water Corporation to pass its efficient costs of providing rural drainage services on to local councils in a cost-reflective manner. (Chapter 6)

Expenditure adjustments for the Water Corporation

16. The efficient revenue requirement for the Water Corporation is estimated to be $10,857.5 million (real undiscounted dollars at 30 June 2016) over the five year period commencing 1 July 2018. (Chapter 3)

17. The Water Corporation's past capital expenditure has been found to be prudent and efficient. As a result, $3,521.5 million (real dollars at 30 June 2016) has been included in the Water Corporation's asset base over the five year period 2011-12 to 2015-16. (Chapter 3)

18. The prudent and efficient capital expenditure that the ERA has included in the Water Corporation's projected asset base is $3,766.7 million over the seven year period between 2016-17 and 2022-23. (Chapter 3)

19. The ERA has applied the following efficiency factors in the Water Corporation's capital expenditure for 2016-17 to 2022-23:

    - A five per cent reduction in capital expenditure from 2016-17 to 2022-23 to remove systematic over-estimation by the Water Corporation of its capital expenditure.

    - A one per cent per year compounding reduction to the forecast capital program from 2018-19 to 2022-23 to remove low benefit projects. There is a lack of evidence that the Water Corporation has applied a strong internal benefits challenge process, so as to ensure the urgency, need and scope of expenditure required for many of the capital projects reviewed.

    - A two per cent efficiency requirement to expenditure from 2018-19 to 2022-23, to reflect the current subdued state of the Western Australian construction sector.

    - A 0.25 per cent per year compounding efficiency from 2018-19 to 2022-23 to reflect innovation and continuous improvement expected to occur during the forecast period. (Chapter 3)

Expenditure adjustments for Aqwest

20. The efficient revenue requirement for Aqwest is estimated to be $73.7 million (real undiscounted dollars at 30 June 2016) over the five year period commencing 1 July 2018. (Chapter 4)

21. Aqwest's past capital expenditure has been found to be prudent and efficient. As a result, $13.991 million (real dollars at 30 June 2016) has been included in Aqwest's asset base over the five year period between 2011-12 and 2015-16. (Chapter 4)

22. The prudent and efficient capital expenditure that is included in Aqwest's projected asset base is $39.497 million (real dollars at 30 June 2016) over the seven year period between 2016-17 and 2022-23. (Chapter 4)

Expenditure adjustments for Busselton Water

23. The efficient revenue requirement for Busselton Water is estimated to be $48.5 million (real undiscounted dollars at 30 June 2016) over the five year period commencing 1 July 2018. (Chapter 5)

24. Busselton Water's past capital expenditure has been found to be prudent and efficient. As a result, $8.175 million (real dollars at 30 June 2016) has been included in Busselton Water's asset base over the five year period between 2011-12 and 2015 16. (Chapter 5)

25. The prudent and efficient capital expenditure that is included in Busselton Water's projected asset base is $13.335 million (real dollars at 30 June 2016) over the seven year period between 2016-17 and 2022-23. (Chapter 5)

Material variations

26. The following approach for treating material variations – that arise from an unexpected expenditure incurred (or expected forecast expenditure not incurred) by the water corporations during the review period – is recommended.

    - Material variations in capital expenditure could be addressed through the introduction of an options test and expenditure test, which have similar characteristics to the regulatory test and new facilities investment test in the Electricity Networks Access Code (currently applicable to Western Power's regulated electricity network).

    - Tariffs would be reset at the next inquiry for any approved material capital expenditure variations. The options test could occur prior to any investment commencing, while the expenditure test could occur either during the review period – to provide the water corporations some investment certainty – or at the next inquiry.

    - Material variations in operating expenditure could be addressed through a cost pass-through mechanism, albeit restricted to variations that result from tax or law change events. Variations in operating expenditure could be recovered by the water corporations through adjustments to tariffs during the review period, or otherwise at the next inquiry.

    - All approaches should be net present value neutral in application, to allow adjustments to be made during the next review period. (Chapter 7)

27. Materiality thresholds for capital and operating expenditure variations could apply to allow the water corporations to recover expenditure when required, but not if the administration costs are excessive when compared to the change in expenditure. The following materiality thresholds could apply:

    - For the Water Corporation:

      Capital expenditure – one per cent of annual required revenue (approximately $25 million)

      Operating expenditure – 0.25 per cent of annual require revenue (approximately $6 million)

    - For Aqwest and Busselton Water:

      Capital expenditure – five per cent of annual required revenue (approximately $800,000 and $530,000 respectively)

      Operating expenditure – two per cent of annual required revenue (approximately $320,000 and $210,000 respectively) (Chapter 7)

28. The assessment of material variations should ideally be undertaken by an independent body and, where possible, coincide with the annual budgetary processes that the water corporations must undertake. (Chapter 7)

Environmental and health regulations

29. The current implementation of environmental regulations for wastewater treatment could be improved. Clearly prescribed processes and compliance frameworks will reduce uncertainty for the Water Corporation, allow better allocation of its resources, and reduce its costs. (Chapter 3)

Maintaining asset bases for future reviews

30. If the Water Corporation were to maintain the ERA's Revenue Requirement Model Book 25 fixed asset register, in consultation with the ERA, this could be used to inform estimation of efficient costs and tariffs in future inquires.

    Specifically, the fixed asset register would need to be maintained in real terms, using real depreciation, or its equivalent in nominal terms. Capital expenditure on new assets would need to be added to the asset base at the end of each year, on an as incurred basis, net of capital contributions. Capital contributions would also need to be identified, as either works handed over or as significant infrastructure contributions, so that they can be excluded from the asset base totals. Land would be included in the asset base.

    Rolling forward the asset base in this way would facilitate implementation of a post-tax modelling methodology and provide for more accurate cost and revenue estimates for future tariff reviews. (Chapter 2)

31. If the water corporations were to develop tax asset bases, this would facilitate the more accurate estimation of their efficient costs and tariffs. The tax asset bases would need to reflect the tax position of the water corporations under relevant tax legislation. However, the tax asset bases would exclude capital contributions, consistent with the ERA's standard regulatory approach. Development of the tax asset bases would facilitate implementation of a post-tax modelling methodology and provide for more accurate cost and revenue estimates for future tariff reviews. (Chapter 2)

Summary of the report

This draft report presents the Economic Regulation Authority's (**ERA**) findings on the efficient costs, revenue and tariffs for the Water Corporation, Aqwest and Busselton Water. It follows public consultation on an issues paper, which was published on 6 December 2016. A final report is due to be provided to the Treasurer by 10 November 2017.

The inquiry is being undertaken in response to a request by the former Treasurer. The ERA does not set prices for the water corporations' services, but rather makes recommendations to the State Government on what the efficient costs, revenue and prices should be. The Minister for Water is responsible for the operation of the water corporations and for setting tariffs.

There are several relevant objectives for State Government decisions on the pricing of water, wastewater and drainage services, including, but not necessarily limited to:

- recovery from property owners of the costs of service provision, including a return on public funds invested in service infrastructure;
- long-term cost efficiency in supplying water services, encouraged by prices that reflect the costs of investing in, maintaining and operating service infrastructure; and
- fair and equitable pricing of water and wastewater as essential services, reflecting needs and the capacity of customers to pay for those services.

The ERA's inquiry informs government on matters primarily relevant to the first two of these objectives. Principal findings and conclusions are set out below for each of the three supply businesses.

Efficient costs and revenues

A focus of the inquiry is to evaluate the efficient costs of providing water services to each region and scheme over the review period 2018-19 to 2022-23. Estimated efficient costs in turn inform the efficient levels of revenue which should be paid by customers for their use of water services. If the water corporations obtain sufficient revenue to just cover the efficient costs of each scheme, then consumers will be paying no more for their water services than is necessary. This is a core principle of the inquiry.

The ERA's method for undertaking the inquiry is set out in detail in chapter 2.

Water Corporation

The efficient level of costs and hence revenue for the Water Corporation, for the five year review period from 2018-19 to 2022-23, is estimated to be $11,866.8 million (undiscounted nominal).

The efficient level of revenue for this financial year (2017-18) is estimated by the ERA to be (nominal) $2,260.8 million. This efficient level of revenue compares to the total *actual* revenue expected to be received by the Water Corporation over 2017-18 – from tariffs and State Government operating subsidies – of $2,480.4 million. This actual revenue forecast is based on the State Government's recent tariff increases, of 6 per cent across-the-board, and a forecast weighted average demand growth for the Water Corporation's services for the year, of around 1.7 per cent.

The difference for 2017-18 in the efficient and actual amounts is $219.6 million. It implies that the expected tariff revenue, plus the revenue currently projected to be provided by State Government subsidies for concessions and country operating losses, will provide 9.7 per cent more revenue than is required for the Water Corporation's efficient operations.

The ERA's efficient costs estimates are based on (all undiscounted nominal dollars):

- an opening capital asset base of $17,157.3 million as at 1 July 2018.
- a recommended efficient level of capital expenditure of $2,752.5 million over the review period;
  - this is nearly 21 per cent below the estimates provided by the Water Corporation for the review period;
  - the ERA finds some proposed capital allocations are unnecessary;
  - in addition, greater efficiencies could be realised in capital program implementation – this would lower the costs of those proposed projects which are found to be prudent;
- a real pre-tax rate of return estimated for this inquiry of 5.02 per cent;
  - the rate of return estimate will change for the final report, as a later averaging period will be adopted.

The efficient cost estimates are derived from the sum of (all undiscounted nominal dollars):

- a pre-tax return on the asset base over the review period 2018-19 to 2022-23 of $5003.8 million;
  - this contributes 40 per cent of the efficient revenue requirement over the review period;
- real straight line depreciation of the asset base over the period 2018-19 to 2022-23, which contributes total costs of $2,937.3 million;
  - this contributes 23 per cent of the efficient revenue requirement;
- operating expenditures of $4,613.2 million over the period from 2018-19 to 2022-23;
  - this contributes 37 per cent of the efficient revenue requirement.

The detail of the evaluation of the Water Corporation's costs and revenues is set out in chapter 3.

Aqwest

The efficient level of costs and hence revenue for the Aqwest, for the five year review period from 2018-19 to 2022-23, is estimated to be $80.6 million (undiscounted nominal).

The efficient level of revenue for this financial year (2017-18) is estimated by the ERA to be (nominal) $13.9 million. This efficient level of revenue compares to the total *actual* revenue expected to be received by Aqwest over 2017-18 – from tariffs and State Government operating subsidies – of $16.2 million. This actual revenue forecast exceeds efficient costs in 2017-18 by 16.5 per cent.

The detail of the evaluation of the Aqwest's costs and revenues is set out in chapter 4.

Busselton Water

The efficient level of costs and hence revenue for Busselton Water, for the five year review period from 2018-19 to 2022-23, is estimated to be $53.1 million (undiscounted nominal).

The efficient level of revenue for this financial year (2017-18) is estimated by the ERA to be (nominal) $9.6 million. This efficient level of revenue compares to the total *actual* revenue expected to be received by Busselton Water over 2017-18 – from tariffs and State Government operating subsidies – of $10.7 million. This actual revenue forecast exceeds efficient costs in 2017-18 by 11.0 per cent.

The detail of the evaluation of the Busselton Water's costs and revenues is set out in chapter 5.

Efficient tariffs

The ERA estimated the efficient tariffs of each service provider for the five year period 2018-19 to 2022-23.

Efficient tariffs assist in allocating resources within the economy. They provide the signals that guide behaviour on both the demand and supply sides. Economic efficiency in costs and tariffs will deliver investment, operation and use of water services that are in the long term interests of consumers. Efficient outcomes in costs and tariffs will minimise the revenue needed to deliver water services.

Efficient tariffs require consideration of both the level and structure of tariffs. The level of tariffs refers to the total amount that is payable by a household or business for each service. The structure of tariffs refers to the mix of different charges that make up the total bill for each service. For example, tariffs for water services for most residential customers currently comprise a constant fixed charge (the service charge) and a scale of increasing usage charges.

Different tariff structures apply to water, wastewater, drainage and irrigation.

For the Water Corporation's operations, across its metropolitan and country regions:

- Water is charged by means of a two-part tariff:
  - The first part is a fixed service charge, which either varies uniformly across the State according to the meter size (for non-residential customers) or which is capped to a single uniform level across the State (for residential customers).
  - The second part is either a single volumetric usage charge based on the customer's cost class (for non-residential customers), or a series of volumetric usage charges that increase as a customer's annual consumption exceeds particular thresholds (for residential customers).
- Wastewater is subject to:
  - a two-part tariff (for non-residential customers) with a service charge that varies uniformly across the State according to the number of fixtures and a single volumetric usage charge; and
  - a single annual service charge (for residential customers) based on the Gross Rental Value of each property, that is, the tariff is in cents per $ of Gross Rental Value, albeit subject to a minimum property charge.

- Metropolitan drainage is subject to a service charge which varies according to the Gross Rental Value of each property.
- Irrigation is mainly charged as part of the bulk water supply agreement between the Water Corporation and Harvey Water.

Aqwest and Busselton Water's potable water services also have a two-part tariff structure. For residential customers, there is a service charge and a series of volumetric charges that increase as a customer's annual consumption exceeds particular thresholds. For non-residential customers, there is a service charge which varies according to the meter size and a single volumetric charge.

In addition, the State Government pursues objectives which are of an equity, distributional or social nature:

- Water supply is subject to a uniform Tariff Cap Policy, which caps the service charge across all regions, and also caps some of the volumetric charges (for consumption below specified thresholds).
- Wastewater tariffs are uniform across the State for non-residential services. Tariffs for residential wastewater services across the State are not uniform, but are bounded within a minimum and maximum tariff range.
- Drainage tariffs only apply in some metropolitan areas – other metropolitan areas, such as Mandurah, as well as country areas, are fully subsidised by the State Government.
- Various concessions on each of the three services are provided to eligible pensioners and seniors, although these are capped to a maximum concession amount.
- Around 75 per cent of the Water Corporation's irrigation costs are funded through operating subsidies.

Similar concessional arrangements apply to the water supply businesses of Aqwest and Busselton Water. As these two water businesses have lower costs than the Water Corporation, their tariffs are lower than the uniform tariff caps.

The costs of these policies are funded by the State Government explicitly through the operating subsidy provided to the water corporations.

Efficient tariff levels

The inquiry evaluates two scenarios for the review period:

- A base case scenario:
  - The existing revenue for 2017-18 is estimated – this results from the State Government's recently announced 6 per cent across-the-board increase to tariffs.
  - The 2017-18 revenue is then increased by forecast inflation and demand growth through to 2022-23.
- An efficient tariff scenario: revenue is adjusted to ensure only efficient costs are recovered — the changes to tariff levels needed to deliver this revenue are then estimated.

Water Corporation

Base case tariff scenario

The ERA finds that tariffs are not efficient in the base case for the Water Corporation. That is, given forecast demand growth, revenue does not equate to the efficient cost of service, either in 2017-18, or in the later years.

In 2017-18, revenue from the Water Corporation's tariff charges and from State Government operating subsidies exceeds the efficient cost of service by $219.6 million, or 9.7 per cent. This over-recovery is a *net* result:

- some metropolitan lines of business under-recover their efficient costs, by $83.4 million in total, comprising:
  - under-recovery on water services, of $79.9 million;
  - under-recovery on drainage services, of $3.5 million;
- wastewater services in metropolitan areas over-recover their efficient costs, by $302.9 million — this more than offsets the under-recovery of water and drainage costs.

If existing tariff levels are maintained in real terms through the review period 2018-19 to 2022-23, the resulting total excess of revenue, over efficient costs, would be $1.46 billion in net present value terms for that period.

Efficient tariffs scenario

Under the efficient tariffs scenario, the level of revenue in metropolitan areas is changed, to remove any under- or over-recovery of efficient costs in metropolitan areas. This then allows for the change that would be needed to ensure metropolitan tariffs are cost-reflective to be assessed.

For the efficient tariffs 'P_0' scenario, the ERA estimates a once-off reduction in tariffs in 2018-19, which then allows tariffs to rise in nominal terms by the rate of inflation over the remainder of the review period, through to 2022-23. The individual tariff changes for 2018-19 are as follows:

- water tariffs would need to increase by 4.4 per cent in nominal terms;
- drainage tariffs would need to fall by 3.6 per cent; and
- wastewater tariffs would need to fall by 41.2 per cent.

These tariff changes would remove the 2017-18 net over-recovery of efficient costs in metropolitan areas of $219.6 million, allowing households and businesses to spend the savings on other goods and services. The saving would be, on average, be around $260 for a typical customer connected to water and sewerage in the metropolitan area.

The impact on country customers of changing metropolitan tariffs would be mixed, given the complexities of the uniform tariff arrangements. The actual outcome would depend on the way in which the metropolitan tariff changes were extended to the country regions. Nonetheless, it would be possible to reform tariffs while ensuring that overall revenue from water and wastewater tariffs in country regions remains largely unchanged, leaving country customers no worse off.

Aqwest and Busselton Water

The ERA finds that Aqwest and Busselton Water's tariffs are also not efficient in the base case. Under the efficient tariffs P_0 scenario, Aqwest and Busselton Water's tariffs are reduced in 2018-19 to recover only efficient costs. Tariffs rise by the expected rate of inflation thereafter. The reduction in tariffs that would be required in 2018-19 is:

- 7.9 per cent for Aqwest; and
- 11.3 per cent for Busselton Water.

Tariffs would then only need to rise by the rate of inflation in subsequent years to match efficient costs over the review period.

Efficient tariff structures

The water corporations' current tariff structures are unnecessarily complex. Simpler tariff structures would be less costly for the water corporations to implement and facilitate better consumer understanding of the costs of consuming water services. They might also encourage more efficient investment decisions and resource use, if prices more closely reflect the costs of supply.

How tariffs for individual services are set, and in particular the degree of flexibility given to the water corporations to set their own tariffs, is a threshold issue when considering tariff reform. Providing the water corporations with more flexibility to set their own tariffs could lead to more efficient outcomes to the extent that they are best placed to gauge how their customers will respond to changes.

A revenue cap would allow the water corporations to set tariffs for individual services, in contrast to the current arrangements where the Minister for Water sets the tariffs. A revenue cap would set an overall revenue requirement for the particular water corporation for a period of up to five years. The water corporation would then set the prices of individual services. Appropriate constraints would however still be required to protect customers from bill shock and to ensure that the State Government's equity objectives are met. Effective implementation of a revenue cap would require different governance arrangements to those currently in place. For example, a clear framework would be needed to ensure that the water corporations did not cross subsidise one line of business from another.

The changes to the levels of tariffs outlined above could, for some water services, allow for reforms to tariff structures to be implemented without leaving customers worse off. However, given the overall effect that tariff structure reform would have on customers' bills, the views of and financial effect on customers would need to be considered prior to any changes being made. The Water Corporation is engaging with customers through 2017 to better understand its customers' needs and expectations around the price of water services.

Water tariff structures

For residential water users, the current tariff structure includes multiple tiers for the usage charge. In the metropolitan area there are three tiers and in country schemes there are four tiers for the Water Corporation and Aqwest's customers, and six for Busselton Water's customers. The State Government's uniform Tariff Cap Policy caps the tariff levels for the first two usage tiers in country areas at the levels for an equivalent amount of usage in the metropolitan area.

A single usage tier is preferable to multiple usage tiers, as it promotes economic efficiency by signalling the cost of new water supplies. The ERA has estimated the mean Long Run

Marginal Cost of new water supplies to the metropolitan area at $2.32/kL. This could be used to inform the level of the tariff for the single usage tier. The current mid-tier charge for water usage is $2.24/kL.

Water service charges for metropolitan customers would continue to be set to recover the residual revenue requirement after revenue from the usage charge has been taken into account.

If a single usage tier was adopted in the metropolitan area, two usage tiers might need to be adopted for country schemes in order to implement the uniform Tariff Cap Policy. The consumption threshold for the first tier could be retained at current levels, which are 150kL in the south, and 350kL in the north. The tariff for water use in the first usage tier could be capped at the metropolitan level of $2.32/kL, ensuring uniformity up to this point. The tariff for water use in the second tier could be set to reflect the cost of supplying water to the particular cost class the scheme belongs to.

Moving to a single usage tier in the metropolitan area and two usage tiers in the country would affect customers' bills, potentially substantially. These effects would need to be assessed prior to any changes being made. If the effect on customers' bills is found to be substantial, consideration would need to be given to how to phase in any changes in order to avoid bill shock.

The ERA recognises that the State Government has objectives for water pricing that are broader than encouraging economic efficiency, and that three usage tiers may therefore continue to be adopted in the metropolitan area. The ERA has developed a lower, mean and upper estimate of the Long Run Marginal Cost of water that could be used to inform the level of tariffs for the three metropolitan usage tiers, as follows:

- Lower estimate: $0.97/kL, compared to $1.68/kL currently;
- Mean estimate: $2.32/kL, compared to $2.24/kL currently; and
- Higher estimate: $3.60/kL, compared to $3.17/kL currently.

If the current multi-tiered tariff structure is maintained in metropolitan and country areas, then consideration could be given to lowering the consumption threshold for the uniform Tariff Cap Policy, for example from 350kL to 150kL in the south, and 550kL to 350kL in the north. Water consumption in country schemes in usage tiers above this amount could be set to reflect the cost of supplying water to the particular cost class the scheme belongs to.

In principle, economic efficiency benefits could be obtained from relaxing the current uniform Tariff Cap Policy and thereby moving to more cost reflective pricing — tariffs that are set to recover costs would encourage consumption that does not place undue pressure on existing sources of water supply. However, the State Government would then need to find alternative means to achieve its equity objectives in country areas. These alternative means could have social or economic costs, which could outweigh the benefits of using price signals to encourage efficient levels of water usage.

The policy objective of the uniform Tariff Cap Policy — and in particular whether the objective is to promote uniform tariffs for basic needs or average household consumption — is a matter for the State Government to decide. The objective of the policy in turn informs the level of consumption up to which the uniform tariff cap should apply.

Changes to the implementation of the uniform Tariff Cap Policy would have an effect on customers' bills and the operating subsidy required to fund country losses. These effects would need to be empirically assessed prior to any changes being made. If the effect on

customers' bills is found to be substantial, consideration would need to be given to how to phase in any changes in order to avoid bill shock.

Wastewater tariff structures

In principle, the efficient tariff structure for residential wastewater customers is a two-part tariff, but in practice this cannot be implemented because it is not currently possible to cost-effectively and reliably measure the amount of wastewater that a household discharges.

The choice of tariff structure is therefore between the current Gross Rental Value approach, or an approach based on average cost per household. Each has implications for the sharing of costs among different households, with the latter leading to all households contributing the same amount irrespective of their capacity to pay.

Given the ERA's finding that wastewater tariffs substantially exceed efficient costs, it is possible that a fixed charge based on the average cost per household (rather than Gross Rental Value) could be adopted for wastewater customers. However, there still would be a need to address equity issues for targeted households with a lower capacity to pay.

An average cost based charge also:

- would be less costly for the Water Corporation to administer and easier for customers to understand; and
- could lead to fewer distortions in the geographic development of recycled wastewater, in an environment where recycled water may play a bigger role in delivering water in future. If residential wastewater tariffs vary by suburb as they do with tariffs linked to Gross Rental Value, recyclers' decisions about where to invest might be influenced by the higher price received for wastewater in some suburbs over others.

To ensure that only the efficient cost of wastewater services in the metropolitan area is recovered, either or both of residential and non-residential wastewater tariffs could be decreased. However, because non-residential wastewater tariffs are currently uniform across geographic locations, decreasing metropolitan non-residential wastewater tariffs would either increase country losses or lead to higher wastewater tariffs for country *residential* customers if country losses are to stay the same. Any decrease in non-residential wastewater tariffs in the metropolitan area therefore should not be matched with lower country non-residential wastewater tariffs.

Drainage tariff structures

Currently only around 40 per cent of the Water Corporation's metropolitan customers – those in Declared Drainage Areas – are charged for drainage services. The tariff structure for drainage is less likely to influence efficiency than the tariff structure for water. This is because property owners can do little to change their impact on the need for drainage services once building and landscaping has been completed. Further, as there is currently no drainage water recycling industry, there is no need to consider the effects on future development of the recycled water industry.

The effects of different tariff structures on equity are therefore the primary consideration in setting drainage tariff structures. This makes the current Gross Rental Value charging approach less problematic than it may prove for wastewater tariffs. The Gross Rental Value charging approach is nonetheless complex and costly to administer. On that basis, a move to average cost charging could be considered. This is especially the case if the Government decided to adopt a fixed charge for wastewater.

Whatever pricing structure is used, consideration could be given to adopting an additional separate drainage levy that applies to all of the Water Corporation's customers in the metropolitan area, with the proceeds from the levy being used to fund all drainage expenditure that creates public benefits. The costs of providing drainage that creates public benefits – for example, that prevents flooding of parks and roads and improves water quality – would therefore be shared among all those that benefit. Such a levy would reduce the amount of drainage costs to be recovered through the existing drainage tariff, assuming this continues to be charged to the 40 per cent of properties in Declared Drainage Areas.

Other matters

The ERA also reviewed a range of other matters.

Factors affecting efficient costs

Findings on factors affecting the efficient costs for each water corporation, particularly capital and operating expenditures, are set out in the relevant chapters (chapters 3, 4 and 5).

Service standards

The water corporations are meeting their current service standards and their resources are being effectively allocated and used efficiently. The ERA is not aware of any evidence that would suggest that the costs of meeting the current service standards are disproportionate to the benefits.

Environment and health regulations

The effects of environmental and health regulations on the efficient costs of the water corporations are difficult to determine due to a lack of clarity and prescriptive standards for specific environmental requirements. This has hampered the quantification of the cost impacts of any inefficiencies, particularly relating to waste water treatment. Instead, the ERA has evaluated the processes in place to maintain environmental and health outcomes.

The health provisions that apply for potable water and the water corporations' understanding of their obligations concerning these regulations appear to be well established. For example, the *Memorandum of Understanding for drinking water* between the Water Corporation and Department of Health (WA), appears to be an effective and efficient way to meet the primary health requirements in place.

There may be some inefficient costs arising in the processes required to meet environmental regulations. Anecdotally, the procedures to achieve compliance with environmental regulations – particularly with regard to wastewater treatment – may be leaving uncertainty about specific environmental outcomes required, and the roles and responsibilities involved for achieving them. The ERA considers that more work to streamline and clearly document the processes and timeframes for meeting environmental regulations could reduce costs and improve efficiencies.

Material variations

Setting a revenue requirement for a longer period would provide the water corporations with greater control over their pricing. In addition, the longer period could enhance incentives for greater cost savings, to the extent that these are retained for the review period.

However, unexpected events may cause the water corporations to incur additional operating or capital expenditure which is greater than recommended in any price or revenue review. Where efficient costs are recommended at the beginning of the review period, the water corporations may not be able to recover the additional costs during the subsequent interval between reviews. Similarly, if costs are lower than forecast, customers will pay a higher tariff than is required to meet the efficient costs of providing water services.

The ERA recommends that material variations be managed through:

- for capital expenditure – an *options test* , whereby a preferred option may be identified, and an *expenditure test*, whereby specific additional capital expenditure may be approved. Any adjustment to water tariffs to account for these variations would then occur at the next inquiry tariff reset; and
- for operating expenditure – an annual cost pass-through mechanism for approved expenditures.

The approach should complement the incentive properties of setting prices over an extended review period. Any compensation mechanism through tariffs for material variations should therefore only apply if actual total expenditure for the review period exceeds forecast total expenditure, and if the expenditure is deemed efficient and prudent.

The ERA's findings on material variations are set out in chapter 7.

1 Introduction

On 21 October 2016, the former Treasurer of Western Australia tasked the Economic Regulation Authority (**ERA**) to undertake an inquiry into the efficient costs and tariffs of the Water Corporation, Aqwest and Busselton Water. The inquiry is for the five year review period beginning 1 July 2018 and ending 30 June 2023. This inquiry will inform the State Government's setting of service tariffs for the five year period starting from 2018-19.

A copy of the full *Terms of Reference* is provided in appendix 1 of this report. The ERA is required to consider the following:

- the efficient costs of providing services, with a focus on:
  - cost effectiveness in the supply of services, including the services funded by operating subsidies;
  - resources necessary to meet the service standards;
  - operating efficiency targets appropriate for the growth scenarios expected over the regulatory period;
  - the impact of environmental and health regulations on efficient costs;
  - the Water Corporation's country schemes;
- a recommended approach for managing material variations in capital or operating expenditure that may be encountered over a five year regulatory period;
- the revenue requirement of each service provider for the five year period commencing 2018-19; and
- the efficient tariffs of each service provider for the five year period commencing 2018-19.

There are several relevant objectives for State Government decisions on the pricing of water, wastewater and drainage services, including:

- recovery from property owners of the costs of service provision, including a return on public funds invested in service infrastructure;
- economic efficiency in the supply and use of services, encouraged by prices that reflect the costs and cost drivers of investing in, maintaining and operating service infrastructure;
- recovery of sufficient revenue to meet the costs of subsidising the supply of services in regional areas; and
- 'fair and equitable' pricing of services commensurate with access to water and wastewater services as an essential service, and the 'capacity to pay' of customers in different socioeconomic circumstances.

The ERA's inquiry informs government on matters primarily relevant to the first two of these objectives. Principal findings and conclusions are set out below for each of the three supply businesses.

1.1 Inquiry process

The ERA published an Issues Paper in December 2016 that explained the purpose of the inquiry and the issues that would be examined.[2] Interested parties were invited to make submissions on any matters of relevance. Two public submissions were received from Stormwater WA and Aqwest in early 2017.[3]

In developing this draft report, the ERA has considered:

- information provided by the water corporations in reply to information requests made by the ERA;
- technical reports by Cardno (QLD) Pty Ltd, the ERA's appointed technical advisor;
- positions and recommendations set out the ERA's previous water inquiries; and
- the submissions made in response to the Issues Paper.

The ERA will prepare a final report after considering submissions from interested parties on this draft report and in light of any new information received. The ERA is to provide its final report to the Treasurer in November 2017. The Treasurer will have 28 days to table the final report in State Parliament, after which a copy will be made available from the ERA's website.

1.2 The water sector

The water sector in Western Australia covers the provision to end users of:

- water services;
- sewerage and wastewater services;
- drainage services; and
- irrigation services.

The State Government, the regulatory agencies, and the water corporations have primary influence over the performance of the water sector in Western Australia.

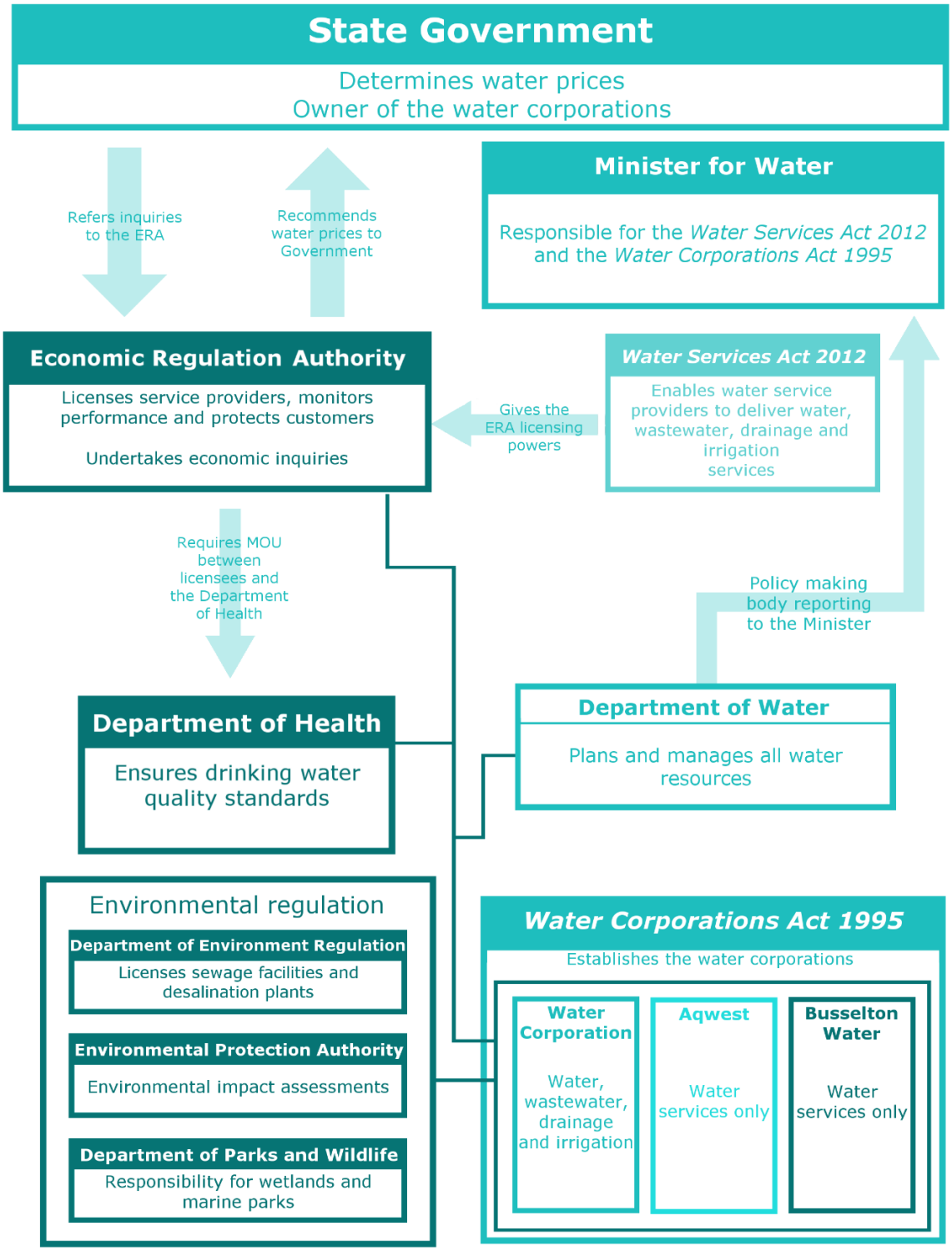
1.2.1 The State Government

The State Government is responsible for the legislation which prescribes the roles and powers of the regulatory agencies and water corporations. Figure 1 illustrates how these bodies and the legislation interact.

[2] Economic Regulation Authority, *Issues Paper: Inquiry into the efficient costs and tariffs of the Water Corporation, Aqwest and Busselton Water*, December 2016.

[3] Public submissions are available from the ERA's website at: https://www.erawa.com.au/inquiries/water-inquiries/inquiry-into-the-efficient-costs-and-tariffs-of-the-water-corporation-aqwest-and-busselton-water-2016/public-submissions .

Figure 1 Overview of the water sector within Western Australia



Source: ERA

The State Government is the owner of the Water Corporation, Aqwest and Busselton Water. It determines the prices the water corporations charge for their services, through the State's annual budget process. The Minister for Water is therefore responsible for water services tariff setting.

1.2.1.1 Legislation

The *Water Corporations Act 1995* and the *Water Services Act 2012* are the principal legislation governing the water services sector in Western Australia. These acts prescribe the functions and powers of individuals and agencies in the water sector.

Within government, the Minister for Water is responsible for administering the *Water Services Act 2012* and the *Water Corporations Act 1995*. These acts provide the Minister with powers to direct the operations of the water corporations.

For example, the *Water Services Act 2012* gives the Minister for Water powers, among others, to make codes of practice on a variety of matters (for example, the Minister may require water service providers to abide by certain service standards). The Minister can also grant licence exemptions to water service providers and, if a licensee is in serious default, recommend to the Governor that licensee's water licence be cancelled.

The *Water Corporations Act 1995* establishes the Water Corporation, Aqwest and Busselton Water and their functions and powers. The water corporations are required to act on commercial principles and develop strategic development plans and statements of corporate intent. The Act specifies that the water corporations report to the Minister for Water.

The *Water Services Act 2012* also provides for the licensing of providers of water, wastewater, drainage and irrigation services. It stipulates requirements for licensing water service providers and gives the ERA the power to administer the licences. The Act also requires licensees to:

- comply with the *Water Services Code of Conduct* made by the ERA;[4]
- comply with codes of practice made by the Minister for Water;
- have an asset management system, and provide the ERA with an independent report on the effectiveness of this system at least once every two years; and
- provide the ERA with an independent report on their compliance with their licence at least once every two years.

In addition, the provision of water services is subject to a range of other legislation and regulation, including relating to health and the environment (Figure 1).

For example, to manage drinking water quality, the water service providers are required to enter into a *Memorandum of Understanding* with the State's Department of Health. As the regulator of drinking water quality, the Department of Health requires licensees to demonstrate compliance with the *Australian Drinking Water Guidelines*. Compliance is assessed through independent audits at agreed intervals.

[4] Under the Water Services Act 2012, the initial (first) *Water Services Code of Conduct* is made by the relevant Minister and not the ERA.

The Department of Health is also responsible for establishing codes of practice for small – less than 20 cubic metres discharge per day – anaerobic sewerage treatment systems, so as to ensure public health.

Finally, three agencies have a role in environmental regulation of the water corporations.

- The Department of Water and Environment Regulation is responsible for licensing the discharges from large – greater than 20 cubic meters discharge per day – sewage facilities and desalination plants.
- The Environmental Protection Authority (now part of the Department of Water and Environment Regulation) is responsible for conducting environmental impact assessments, which consider the effect of the water corporations' activities on the environment.
- The Department of Biodiversity Conservation and Attractions is responsible for the conservation of wetlands and marine parks. Groundwater abstraction, desalination plants, or wastewater treatment and disposal can affect these environments.

1.2.2 The water corporations

The Water Corporation, Aqwest and Busselton Water provide water services to customers in Western Australia (Figure 2).

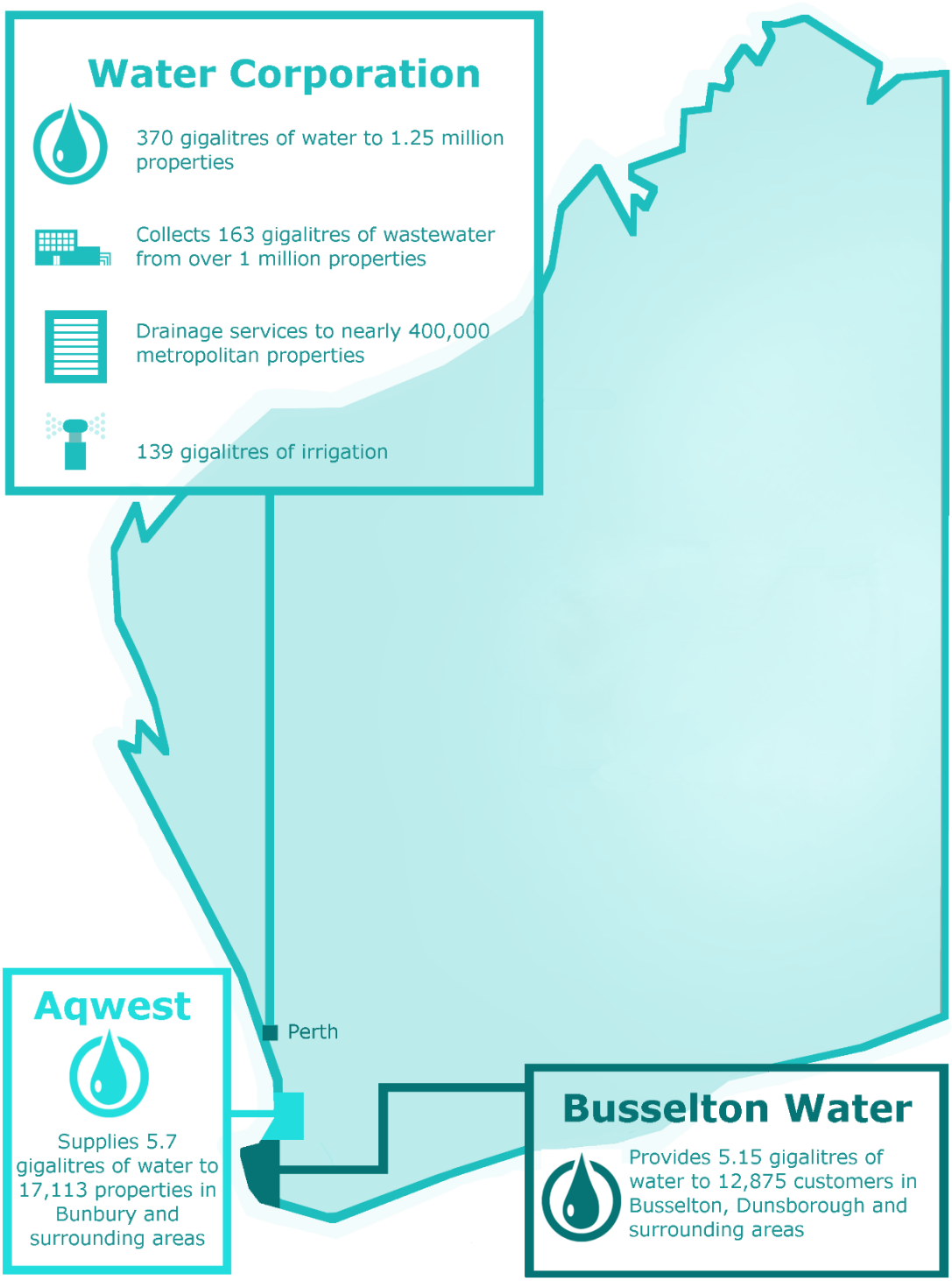
The Water Corporation provides water (potable and non-potable), wastewater, drainage and irrigation services to Perth and most of regional Western Australia. The Water Corporation's activities are organised into 'schemes', covering various regions. There are six metropolitan schemes and more than 200 country schemes.

Aqwest and Busselton Water provide potable water to the areas around Bunbury and Busselton respectively. The Water Corporation provides wastewater and drainage services to these areas.

The three water corporations are statutory corporations operating under the *Water Corporations Act 1995* and are each governed by a board of directors. The board of directors is accountable to the Minister for Water. The water corporations are required to pay a dividend to the State Government, and are also subject to tax under the National Tax Equivalent Regime. Under this regime, the water corporations are assessed annually for their income tax equivalent liability, and are required to pay instalments of the resulting liability to the Western Australian Treasury.

Other businesses also provide water services to regional areas of Western Australia. The ERA licenses an additional 21 water service providers (in addition to the three water corporations). This inquiry does not consider the efficient costs and tariffs of these other 21 water service providers.

Figure 2 Overview of the water corporations



Source: Water Corporation, *2016 Annual Report*; Aqwest, *Annual Report 2016*; and Busselton Water, *Annual Report 2016*.

2 The ERA's approach

This chapter summarises the ERA's method for evaluating the efficient costs and tariffs of the water corporations.

2.1 Efficient costs and tariffs

Economic theory suggests that efficient costs and prices are an outcome of effective competition in the market for a good or service.

Effective or 'workable' competition exists when the market power of suppliers to raise prices is constrained, for example by rivalry from competing suppliers, or by the threat of substitute goods and services or new entrants. Workable competition limits the ability of the firm to extract excessive profits. Instead, it creates incentives for the firm to:

- invest efficiently and to innovate;
- improve the efficiency of existing operations;
- provide services at a quality that reflects consumer demands;
- share the benefits of efficiency gains with consumers, including through lower prices.

This leads to economic efficiency, encompassing:

- efficiency in production, allowing goods and services to be produced at the lowest possible cost (productive efficiency);
- prices which signal appropriate consumption decisions, allowing markets to function effectively, thereby enhancing cyclical stability, and encouraging output levels and product quality which reflect consumer demands (allocative efficiency);
- profits at levels just sufficient to encourage and reward investment, efficiency and innovation (dynamic efficiency).

However, given the monopoly characteristics of water networks, the scope for effective competition is limited. Nonetheless, by targeting similar outcomes for costs and tariffs as occur under effective competition, economic efficiency can be enhanced.

Economic efficiency in costs and tariffs will deliver investment, operation and use of water services that are in the long term interests of consumers. Efficient outcomes in costs and tariffs will minimise the revenue needed to deliver water services.

2.1.1 Determining efficient costs and revenue

A primary focus of the analysis is to evaluate the efficient costs of providing water services to each region and scheme over the review period 2018-19 to 2022-23.

The forecasts of efficient costs for each scheme, in each year of the review period, are the sum of a number of component cost 'building blocks'. These are:

- a return *on* and *of* capital which is just sufficient to maintain investment in the fixed assets required to meet customers demand preferences, involving:

  - a return *on* the written down value of efficient capital investments – obtained by multiplying the opening value of the capital asset base, in each year, by the weighted average cost of capital;
  - the return *of* efficient capital investments – given by an amount of depreciation of the asset base in each year;
- a provision for efficient operating expenditure, to maintain and operate water services delivery infrastructure, net of efficiency target savings; and
- a provision to cover the statutory tax obligations.

Developers lay pipes for new developments, and individual users pay headworks charges. These 'capital contributions' – whether gifted assets or cash contributions – are not included in the asset base. These have been paid for already, so do not require capital remuneration (although related operating costs are included). Efficient costs and revenue are therefore net of the capital costs of these assets. This reflects an important economic principle – that of user pays – where the broader set of consumers should not subsidise individual user's costs.[5]

Capital returns and operating expenditures together contribute more than 90 per cent of total costs. Therefore, a review of the prudency and efficiency of the water corporations' capital expenditures and operating costs is a key element of this report. Those costs deemed efficient are combined in a building block model to deliver the total cost of service for each of the water corporations.

Estimated efficient costs in turn inform the efficient levels of revenue which should be paid by customers for their use of water services.[6] If the water corporations obtain sufficient revenue to just cover the efficient costs of each scheme, then consumers will be paying no more for their water services than is necessary. This is a core principle of the inquiry.

In addition, the ERA considers that its recommendations have been developed consistent with good regulatory practice. Good regulatory practice for pricing access to monopoly infrastructure is:

- driven by economic principles;
  - based on a strong theoretical foundation, informed by empirical analysis;
- fit for purpose;
  - able to perform well in estimating efficient tariffs over the estimation period;
  - implemented in accordance with best practice;
- supported by robust, transparent and replicable analysis;
  - based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to small changes in the input data;
- supportive of specific regulatory aims; and thereby:

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[5] For the same reason, it is also important that any tax implications for the water corporations of capital contributions are borne by the benefiting consumer. The water corporations can charge for these costs. For example, headworks charges can include a margin for the implied tax costs.

[6] Technically, efficient revenue should balance with the efficient *net* cost of service. The net cost of service is the total (gross) cost of service of the service provider, less the cost of providing contestable services, which do not need to be subject to price regulation. The cost of the contestable services will be given by the revenue received for them. It follows that the net cost of service is equal to the gross cost of service, less contestable revenue and any other non-regulated revenues.

- recognises the desirability of consistent approaches to regulation across industries, so as to promote economic efficiency;
- seeks to achieve rates of return that would be consistent with the outcomes of efficient, workably competitive markets;
- as far as possible, ensures that the net present value of returns is sufficient to cover a service provider's efficient expenditures (the 'Net Present Value = 0' condition);
- provides incentives to act efficiently;
- promotes simple approaches over complex approaches, where appropriate;
- promotes reasoned, predictable and transparent decision making; and
- enhances the credibility and acceptability of a decision.

The ERA's resulting estimates of the efficient costs and revenues for each of the water corporations are set out in the following chapters (Water Corporation at chapter 3, Aqwest at chapter 4 and Busselton Water at chapter 5).

2.1.2 Determining efficient tariffs and operating subsidies

The efficient revenue requirement can be translated into efficient tariffs, given forecast demand.

For this report, the existing water services tariff charges – including those set out for 2017-18 in the State Government's most recent announcement – are taken as the foundation of a 'base case'.[7] For the base case, the 2017-18 tariff charges are then indexed through to 2022-23 by applying the ERA's forecast of consumer price inflation, thereby maintaining their level in real terms.[8]

Combining forecast demand with the tariff charges in the ensuing years provides an estimate of the level of revenue by scheme expected over the review period.

This forecast revenue from tariffs can be compared to the estimated revenue requirement developed from efficient costs evaluation, as discussed above. Any divergence between the two will indicate that the existing or forecast levels of tariffs are not efficient.

The State Government's uniform Tariff Cap Policy is to achieve similar tariff levels for residential water services across the State for both the service charge and the first two tiers of the consumption charges.[9] Under the policy, a significant proportion of the country tariffs levels are pegged to the metropolitan tariff level. For example, in the case of residential water, both the service charge and the first and second tiers of the variable consumption charge, for most metro and country schemes, are the same.

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7 The Hon Ben Wyatt, 'Tariffs, fees and charges to assist in budget repair', *Media Statements*, 21 June 2017. The statement announced a 6 per cent increase in water, wastewater and drainage charges for 2017-18, taking effect from 1 July 2017.

8 All indexing in this report is based on the ERA's estimates of the 'Eight cities Consumer Price Index' (Australian Bureau of Statistics, *Consumer Price Index*, Cat. 6401.0, Tables 3 and 4, March 2017).

9 The Water Corporation also applies uniform tariffs for the service charge for non-residential water customers and for non-residential wastewater charges, though these are not part of the State Government's Tariff Cap Policy.

In addition, some customers in both the metropolitan and country regions – pensioners and seniors, non-rated and exempt customers, and aboriginal communities – receive tariff discounts. Broadly these include:

- a 50 per cent discount on the water, wastewater and drainage service charge, up to a cap of $108.86 for the water service charge, $436.15 for the wastewater service charge and $54.99 for the drainage service charge; and
- a 50 per cent discount on water usage charges for the first 150kL in the metropolitan area, 400kL in the country south region, and 600kL in the country north region.[10]

Accordingly, the tariff revenues for many schemes – particularly those in the country regions – are not sufficient to cover their efficient costs. To address this, the revenue requirement incorporates a State Government operating subsidy. The sum of the tariff revenue and the operating subsidy (which covers any tariff discounts and country losses) should then deliver the revenue sufficient to just cover efficient costs.[11] If there is a divergence between the two, then either:

- tariff charges are not efficient – for example, the metropolitan tariff charges may not deliver revenue which covers only efficient costs;[12] or
- the country operating subsidy is not efficient – for example, if there is a difference (inclusive of operating subsidies) between a scheme's total revenue and its efficient costs; or
- given the tariff uniformity between the metro and country regions, both of the above.

The efficient operating subsidies for each of the water corporations by line of business are set out in chapter 6.

2.1.3 Efficient tariff structures

A further consideration for efficiency is the structure of the tariff charges. Efficient tariff structures will signal the efficient costs of water services.

Where the average cost curve is characteristic of a network monopoly – that is, downward sloping over the quantity demanded – then it will be efficient to price the marginal unit of consumption at its marginal cost. Any shortfall between average revenue and the average costs of supply may then be recovered through a service (fixed) charge on all consumers.

Marginal cost pricing signals efficient levels of consumption, such that:

- consumers have incentives to consume only the level of water services which aligns with their preferences and overall budget constraint; and thereby

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[10] Pensioners, State and Commonwealth Seniors cardholders and Community Residential (Aboriginal Communities) are eligible for the 50 per cent discount on service charges. Only Pensioners are eligible for the 50 per cent discount on usage charges. State Seniors cardholders are also eligible for an additional 25 per cent discount on service charges — the concession for each individual service charge is subject to a cap, and there is a cap on the total concession given across all the service charges of $100.

[11] This is a high level explanation. Account needs to be taken of all elements, including seniors and pensioners discounts, non-rated and exempt property concessions, and a range of other revenues and costs.

[12] This revenue is that before any shortfall in revenue arising from discounts. These revenue shortfalls are covered by a State Government operating subsidy.

- allocatively efficient levels of consumption are promoted.

The ERA recommends that the marginal cost for water tariffs be based on the long run marginal cost of providing new water supplies. Charging for marginal water use at the long run marginal cost means that it becomes possible to meet any supply shortfall with a new water source, without a significant change in the variable consumption charges. To that end, the report provides an estimate of the efficient long run marginal costs of water, given emerging trends for new supply sources supply. In addition, commentary also is provided on other considerations for the structure of tariffs (see chapter 6).

2.2 Undertaking the analysis

The following analytical tools and inputs are used to determine the efficient costs.

2.2.1 Modelling efficient costs

The cost of service models employed for the water corporations are all *real, pre-tax* models.

2.2.1.1 Real values

The ERA's approach for this review is to account for values at the end of financial year. All reported dollar values in the model are expressed in real 2016 $, valued at the end of the financial year on 30 June 2016.

Historic values – such as the written down value of assets – are indexed to real 2016 $ using the Consumer Price Index (**CPI**).[13] The Water Corporation used its own 'Capital Cost Index' for indexing the asset base under its replacement costs method. The ERA has backed this index out and replaced it with the eight cities CPI. The ERA considers that the CPI is more representative of the water corporations' costs, and less subjective in the construction of the index (see appendix 10).

A forecast of inflation is developed to convert the model outputs for the review period – in real 2016 $ – to nominal dollars of the day, for reporting purposes. The inflation forecast used for this inquiry is 1.79 per cent (see Table 1 in section 2.2.1.4 below, and appendix 9 for the method used to determine the forecast CPI).

2.2.1.2 Taxation

The water corporations, as State government-owned enterprises, are subject to tax under the National Tax Equivalent Regime.[14] This tax on profits is passed through to consumers as a cost of service. It is therefore estimated as a building block in the cost of service modelling.

Tax may be dealt with explicitly in the modelling, by building in a nominal tax module. That approach is more data intensive, as it requires the development of a nominal tax asset base,

[13] Australian Bureau of Statistics, *Consumer Price Index: Weighted Average of Eight Capital Cities*, Catalogue 6401.0, March 2017.

[14] Australian Taxation Office, *Manual for the National Tax Equivalent Regime*, April 2016.

which may be different to the inquiry's *regulatory* asset base (**RAB**).[15] However, it is accepted that the resulting estimate is more reflective of actual tax costs.

Alternatively, tax may be estimated using a 'pre-tax' rate of return. It is less precise. Specifically, the pre-tax approach substitutes the RAB as a proxy for the tax asset base – from which taxable incomes are determined – which tends to result in an over-estimate.[16] The result is that profits and tax costs are over-stated for tax purposes, all other things equal (see appendix 3 for a summary of the difference between the pre-tax and post-tax modelling methods).

Weighed against that, the pre-tax approach is more tractable and less data intensive.

The ERA has used the pre-tax approach for its previous inquiries into water tariffs. Given the time and resource constraints for this inquiry, and the fact that detailed tax bases are not available for the water corporations, the ERA elected to adopt the pre-tax approach again for this inquiry.[17]

The issues of the over-statement of the pre-tax approach is informed by an analysis of the differences between the two approaches. That analysis suggests that the amount of over-statement of revenues for the efficient cost of service case in this report is around 0.7 per cent (see appendix 3).

For the future, to address this issue with greater precision, the ERA recommends that the water corporations take steps to develop a regulatory tax asset base. Post-tax estimates of efficient costs then could be undertaken for any future review. This exercise could follow a similar approach to that taken by Western Power for its 2012 review of the access arrangement.[18]

Recommendation or finding

If the water corporations were to develop tax asset bases, this would facilitate the more accurate estimation of their efficient costs and tariffs. The tax asset bases would need to reflect the tax position of the water corporations under relevant tax legislation. However, the tax asset bases would exclude capital contributions, consistent with the ERA's standard regulatory approach. Development of the tax asset bases would facilitate implementation of a post-tax modelling methodology and provide for more accurate cost and revenue estimates for future tariff reviews.

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15 The asset base used for determining efficient costs for this inquiry is equivalent in construct to the regulatory asset bases used for the ERA's access arrangement decisions. It only includes assets which should earn a return paid through tariffs by the broad customer base. Other assets – such as those relating to contestable segments of the business, or which have been contributed – are omitted. Accordingly, the inquiry regulatory asset base acronym is RAB.

16 A number of factors can influence this outcome. Primarily, different approaches to depreciation in the tax and the RAB tend to lead to a divergence over time.

17 The tax base needs to be in a form consistent with the pricing objective of this inquiry. Importantly, capital contributions need to be removed, which is not straightforward (see for example Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012, pp. 262 – 269).

18 Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012, pp. 262-269.

2.2.1.3 Establishing the asset base

The starting points for modelling the efficient costs of each water corporation are their financial positions in 2015-16. Wherever possible, data from the actual outcomes for 2015-16 are used. The models then project values from that point forward – through the review period 2018-19 to 2022-23 – in order to determine the efficient costs and revenue.

The return on and of the invested capital included in the RAB delivers around 60 per cent of the estimated efficient costs (with operating costs providing the remainder).[19] The value of the asset base therefore has a major impact on the total revenue outcome.

For the Water Corporation, the building block model employed for estimating the efficient costs for this inquiry is a variant of the Water Corporation's own nominal Revenue Requirement Model (**RRM**). The RRM provides a rich detail on contributing asset values and operating costs, down to individual assets at the scheme level.

This ERA amended version of the RRM (hereafter the ERA RRM) replaces the ERA's former model, which was used in the three previous inquiries into the costs and tariffs of water services.

However, the ERA retains and continues to use its existing pre-tax revenue models for Aqwest and Busselton Water.

Roll forward method

The 2015-16 RAB used in the ERA RRM is developed by rolling forward the initial 2004-05 asset base. The 2004-05 initial capital base was established by the ERA in previous inquiries, using the deprival value method.[20] The deprival value of the Water Corporation's RAB, as at 2004-05, was 2005$ 9.6 billion.[21] This ERA asset base accounted for the major asset classes, but did not identify individual assets or scheme level asset bases.

In order to bring the ERA RAB up to date, a first step is to roll forward the ERA RAB in *real terms* from the 2005 deprival value, through to 2016, accounting for the CPI, efficient capital expenditures since 2005, and deductions of approved depreciation. That is, each year, the ERA's roll forward method updates the RAB by summing, in real terms, the CPI-indexed:[22]

- closing RAB from the previous year; plus
- real annual depreciation based on the straight line method; and
- approved efficient new capital expenditure.

This provides the 2016$ value of the ERA RAB as at 30 June 2016.

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19 The tax margin is included in the return on capital.

20 The deprival value method is a standard regulatory approach for establishing initial capital bases.

21 Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board Revised Final Report*, 28 March 2013, p. 38.

22 The roll forward method used by the ERA for rolling forward the deprival value asset base from 2005 for Aqwest and Busselton Water adopts the same approach as that used for the Water Corporation, and set out here.

Alignment of the Water Corporation's asset base with the 2005 deprival value

The ERA determined to use the Water Corporation's fixed asset register for this inquiry. However, the Water Corporation's fixed asset register utilises an indexed replacement cost valuation in *nominal dollars*. That is, the closing value of the RAB in each year is the sum of:

- the opening asset base, which is based on the historic cost of the asset base, indexed to current dollars using is the Water Corporation's own Capital Cost Index;[23]
- less depreciation, which is the straight line (nominal) historic cost depreciation, indexed by the Capital Cost Index; plus
- new capex applied in the year.

The Water Corporation's roll forward method contrasts with that used in the ERA's deprival value RAB. There is a major distinction in the resulting depreciation. This is discussed below.

Therefore, as a second step, the ERA adjusted the Water Corporation's RRM fixed asset register by, among other things:

- backing out the Capital Cost Indexation, and replacing it with the Consumer Price Index (see discussion below);
- removing capital contributions (see appendix 13);
- adding in the asset value of the Water Corporation's land holdings; and
- rolling forward the fixed asset register using the ERA's real roll forward method.

This brings the RRM fixed asset register to a like-for-like basis with the ERA's asset base, at 2015-16.

Third, to align the adjusted Water Corporation RRM fixed asset register with the ERA's roll forward of the 2005 deprival value asset base, the ERA 'splices' the two bases at 2015-16. Every asset in the adjusted Water Corporation fixed asset register is pro-rated by a splice factor, to ensure that the overall total of the adjusted RRM fixed asset register matches the ERA RAB's roll forward value in 2015-16. It does this by decreasing every 2015-16 written down value in the Water Corporations fixed asset register by a factor of 0.974, giving a reduction of just less than 3 per cent.

The result is an ERA RRM fixed asset register. This maintains the detail and relativities of the Water Corporation's RRM fixed asset register, but returns it to consistency with the roll forward of the ERA RAB's 2005 $ deprival value, in written down 2015-16 $ terms (see appendix 10 for a detailed discussion of these asset base issues).

The ERA also has rolled forward its existing models for Aqwest and Busselton Water in a similar manner to the ERA RAB for the Water Corporation. The Aqwest and Busselton Water RABs are therefore consistent with their respective 2005 deprival values.

[23] The Water Corporation's Capital Cost Index is mix of engineering costs indices. It differs from the ERA's standard inflation index, which the Australian Bureau of Statistic's 8 cities Consumer Price Index.

Treatment of capital contributions

The ERA's estimates of the 2005 deprival values excludes the value of capital contributions, which arise from developer works handed over and other cash significant infrastructure contributions. The ERA's standard practice is that these items should be excluded, as they have been already paid for by developers. The ERA also considers that any tax outcomes arising from those contributions should be excluded from efficient costs of service.[24] These positions were established in the ERA's 2008 report, which stated:[25]

> On efficiency grounds, developers should face at least the forward-looking direct costs of development in each location. Developer charges set in this way would be higher in areas where development costs are higher, and lower in areas where development costs are lower (such as in areas where there is spare capacity), sending a price signal to developers as to the costs of development.

Allowing pass through of the tax implications of capital contributions would unduly penalise those users who do not benefit from the contributed assets. The water corporations and developers are best placed to negotiate the costs of access. That position is retained for this inquiry (see appendix 13 for a more detailed consideration of this issue).

Depreciation

Depreciation affects the time profile over which an asset's costs are recovered. It has a strong influence on the overall revenue path. Some depreciation approaches – such as the nominal Historic Cost Accounting method typically used by accountants – accelerate the recovery of asset costs, increasing the revenue requirement in the near term. The asset values are depreciated by more in the early years of its life, compared to other methods.

The roll forward method adopted for the ERA's previous inquiries utilised real straight line depreciation. Such real straight line depreciation is consistent with Australian regulators' standard Current Cost Accounting method. The Current Cost Accounting approach is preferred for long lived monopoly assets, as it spreads the cost more evenly over their life. The depreciation write down is less in the early years of the assets' lives. This more even spread is in the interests of all consumers, both current and future.[26]

Perhaps more problematically, the Water Corporation's Replacement Cost Accounting roll forward method – applied, as it is, within the Water Corporation's nominal RRM – over-recovers assets. It violates the 'Net present value = 0' condition (refer to the regulatory principles in section 2.1.1 above).[27] This is because inflation is counted twice:

- first, there is an allowance for inflation in the *nominal* rate of return applied in the nominal modelling framework; and

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[24] Capital contributions are treated as revenue in the year of receipt by the Australian Tax Office under corporate income tax provisions.

[25] Economic Regulation Authority, *Inquiry into Developer Contributions to the Water Corporation*, 30 June 2008, p. vi.

[26] The Historic Cost Accounting method on the other hand drags forward the cost recovery to the near term, thereby favouring future consumers at the expense of current customers.

[27] The 'present value principle' – also known as the 'financial capital maintenance principle' – requires that the present value of expected capital charges for an asset over its economic life be equal to the initial value or purchase costs. The capital charge relating to assets comprises both the return *on* and the return *of* capital (for a good summary of the issues, see Queensland Competition Authority, *Financial Capital Maintenance and Price Smoothing*, February 2014). If the present value condition is not achieved, the asset is either over- or under- recovered, leading to a departure from normal profits. (Refer to appendix 9 for a discussion of the alternative approaches.)

- second, there is an allowance for inflation in the *indexation* of the asset base, which occurs with the Replacement Cost Accounting method used by the Water Corporation.

The Replacement Cost Accounting method is based on Historic Cost Accounting. It accelerates the recovery of capital compared to the standard regulatory approach.

These factors together accelerate the write down of the asset base, which then is lower than it would otherwise be, all other things equal.

In contrast, the ERA's version of the RRM is a real model. It applies real straight line depreciation, and a real rate of return to the opening asset value in each year.[28] It does not result in a double count for inflation. The present value principle is adhered to. It does not write down the asset base too rapidly.

The ERA therefore recommends that the Water Corporation maintain the ERA's revised Book 25 fixed asset register, which underpins the ERA's RRM estimates for this inquiry.

Recommendation or finding

If the Water Corporation were to maintain the ERA's Revenue Requirement Model Book 25 fixed asset register, in consultation with the ERA, this could be used to inform estimation of efficient costs and tariffs in future inquires.

Specifically, the fixed asset register would need to be maintained in real terms, using real depreciation, or its equivalent in nominal terms. Capital expenditure on new assets would need to be added to the asset base at the end of each year, on an as incurred basis, net of capital contributions. Capital contributions would also need to be identified, as either works handed over or as significant infrastructure contributions, so that they can be excluded from the asset base totals. Land would be included in the asset base.

Rolling forward the asset base in this way would facilitate implementation of a post-tax modelling methodology and provide for more accurate cost and revenue estimates for future tariff reviews.

Treatment of common assets

In the Water Corporation's RRM, the capital costs of common assets (such as water sources and the main trunkline pipes used by many schemes) are allocated to individual schemes in proportion to those schemes' contribution to the use of the common assets. The proportions are determined using the key drivers of costs at the scheme level. For example, for water, these include:

- the water volumes consumed in each scheme – these volumes allow for allocation of the costs of upstream water sources, based on each scheme's share of the total volume supplied by the upstream water sources; and

[28] This provides for a further distinction to the regulators' approach. To ensure the Net Present Value = 0 condition, regulators apply the rate of return to the *opening* asset value to calculate the return on capital in any particular year. The Water Corporation in its RRM applies the rate of return to the closing asset value, which leads to another violation of the present value condition.

- the 'kilolitre kilometres' involved in transporting water to each scheme – these estimates are used for allocating the costs of common use pipes to the individual schemes.

The ERA has maintained the Water Corporation's asset allocation, albeit applied within the revised ERA RRM used for this inquiry.

There is no need to allocate the common assets for Aqwest and Busselton Water, as these are single schemes.

2.2.1.4 Rate of return

The ERA has applied a single real pre-tax rate of return to all three water authorities. This single rate of return is a change from previous inquiries, where separate rates of return were applied to Aqwest and Busselton Water to account for their smaller size. However, the ERA has determined that smaller service providers should not be distinguished through a higher rate of return, as it reduces the incentive to attain minimum efficient scale (see appendix 9). Operations less than the minimum efficient scale lead to higher charges for water users than necessary.

The ERA's approach to estimating the rate of return is based on (see appendix 9 for details):

- a 60 day averaging period, ending 29 March 2017 – this will be updated for the final report, so the rate of return for this draft report only provides an indication of the final estimate at this point;
- a five year term, consistent with a regular five year reset of the estimates of efficient tariffs;
- a single benchmark efficient entity, defined as a pure-play service provider operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of the water services;
    - this entity informs the selection of the benchmark efficient sample of comparators, which allows estimation of the benchmark entity's rate of return parameters, including the level of gearing, the credit rating and the beta;
- a risk free rate determined as the average of the rates on available five year Commonwealth Government Securities, over the 60 day averaging period;
- a return on equity informed by the Sharpe-Lintner Capital Asset Pricing Model;
- a return on debt based on a 10 year 'hybrid' trailing average, where:
    - the base rate is given by the five year interest swap rate, fixed 'on the day' as the average value over the 60 day averaging period; and
    - the debt risk premium is estimated based on a 10 year trailing average of past BBB credit rates, combined with the ERA's current estimate for the rate to apply for the next five years; and
- an estimate of the value of imputation credits, gamma, of 0.4.

As at 29 March 2017 the real pre-tax estimate is 5.02 per cent (Table 1 below).

Table 1 Water Corporation weighted average cost of capital parameters and estimate as at 29 March 2017

Parameter	Value
Nominal Risk Free Rate (10 year Term)	2.25%
Real Risk Free Rate	0.45%
Inflation Rate	1.79%
Debt Proportion	55%
Equity Proportion	45%
Debt Risk Premium	2.698%
Debt Issuing and Hedging Cost	0.125%
Debt Risk Margin	3.301%
Australian Market Risk Premium	6.80%
Equity Beta	0.7
Corporate Tax Rate	30%
Franking Credit	40%
Nominal Cost of Debt	5.551%
Real Cost of Debt	3.695%
Nominal After Tax Cost of Equity (before personal tax)	8.55%
Real After Tax Cost of Equity	6.64%
Nominal Pre Tax Cost of Equity	7.01%
Real Pre Tax Cost of Equity	5.13%
Nominal Pre Tax WACC	**6.90%**
Real Pre Tax WACC	**5.02%**

Source: ERA Analysis

The real pre-tax estimate of 5.02 per cent is an increase of 1.43 percentage points on the previous estimate made for Water Corporation, on 16 November 2012. Given that the return on capital contributes 40 per cent of the efficient revenue requirement, this increase has a significant impact.

The higher rate of return is largely driven by an increase in the debt risk premium. It is the result of applying a lower BBB credit rating, compared to A- in November 2012, and a 10 year instead of 5 year term for the debt risk premium.

In addition, the market risk premium has increased. This is largely the result of the ERA's departure from a previous estimation methodology, which placed much greater emphasis on mean reversion to the long term historical average MRP than on prevailing and forward looking capital market expectations.

The equity beta estimate has also increased from 0.65 in the previous inquiry to 0.7.

Expected inflation estimates are 0.73 per cent lower than in November 2012. This results in a lower discounting of the nominal WACC and consequently a higher real estimate.

Finally, the estimate of gamma has increased, from 0.25 to 0.4. This has the effect of reducing the wedge between the post-tax estimate of the rate of return, and the pre-tax rate of return.

Full details on the parameter estimates are given in appendix 9.

2.2.2 The efficiency of expenditures

2.2.2.1 Demand forecasts

Growth in demand over time drives the need for new capital expenditures and increased operating expenditures. It also influences the estimates of the tariffs.

The demand forecasts for the review period for each water corporation are reported in the relevant chapters below.

2.2.2.2 Capital expenditure

The efficiency of capital expenditure is a major determinant of efficient costs, as noted above. The ERA, in conjunction with its consultant Cardno, has evaluated the efficiency of the capital expenditures included in the water corporations' asset base, from 2011-12 through to 2015-16, and also the capital expenditures proposed for each year through to 2022-23 (see chapters 3, 4 and 5 for each of the water corporations, respectively).

2.2.2.3 Operating expenditure

Operating expenditure contributes around 40 per cent of the annual revenue requirement. The ERA, in conjunction with its consultant Cardno, has evaluated the efficiency of operating expenditure proposed by the water corporations over the period 2015-16 to 2022-23 (see chapters 3, 4 and 5 for each of the water corporations, respectively).

2.2.2.4 Factors affecting efficient costs

The water corporations are required to operate within the legislative frameworks governing their activities. These have the potential to affect their efficient costs, through their influence on the level of capital and operating expenditure.

The ERA was tasked to evaluate the impact on efficient costs of the following factors:

- service standards;
- health and environment regulations; and
- efficiency targets.

These elements are considered in chapters 3, 4 and 5 for each of the water corporations, and in appendix 6.

3 The efficient costs and revenue of the Water Corporation

This chapter presents the ERA's analysis and recommendations of the efficient costs and revenues of the Water Corporation, based on the methodology described in chapter 2. The evaluation is informed by the written material and data provided by the Water Corporation.

First, the chapter sets out the efficient total revenue requirement for the review period for the inquiry. By definition, the efficient total revenue in each year is equal to the ERA's estimate of the net cost of service. The net cost of service equals:

- the gross cost of service arising from all the Water Corporation's activities; less
- the costs of any contestable or non-regulated activities, for example costs associated with:
  - special agreement contracts,
  - miscellaneous and administered charges, including for trade waste.

Second, the outcomes for the building block components which drive the efficient net cost of service are summarised, including:

- the demand forecasts for the review period;
- the ERA's estimates of efficient capital expenditure from 2011-12 through to 2012-13;
- the resulting inquiry regulatory asset base (**RAB**) for 2015-16 through to 2022-23;
- the three building block costs which contribute the total annual cost of service – the return on the RAB, the depreciation of the RAB, and the efficient amount of operating expenditures.

Third, other factors affecting the efficient costs of the Water Corporation are evaluated.

3.1 Total revenue requirement

The ERA's estimates of the efficient revenue requirement for the Water Corporation are based on the efficient net cost of service of providing water services.[29]

The efficient level of revenue for Water Corporation is $10,857.5 million (real 2016 $) for the review period from 2018-19 to 2022-23 (Table 2). That is equivalent to $11,866.8 million in undiscounted nominal terms.

The efficient level of revenue for 2017-18, of $2,260.8 million (nominal), also is reported in Table 2. It compares to the expected revenue for 2017-18 of $2,480.4 million, which is based on the State Government's recently announced tariff increases, the forecast level of demand for the Water Corporation's services in that year, and the ERA's estimates of the operating subsidy given the current tariffs. The difference means that tariffs are currently recovering 9.7 per cent more revenue than is required for efficient operations.

[29] The net cost of service is equal to the total gross cost of service developed from the ERA's Revenue Requirement Model (see section 2.1.1), less the costs associated with commercial special agreements or other revenue.

Table 2 Total Revenue Requirement Forecasts for Water Corporation ($ million nominal, except for the last column)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total of the review period (real $2016)
Water	1,406.1	1,427.6	1,447.6	1,468.8	1,493.3	1,493.9	6,708.1
Metro	763.8	770.8	778.8	784.5	788.4	764.1	3,557.9
Country	642.3	656.8	668.8	684.3	704.9	729.8	3,150.2
Wastewater	744.0	765.7	781.5	796.4	808.3	823.4	3,636.7
Metro	495.6	504.6	512.4	516.0	517.7	521.2	2,353.7
Country	248.4	261.2	269.1	280.3	290.6	302.2	1,283.0
Drainage	80.6	80.5	80.6	81.4	81.1	82.1	371.3
Metro	64.3	63.6	63.6	64.4	64.0	64.8	293.3
Country	16.3	16.9	17.0	17.0	17.1	17.3	78.0
Irrigation	30.1	30.6	30.8	30.8	30.7	31.7	141.5
Metro	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Country	30.1	30.6	30.8	30.8	30.7	31.7	141.5
Total	**2,260.8**	**2,304.4**	**2,340.5**	**2,377.4**	**2,413.4**	**2,431.1**	**10,857.5**
Metro	***1,323.7***	***1,339.0***	***1,354.8***	***1,364.9***	***1,370.1***	***1,350.1***	***6,204.8***
Country	***937.1***	***965.4***	***985.7***	***1,012.5***	***1,043.3***	***1,080.9***	***4,652.7***

Source ERA estimates

Recommendation or finding

The efficient revenue requirement for the Water Corporation is estimated to be $10,857.5 million (real undiscounted dollars at 30 June 2016) over the five year period commencing 1 July 2018.

3.2 Demand

The ERA has accepted the demand forecasts developed by the Water Corporation for the purpose of evaluating the efficient costs, revenues and tariffs (Table 3).

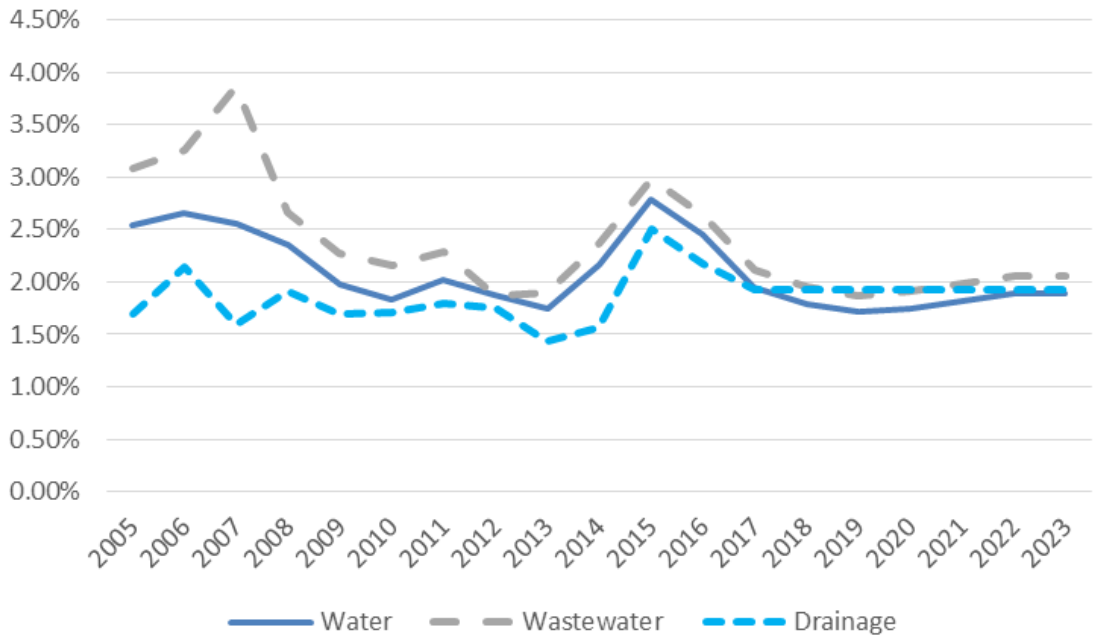
The growth rates of the Water Corporation's metropolitan operations are expected to approach 2 per cent over the period to 2022-23. This follows the elevated growth rates over the boom years, as well as over the more recent 2012-13 to 2015-16 period (Figure 3).

Table 3 Demand growth by region and line of business (per cent)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Metro							
Water	1.95%	1.79%	1.72%	1.75%	1.82%	1.89%	1.89%
Wastewater	2.11%	1.95%	1.87%	1.91%	1.99%	2.06%	2.06%
Drainage	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%	1.92%
Country (including Mandurah)							
Water	0.81%	0.72%	0.77%	0.85%	1.03%	1.16%	1.16%
Wastewater	1.13%	1.04%	1.04%	1.22%	1.46%	1.66%	1.66%
Irrigation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
All services							
	1.80%	1.68%	1.64%	1.69%	1.78%	1.85%	1.85%

Source Water Corporation

Figure 3 Metropolitan demand growth by line of business (per cent, financial year ended)



Source ERA analysis, Water Corporation data.

3.3 Capital expenditure

The ERA has assessed the capital expenditure expected to be incurred prior to the inquiry period, in order to establish the opening capital base. The ERA has also reviewed Water Corporation's forecast capital expenditure expected to be incurred during the inquiry period. The ERA's review is to ensure that only prudent and efficient capital expenditure is included in the capital base, for the purpose of determining the return on investment and allowances for depreciation (see appendix 7 for detail).

3.3.1 Past Capital Expenditure

The ERA has reviewed the Water Corporation's actual capital expenditure between 2011-12 and 2015-16. The ERA has undertaken this review based on a sample number of projects. The ERA has not recommended any adjustments to the Water Corporation's capital expenditure during this period.

The ERA's recommended capital expenditure to be included in the Water Corporation's asset base for 2011-12 to 2015-16 is shown in Table 4.

Table 4 ERA's Assessment of Capital Expenditure 2011-12 to 2015-16 (real $ million at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16
Water	583.2	566.8	549.6	307.2	281.3
Metro	*477.2*	*198.7*	*287.1*	*111.8*	*76.1*
Country	*106.1*	*368.2*	*262.5*	*195.5*	*205.3*
Wastewater	175.0	237.5	272.3	235.6	162.7
Metro	*84.5*	*123.2*	*143.1*	*71.8*	*69.9*
Country	*90.4*	*114.3*	*129.1*	*163.8*	*92.8*
Drainage	3.9	11.8	8.4	4.9	5.8
Metro	*2.0*	*5.6*	*8.2*	*4.9*	*4.4*
Country	*1.9*	*6.2*	*0.1*	*0.0*	*1.4*
Irrigation	4.7	4.3	4.8	100.5	1.1
Metro	-	-	-	-	-
Country	*4.7*	*4.3*	*4.8*	*100.5*	*1.1*
Total	**766.8**	**820.4**	**835.0**	**648.3**	**451.0**
Metro	***563.8***	***327.4***	***438.4***	***188.5***	***150.3***
Country	***203.1***	***493.0***	***396.6***	***459.8***	***300.7***

Source ERA Calculations

Recommendation or finding

The Water Corporation's past capital expenditure has been found to be prudent and efficient. As a result, $3,521.5 million (real dollars at 30 June 2016) has been included in the Water Corporation's asset base over the five year period 2011-12 to 2015 16.

3.3.2 Forecast Capital Expenditure

The ERA has reviewed the Water Corporation's forecast capital expenditure between 2016-17 and 2022-23. The ERA has undertaken this review based on a sample number of projects. The ERA's recommended capital expenditure between 2016-17 and 2022-23, converted to real dollar millions at 30 June 2016, is shown in Table 5.

Table 5 ERA's Assessment of Capital Expenditure 2016-17 to 2022-23 (real $ million at 30 June 2016)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Water	403.1	298.6	272.8	326.2	294.1	307.0	299.3
Metro	*174.6*	*143.2*	*190.4*	*134.5*	*61.3*	*57.6*	*75.0*
Country	*228.5*	*155.4*	*82.4*	*191.6*	*232.9*	*249.4*	*224.3*
Wastewater	222.6	282.0	199.4	231.0	184.1	148.8	133.2
Metro	*141.6*	*193.8*	*138.5*	*158.0*	*106.6*	*78.7*	*89.4*
Country	*81.0*	*88.2*	*60.9*	*73.0*	*77.6*	*70.1*	*43.8*
Drainage	11.5	12.6	3.5	18.8	13.1	15.7	13.5
Metro	*6.2*	*3.0*	*2.3*	*14.7*	*13.1*	*15.1*	*13.5*
Country	*5.3*	*9.5*	*1.2*	*4.1*	-	*0.6*	-
Irrigation	4.8	7.6	6.5	7.9	7.8	23.7	17.5
Metro	-	-	-	-	-	-	-
Country	*4.8*	*7.6*	*6.5*	*7.9*	*7.8*	*23.7*	*17.5*
Total	**642.0**	**600.8**	**482.3**	**583.9**	**499.2**	**495.1**	**463.5**
Metro	***322.4***	***340.0***	***331.2***	***307.3***	***180.9***	***151.3***	***177.9***
Country	***319.6***	***260.8***	***151.1***	***276.6***	***318.2***	***343.8***	***285.6***

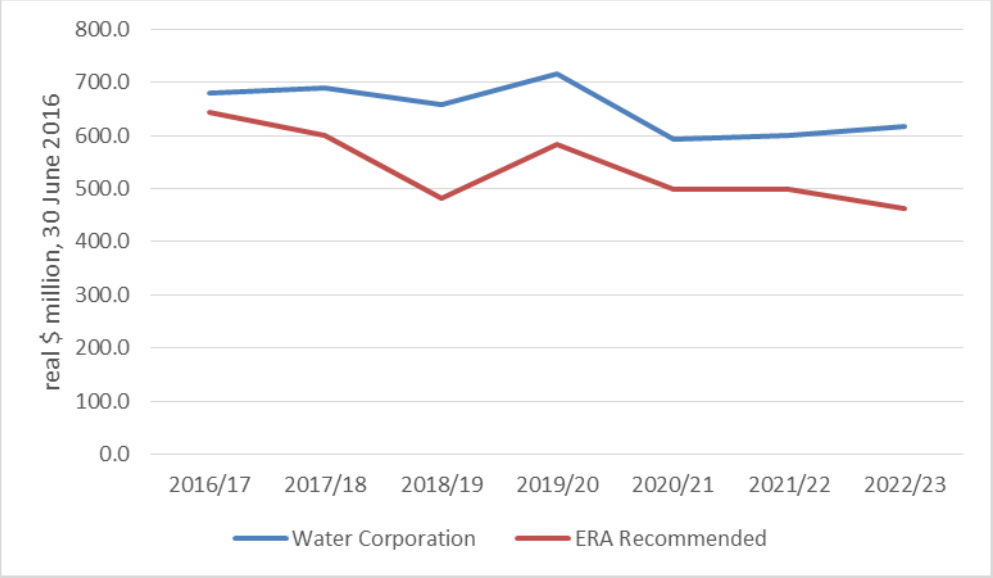
Recommendation or finding

The prudent and efficient capital expenditure that the ERA has included in the Water Corporation's projected asset base is $3,766.7 million over the seven year period between 2016 17 and 2022-23.

3.3.3 Differences between the ERA and Water Corporation estimates

The ERA's recommended efficient level of capital expenditure is $795.2 million lower than the estimates provided by the Water Corporation for the period 2016-17 to 2022-23 (Figure 4). The average reduction is around 18 per cent.

Figure 4 Comparison of Water Corporation's and ERA's recommended capital expenditure for 2016-17 to 2022-23 (real $ million at 30 June 2016)[30]



Source ERA estimates, Water Corporation.

The ERA's estimates are lower than the Water Corporation's because:

- some capital expenditure projects from the Water Corporation's estimates are not deemed necessary;
- some capital expenditure projects should be either reduced to align with efficient cost estimates, or re-profiled across the period;
- savings are applied to base capital expenditure for water and wastewater; and
- the ERA has applied an efficiency target to the Water Corporation's capital expenditure over the period 2018-19 to 2022-23 (see the next section).

[30] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

3.3.3.1 Efficient targets for capital expenditure

The ERA's recommended capital expenditure estimates for 2016-17 to 2022-23 are based on Water Corporation data, which is adjusted in light of the ERA's and Cardno's review. The estimates also are subject to continuing efficiency targets. The resulting forecast levels of capital expenditure are prudent and efficient.

The following specific adjustments to the total capital expenditure data are applied. These reflect the specific project and program adjustments set out in appendix 7:

- Cost estimation – a five per cent reduction is applied to capital expenditure estimates over 2016-17 to 2022-23 to remove systematic over-estimation. The ERA understands the Water Corporation's cost estimation team has a key performance indicator to over-forecast expenditure by five per cent.
- Optimisation of the capital program – a one per cent per year compounding reduction is applied to the forecast capital program, to ensure that only capital projects which provide the greatest benefit are delivered. There is a lack of evidence that the Water Corporation has applied a strong internal benefits challenge process to ensure the urgency, need and scope of expenditure required for many of the capital projects reviewed. As it might take some time for the Water Corporation to realise the benefits from a stronger internal challenge process, the adjustment has been applied from 2018-19.
- Competitive supplier environment – a two per cent efficiency requirement is applied to expenditure from 2018-19 to 2022-23, to reflect the current subdued state of the Western Australian construction sector. The Water Corporation's cost estimates have not factored in any reduction in construction costs, whereas the evidence is that significant price reductions have occurred in recent tenders received.
- Continuing efficiency – a 0.25 per cent per year compounding efficiency is applied to expenditure from 2018-19 to 2022-23 to reflect innovation and continuous improvement, which the ERA expects should occur during the forecast period. Continuing efficiency improvements have been applied to other water businesses in Australia. A 0.4 per cent per year efficiency was applied to SA Water and a 0.25 per cent per year efficiency was applied to Sydney Water.

The ERA's recommended efficiency factors are shown in Table 6. These factors have been applied to the adjusted capital expenditure following the ERA's project and program specific adjustments and are incorporated in the recommended capital expenditure shown in Table 5.

Table 6 ERA's recommended efficiency factors for 2016-17 to 2022-23

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Cost – estimation contingency	5%	-	-	-	-	-	-
Benefits case challenge and program optimisation	-	-	1%	1%	1%	1%	1%
Competitive supplier environment	-	-	2%	-	-	-	-
Continuing efficiency	-	-	0.25%	0.25%	0.25%	0.25%	0.25%
Efficiency factor to apply	**0.95**	**0.95**	**0.92**	**0.91**	**0.90**	**0.89**	**0.87**

Source ERA analysis

Recommendation or finding

The ERA has included the following efficiency factors in Water Corporation's capital expenditure for 2016-17 to 2022-23:

- A five per cent reduction in capital expenditure from 2016-17 to 2022-23 expenditure should be applied to remove systematic over-estimation by the Water Corporation of its capital expenditure.
- A one per cent per year compounding reduction to the forecast capital program from 2018-19 to 2022-23 should be applied to remove low benefit projects. There is a lack of evidence that the Water Corporation has applied a strong internal benefits challenge process, so as to ensure the urgency, need and scope of expenditure required for many of the capital projects reviewed.
- A two per cent efficiency requirement should be applied to expenditure from 2018-19 to 2022-23, to reflect the current subdued state of the Western Australian construction sector.
- A 0.25 per cent per year compounding efficiency should be applied to expenditure from 2018-19 to 2022-23 to reflect innovation and continuous improvement expected to occur during the forecast period.

3.4 Inquiry asset base

As set out in section 2.2.1, the ERA maintains consistency with its standard regulatory 'roll-forward' methodology, based on its 2005 deprival valuation. The ERA has determined that

the appropriate inquiry asset base is $15,776.3 million for 1 July 2011. This value is consistent with the value from the ERA's 2013 inquiry and ensures consistency across inquiries (see Appendix 10).

3.4.1 Roll forward of asset base to 30 June 2018

The ERA has determined that the opening value of the Water Corporation asset base for the purposes of this inquiry is $17,157.3 million (real dollars at 30 June 2016). The asset base has been rolled forward from the beginning of 2011-12, as the ERA had incorporated actual capital expenditure and recommended depreciation amounts prior to this in past inquiries.

As noted in the previous section, the ERA has not adjusted the actual capital expenditure incurred by the Water Corporation up to 2015-16. The ERA has made adjustments to the forecast capital expenditure estimates provided by the Water Corporation for 2016-17 and 2017-18. All capital expenditure included in the inquiry asset base excludes works handed over by developers and cash contributions for assets from the Water Corporation's Standard Infrastructure Charge. These capital contributions must be excluded to avoid customers being charged through tariffs for assets that have already being funded.

The depreciation amounts for 2011-12 to 2015-16 are the ERA's recommended depreciation values that were used to determine recommended tariffs for the last ERA inquiry. These depreciation values were based on the forecast capital base at that time. The ERA has used its calculation of forecast depreciation for 2016-17 and 2017-18 as the recommended tariffs of the previous inquiry did not include these years.

The ERA's roll forward Water Corporation inquiry asset base to 30 June 2018 is shown in Table 7.

Table 7 ERA's Assessment of Water Corporation's Opening Capital Base (Real $ million at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Opening Capital Base	15,776.3	16,103.1	16,466.1	16,824.5	16,982.4	16,933.9	17,070.0
Capital Expenditure	766.8	820.4	835.0	648.3	451.0	642.0	600.8
Depreciation	(440.1)	(457.4)	(476.5)	(490.4)	(499.5)	(505.9)	(513.6)
Closing Capital Base	16,103.1	16,466.1	16,824.5	16,982.4	16,933.9	17,070.0	17,157.3
Opening Capital Base at 1 July 2018							**17,157.3**

Source ERA estimates

3.4.2 Forecast capital base

The ERA's forecast inquiry capital base for the Water Corporation is shown in Table 8. The forecast capital base includes the ERA's recommended capital expenditure (excluding capital contributions) for the Water Corporation. The ERA has determined the calculation

of depreciation by using its recommended asset values applied to the Water Corporation's asset base model to determine depreciation based on asset lives for each asset.

Table 8 ERA's Assessment of Water Corporation's Forecast Capital Base (Real $ million at 30 June 16)

	2018-19	2019-20	2020-21	2021-12	2022-23
Opening Capital Base	17,157.3	17,109.8	17,152.9	17,109.1	17,053.5
Capital Expenditure	482.3	583.9	499.2	495.1	463.5
Depreciation	(529.7)	(540.8)	(543.0)	(550.6)	(535.8)
Closing Capital Base	17,109.8	17,152.9	17,109.1	17,053.5	16,981.3

Source ERA estimates

3.5 Contributions to the revenue requirement

The following building block estimates contribute to the total revenue requirement:

- return on and of capital; and
- operating expenditure.

3.5.1 Return on and of capital

The rate of return applicable for this draft report is 5.02 per cent (real, pre-tax) (see section 2.2.1.4).

The revenue building block provided by applying the rate of return to the capital base is (real 2016) $4,327.2 million for the review period (Table 9). It contributes 43 per cent of the total net cost of service of $10,857.5 million. Metropolitan assets contribute just over half of that amount.

Depreciation of the capital base over the review period is (real 2016) $2,539.7 million (Table 9). That is 23 per cent of the total net cost of service.

Depreciation is based on straight line depreciation of the real $2016 regulatory asset base (Table 8).

Table 9 Return on and of capital, 2018-19 to 2022-23 ($ million nominal, except for last column)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total of the review period (real $2016)
Return on asset	947.3	968.6	982.3	1002.4	1017.8	1032.7	4577.8
Metropolitan	311.1	326.9	341.6	349.3	357.4	345.5	1574.1
Country	401.4	419.7	431.6	451.4	470.0	489.7	2068.1
Depreciation	529.7	556.2	577.5	590.3	609.5	603.7	2686.8
Metropolitan	311.1	326.9	341.6	349.3	357.4	345.5	1574.1
Country	218.6	229.4	236.0	241.1	252.1	258.2	1112.6
Total return on and of the RAB	**1,477.0**	**1,524.9**	**1,559.8**	**1,592.7**	**1,627.3**	**1,636.4**	**7,264.6**

Source ERA estimates

3.5.2 Operating expenditure

Operating expenditure for the Water Corporation includes water and wastewater treatment plant operation (for example, power, chemicals, labour and materials), plant and equipment, administration, salaries, contracted services and overheads.

The ERA has based its forecast the Water Corporation's efficient operating expenditure on the following (see appendices 6 and 8 for more detail):

- The 2015-16 actual operating expenditure is taken as the base year for the operating expenditure forecast, subject to:
  - subtracting operating expenditure incurred in 2015-16 on temporary Operating Implementation Business Cases and non-recurrent Financial Impact Statements;[31]
  - subtracting operating expenditure incurred in 2015-16 on Alliance Contracts;[32] and

[31] Financial Impact Statement operating expenditure captures the impact of capital investment on operating expenditure. Operating Implementation Business Case operating expenditure is expenditure due to a specific project or activity, or due to changes in circumstances – it may fall under the categories 'regulatory', 'growth in service levels', 'non-standard business' or 'other'. Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 37-40.

[32] Alliance Contracts are the Water Corporation's partnerships with the private sector, specifically, the Operations and Maintenance Integrated Alliances for metropolitan service delivery; the Operations and Maintenance Non-Integrated Alliances for operation of metropolitan desalination plants; Capital Alliances for the delivery of capital projects; and the Public Private Partnership for the finance, design, build and operation of the Mundaring Water Treatment Plant. Operating expenditure on Alliance Contracts is

- adding an uplift of $22 million to account for a step change in energy consumption due to increased operation of the Southern Seawater Desalination Plant from 80GL per annum to 102GL per annum.

- The CPI is used as the index to account for the expected increase in base operating expenditure unit costs.

- The Water Corporation's forecasts of connections growth are used to account for the expected increase in base operating expenditure due to growth.

- An efficiency target reducing real base operating expenditure per connection by 2.5 per cent per annum is applied.

- The Water Corporation's forecasts of operating expenditure on Alliance Contracts and regulatory Operating Implementation Business Cases are added to base operating expenditure in each year.[33]

This generates the ERA's recommended nominal operating expenditure forecast (Table 10).

Table 10 ERA recommended operating expenditure ($ million, nominal)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total 2018-19 to 2022-23
ERA recommended	916.0	920.8	921.3	926.7	931.0	941.0	954.3	4,674.3

Note: Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period, and the 'Total' figure in the above table. Total for 2018-19 to 2022-23 may not sum due to rounding. The relatively small increase in operating expenditure from 2017-18 to 2018-19 reflects the Water Corporation's lower forecast of connections growth for 2018-19.

Source: Economic Regulation Authority.

A comparison of the ERA's recommended operating expenditure to the Water Corporation's historic operating expenditure, in real terms ($2005), is shown in Figure 5. The recommended operating expenditure forecast – which reduces in real terms each year – is reflective of an economy characterised by lower population growth and input cost inflation relative to previous inquiries, and the more demanding efficiency target being recommended by the ERA in this inquiry (see the next section below).

subtracted from the base and the Water Corporation's forecast passed directly through to the revenue requirement because Alliance Contracts incorporate their own efficiency targets. Including this operating expenditure in the base – to which the ERA's efficiency target is applied – would result in two sets of efficiency targets being applied to it. Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 45.

[33] Operating expenditure on regulatory Operating Implementation Business Cases is defined by the Water Corporation as "mandatory costs imposed on the Corporation by regulatory bodies (including Department of Environmental Regulation, State Health Department, Australian Drinking Water Guidelines or licence fees imposed by a regulatory body)." Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 38.

Figure 5 Comparison of the ERA's recommended operating expenditure ($2005 million)

Source: Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board,* 23 March 2013, pp. 47-51; [redacted]

The operating expenditure forecast generated by the ERA is different to that provided by the Water Corporation, due to the following:

- Different approaches to generating the forecast — the ERA has not been able to reconcile differences between the operating expenditure forecast generated by the Water Corporation's Macro Budget Model and the operating expenditure forecast included in its Economic Efficiency Model and written submission.[34] The ERA has based its forecast on information included in the Macro Budget Model.

[34] The Macro Budget Model is used for the Water Corporation's annual budgeting process. It adopts a 'budget-on-budget' approach, where budgets for the next year are based on 'base' budget costs from the previous year (after removal of non-recurring items that received temporary funding), adjusted for inflation and efficiency targets. Additional items in the form of impacts from the capital program together with operating business cases for new programs are then added to the extent that they are affordable, i.e. allow for efficiency targets to bet met. The Economic Efficiency Model is used to check that the forecasts of operating expenditure developed by the Macro Budget Model meet the required efficiency targets. A forecast is estimated of what the Macro Budget Model implies for annual non-level of service operating expenditure in 2010-11 dollars, if it was the case that only the 2010-11 customer base was being serviced. The year on year change is then assessed to establish whether the efficiency target is met. Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 34-37; [redacted]

- The ERA has adopted different input assumptions to those assumed by the Water Corporation — including about operating expenditure driven by desalination plant operation and labour.

- The level of the efficiency target applied — whereas the Macro Budget Model applies a 0.5 per cent per annum efficiency target on aggregate operating expenditure, the ERA applies a 2.5 per cent per annum efficiency target, on a per connection basis.[35] The ERA's efficiency target translates to approximately a 0.75 per cent per annum efficiency target applied to aggregate operating expenditure.

The rationale for the ERA's input assumptions is set out in detail in appendix 8.

3.5.2.1 Efficiency targets

The terms of reference require the ERA to consider the efficient costs of providing services, including with reference to operating efficiency targets appropriate for the growth scenarios expected over the review period.

The aim of an operating efficiency target is to encourage the water business to reduce its real operating expenditure per connection, while maintaining or improving service levels to customers. The savings in operating expenditures should result in lower tariffs charged to consumers.

The level of connections growth expected over the review period is important, because it affects aggregate operating expenditure and hence the size of the efficiencies that can be derived, due to economies of scale. The growth scenarios expected over the review period for each water business, and a comparison to the growth scenarios assumed in previous inquiries, are summarised in Table 11. Growth for the Water Corporation and Aqwest is expected to be lower for the coming period, compared to previous periods, suggesting the prospects of deriving efficiencies from economies of scale may be somewhat reduced compared to those previous periods. Growth is expected to be higher for Busselton Water than in the 2012 inquiry.

Table 11 Assumed average customer connections growth over the review period

	2004 inquiry	2008 inquiry	2012 inquiry	Current inquiry
	Per cent per annum			
Water Corporation (metro)	2.3	2.4	2.2	1.9
Water Corporation (country)	N/A	3.2	1.7	1.1
Aqwest	2.7	2.5	2.0	1.5
Busselton Water	3.7	3.4	1.4	2.6

Source: Economic Regulation Authority, *Final Report on the Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, pp. 82, 121 & 154; Economic Regulation Authority, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Final Report*, 16 September 2009, p. 128; Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board Revised Final Report*, 28 March 2013, p. 40; Aqwest, *Submission to ERA Issues Paper 2012*, 4 May 2012, p. 16; Busselton Water, *Submission to ERA Issues Paper 2012*, 4 May 2012, p. 5; Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 42; [redacted]

[35] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 35.

[redacted]; Cardno, *Review of capital and operating expenditure plans for Busselton Water, Report prepared for the ERA,* August 2017, p. 15.

Since 2005, the ERA has recommended that the Water Corporation's tariffs be set assuming the Water Corporation can reduce its real base operating costs per connection by an annual efficiency target. 'Base operating costs' maintain levels of services to customers, consistent with existing service standards.

In addition to base operating expenditure, the Water Corporation incurs operating expenditure to meet newly imposed standards or requirements. The ERA has not previously recommended that an efficiency target be applied to this operating expenditure.

The ERA's detailed considerations – of what operating expenditure the efficiency target should apply to, and what the level of the target should be – are set out in detail in appendix 6. The ERA is recommending that a target reduction in real operating expenditure per connection of 2.5 per cent per annum be applied. The target would be applied to all operating expenditure except for the following:

- Operating expenditure on agreements with private sector entities that already incorporate efficiency targets, specifically, the Water Corporation's Alliance Contracts. These include:
  - the Operations and Maintenance Integrated Alliances for metropolitan service delivery;
  - the Operations and Maintenance Non-Integrated Alliances for the operation of metropolitan desalination plants;
  - Capital Alliances for the delivery of capital projects; and
  - the Public Private Partnership for operation of the Mundaring Water Treatment Plant.[36]
- Operating expenditure that the Water Corporation has no authority to change ('non-controllable' operating expenditure) – in particular, operating expenditure on regulatory Operating Implementation Business Cases.

The efficiency target could preclude operating expenditure on unexpected events from being recovered. However, the ERA's recommended approach to managing material variations (set out in chapter 7) would allow for consideration of whether the additional unexpected costs should be recovered.

The ERA's approach contrasts with that applied by the Water Corporation in its operating expenditure models:

- In the Macro Budget Model, nominal base operating expenditure is reduced by 0.5 per cent each year, prior to forecast Financial Impact Statement and Operating Implementation Business Case operating expenditure being added to base operating expenditure.[37]

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[36] These contracts include a [redacted] Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 45. [redacted]

[37] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 35. Assuming inflation of 1.79 per cent, this allows nominal base operating expenditure to increase by around 1.3 per

- In the Economic Efficiency Model, the proportion of the Macro Budget Model's forecast of total operating expenditure that is non-level of service is calculated.[38] The '2010-11 equivalent' forecast of non-level of service operating expenditure is then compared against a target of a 2 per cent reduction in real operating costs per property per annum, as well as any other efficiency dividend requirements set by the State Government.

The ERA's recommendations result in 85 per cent of the Water Corporation's operating expenditure over the period 2018-19 to 2022-23 being subject to the efficiency target. The remaining 15 per cent of the Water Corporation's operating expenditure is passed directly through to the revenue requirement. This compares to the 70 per cent of operating expenditure classified as non-level of service and assessed against the efficiency target under the Economic Efficiency Model.

Table 12 summarises the ERA's recommended operating expenditure, in light of the above recommendations.

Table 12 The ERA's recommended operating expenditure ($ million, nominal)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Base operating expenditure	766.4	773.4	780.2	787.4	795.3	803.9	812.6	3,979.4
Efficient contracts	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Non-controllable	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	916.0	920.8	921.2	926.7	931.0	941.0	954.3	4,674.3

Note: Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period, and the 'Total' figure in the above table. Total for 2018-19 to 2022-23 may not sum due to rounding.

Source: Economic Regulation Authority.

cent per year, and real operating expenditure is reduced by 0.5 per cent per year. With connections forecast to grow at 1.8 per cent per year, this implicitly suggests a reduction in real operating costs per connection of 2.25 per cent per annum, for the expenditures included prior to any additions. As the additions are not subject to efficiency targets, this reduces the Water Corporation's overall efficiency proposal on a per connection basis to below 2.25 per cent per annum.

Financial Impact Statement operating expenditure is that associated with capital projects, and includes projects driven by supply/demand, base capital maintenance, enhanced service, or quality and standards. Operating Implementation Business Case operating expenditure is that due to a specific project or activity, or due to changes in circumstances, and includes operating expenditure driven by regulatory, growth, non-standard business or 'other' circumstances. Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 27; 37-38; 40.

[38] Level of service, 'Reimbursement Projects' and 'Contestable Business' operating expenditure is excluded from the assessment. [redacted] Level of service operating expenditure is defined by the Water Corporation as including expenditure on improving service levels, regulatory or externally imposed requirements, expenditure driven by Ministerial requirements or expenditure justified by Net Present Value considerations. Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 34.

3.6 Other factors affecting efficient costs

3.6.1 Service standards

The ERA is required to consider the Water Corporation's efficient costs of providing services, including with reference to the resources necessary to meet its service standards. Appendix 6 of this report outlines the general considerations given to service standards that are applicable to the Water Corporation, Aqwest and Busselton Water, including:

- service standard terminology;
- the water licensing regime and licence requirements;
- the *Water Services Code of Conduct* and current review of this code; and
- service standards performance data.

The remainder of this section focuses on the evaluation of the impact of service standards on the efficient costs of the Water Corporation.

3.6.1.1 Water Corporation licence requirements

The ERA administers the licensing regime set out in the *Water Services Act 2012* (**Water Act**). The ERA first issued the Water Corporation's water licence in June 1996. The Water Corporation is licenced to provide potable water supply, non-potable water supply, sewerage, drainage and irrigation services. Schedule 2 of the Water Corporation's licence outlines the individual performance standards that are applicable to it.[39] These individual standards cover:

- Potable water
  - Minimum and maximum static pressure standards for the Perth metropolitan and country urban areas
  - Minimum flow standards for the Perth metropolitan and country urban areas
- Drainage
  - Standards (and targets) for the design of new urban infrastructure
  - Standards (and targets) for flood protection works
- Irrigation
  - Standards for irrigation water quality
  - Standards (and targets) for minimum notice requirements of a planned interruption
- Farmlands
  - Standards (and targets) for the annual notification of the conditions of service
  - Maximum static pressure standards (and targets) for farmland services supplied from the: (1) Goldfields and Agriculture Water Supply, the Great Southern Town Water Supply Scheme and Mid-West Region; and (2) rural water supply schemes

[39] Economic Regulation Authority, *Water Services Licence: Water Corporation (WL32, Version 15)*, 19 July 2016.

- Minimum flow standards (and targets) for farmland services supplied from the: (1) Goldfields and Agriculture Water Supply, the Great Southern Town Water Supply Scheme and Mid-West Region; and (2) rural water supply schemes

3.6.1.2 Compliance with licence requirements

Licence terms and conditions require the Water Corporation to have an independent operational audit conducted at least every two years. An independent review of its asset management system must also occur at least every two years. The processes aim to verify the Water Corporation's compliance with its licence obligations (including service standards) and ensure the assets that are used to provide licenced water services are being properly maintained. The results of the Water Corporation's most recent operational audit and asset management review, which both cover the period 1 July 2012 to 30 June 2015 (36 months), are as follows.

- The independent operational audit, conducted in October 2015, found the Water Corporation had demonstrated an adequate level of compliance with its licence obligations.[40] The audit covered licence obligations under the previous *Water Services Licensing Act 1995* and current Water Act.
- The independent asset management review, conducted in February 2016, found that the Water Corporation had an effective asset management system, except for 'operational contingency planning'.[41] Improvements were deemed necessary to meet the required licence standard. The ERA requested the Water Corporation take action to test and update operational contingency plans in its post-review implementation plan.
- Based on the Water Corporation's operational audit and asset management review results, the ERA decided to retain a 36 month reporting schedule, meaning that the next audit and review will cover the period 1 July 2015 to 30 June 2018.[42]

The ERA is of the view that the Water Corporation's ongoing performance and compliance should not deviate significantly from historical results. This view is based on the post-audit and post-review implementation plans which are now in place. These aim to identify, monitor and deal with any areas of concern. The ERA considers these plans are thorough and will ensure the Water Corporation continues to perform at a satisfactory level.

The ERA's *Water, Sewerage and Irrigation Performance Report* for 2015-16 examines the service levels provided to customers over time.[43] It finds that the performance of large water service providers remains satisfactory. The ERA does note that some reported performance measures – such as the average frequency of unplanned interruptions and duration of supply interruptions – show a decline in service performance compared with the previous reporting period. Changes to reporting methodologies and isolated events are thought to have contributed to this change in service performance.

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[40] Economic Regulation Authority, *Notice – Water Corporation 2015 Operational Audit*, 18 December 2015.

[41] Economic Regulation Authority, *Notice – Water Corporation 2015 Asset Management System Review*, 1 April 2016.
Contingency planning comprises "incident planning" (covering major or serious incidents) and "operational contingency planning" (covering minor short-term disruptions of normal asset operations).

[42] The Water Corporation is required to provide its relevant reports to the ERA by 30 September 2018.

[43] Economic Regulation Authority, *2015-16 Water, Sewerage and Irrigation Performance Report*, May 2017.

3.6.1.3 *Customer service and engagement*

The Water Corporation's performance in areas relating to customer service standards is consistent with (and in some instances better than) the performance of other comparable water utilities nationally. The Bureau of Meteorology's 2015-16 national performance report for urban utilities[44] shows the Water Corporation reported:

- The lowest number of complaints per 1,000 properties (0.8), significantly lower than the results for any other major urban centre with more than 100,000 customers (Gold Coast had the highest rate at 6.3).
- A 12 per cent increase in the average duration of unplanned interruptions to its water supply (from 96 to 108 minutes). Even with this increase the Water Corporation's performance is considered by the ERA to be satisfactory given the lowest and highest average durations reported nationally were 81 (South East Water, VIC) and 198 (Central Coast Council, NSW) minutes respectively. The national median was reported to be 134 minutes.
- 71 per cent of calls (to its customer call centre) were answered by an operator within 30 seconds, which approaches the national median (of 79%). The highest and lowest percentage of calls answered nationally within 30 seconds were recorded by Tasmanian Water and Sewerage Corporation (88.5%) and Yarra Valley Water, Victoria (47%) respectively.

Given the Water Corporation's most recent reported performances, the ERA considers the Water Corporation is providing its water services in accordance with the terms and conditions of its licence. The ERA notes the Water Corporation's performance is consistent with the performance of other comparable water utilities within Australia.

The Water Corporation has indicated that going forward it intends to focus on its customer engagement to better understand what its customers value. The Water Corporation's customer engagement project – *Tap-In* – will help achieve this.[45]

Regarding its licencing framework and performance, the Water Corporation has acknowledged 'that outside of the few service standards prescribed in [its] Water Services Licence, there is not one set of overarching service standards by which the [Water] Corporation provides services'.[46] The Water Corporation has suggested that it may be beneficial to generally reconsider service standards to provide more specific guidance on the application of such standards, which it considers is needed within the water industry.[47]

[redacted]

[redacted]

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44 Bureau of Meteorology, *National performance report 2015-16: urban water utilities: Part A*, March 2017.

45 Water Corporation, *Tap-In,* [website], 2017,http://yoursay.watercorporation.com.au/tap-in (accessed August 2017).

46 Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 4.

47 Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 75.

[redacted]

A review of, and the provision of guidance on, service standards applicable to the water industry is beyond the scope of this inquiry. Nonetheless, any such review should involve representation from key water industry stakeholders, including customers. The Water Corporation's current work in the area of customer engagement may be of benefit to future inquiries into efficient costs and tariffs.[48]

3.6.1.4 Drainage service standards

In a submission to the ERA, Stormwater WA suggest a need to reconsider the service standards relating to drainage.[49] Specifically:

> … there is a requirement to redefine the service standards for drainage and clearly define the split of responsibilities between state government entities, local government and the Water Corporation before the costs of delivering that service to the community can be determined and how those costs are split between the delivery organisation.

The drainage service standards within the Water Corporation's operating licence includes a measurable standard for the 'design of new urban infrastructure', where 100 per cent of the schemes audited must comply with the standard.

In setting (and complying with) this standard, regard has been (and should be) given to the Institution of Engineers Australia publication *Australian Rainfall and Runoff (1987)*. New rural drainage infrastructure must comply with the *Rural Drainage Manual of Standards (1977)*. A further measurable standard for flood protection works, for Preston River levees and Vasse River diversion, is also specified.

Given Stormwater WA's submission and the Water Corporation's current water licence, there is a need to communicate the governance and operational arrangements for drainage assets and services (and any associated service standards) so that drainage customers fully understand the service they are receiving (or not receiving). For the Water Corporation, the *Tap In* project provides opportunity to engage customers on this topic.

The ERA considers the review and setting of specific drainage service standards and governance arrangements to be beyond the scope of this inquiry.[50]

3.6.1.5 Conclusions

The ERA is of the view that the Water Corporation is meeting its current service standards and that its resources are being effectively allocated and used efficiently in this context.

The ERA is not aware of any evidence that would suggest that the costs of meeting the current service standards are disproportionate to the benefits.

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[48] The Essential Services Commission (VIC), Essential Services Commission of South Australia and Independent Pricing and Regulatory Tribunal (NSW) all require the water pricing submissions of their respective regulated water businesses to demonstrate the level of customer engagement undertaken and how it has impacted on the business' pricing submission.

[49] Stormwater WA, *Inquiry into the efficient costs of tariffs of the Water Corporation, Aqwest and Busselton Water – Submission by Stormwater Western Australia*, 20 January 2017.

[50] The ERA is tasked to examine the impact on the efficient costs of the Water Corporation of the resources necessary to meet the existing service standards.

3.6.2 Environmental and health regulations

The ERA is required to consider the Water Corporation's efficient costs of providing services, including with reference to the impact of environmental and health regulations on efficient costs. Appendix 6 details the ERA's findings.

The impact of environmental and health regulations on efficient costs is not clear. A lack of information has hampered the quantification of the cost impacts of any inefficiencies. Instead, the ERA has evaluated the processes in place to maintain environmental and health regulations.

The requirements that apply for potable water are clearly defined, such that the Water Corporation has a good understanding of its obligations. Specifically, the *Memorandum of Understanding for drinking water* (**MOU**) between the Water Corporation and Department of Health (WA), appears to be an effective and efficient way to meet the primary health conditions in place. The Water Corporation submits that:[51]

> There are specific conditions around recycled water disposal and reuse set out in the Memorandum of Understanding with the Department of Health. These conditions have enabled the [Water] Corporation to establish recycled water processes to assist with deferring forecast capital and operational expenditure in this portfolio.

However, there may be some inefficient costs arising in the processes required to meet environmental regulations. Unlike for health, there is no MOU in place to outline and assist compliance with environmental regulations. The absence of an MOU may contribute to the Water Corporation's uncertainty about specific environmental outcomes required, and the roles and responsibilities involved for achieving them. A clearer approach – that better documents the processes, requirements and timeframes for meeting environmental regulations – may reduce costs and improve efficiencies.

Processes for achieving environmental approvals for wastewater provide a specific example. While the current governance arrangements concerning environmental regulations for wastewater treatment appear to be achieving their intended purpose, the arrangements may be less than optimal.[52] There is some anecdotal evidence that further improvements should be sought to clarify and simplify environmental regulations. Specifically, while the (former) Department of Environmental Regulation sought to address process issues concerning its assessment (and licensing) of wastewater treatment plants (see appendix 6), a lack of clarity regarding the requirements for compliance remains.

Recommendation or finding

The current implementation of environmental regulations for wastewater treatment could be improved. Clearly prescribed processes and compliance frameworks will reduce uncertainty for the Water Corporation, allow better allocation of its resources, and reduce its costs.

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[51] Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 17.

[52] Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017 [redacted] and Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, July 2017.

4 The efficient costs and revenue of Aqwest

This chapter presents the ERA's analysis and recommendations of the efficient costs and revenues of Aqwest, based on the methodology described in chapter 2. The evaluation is informed by data and other written material provided by Aqwest.

4.1 Total revenue requirement

The total of efficient costs over the five year review period 2018-19 to 2022-23, and hence the total efficient revenue requirement for Aqwest, is estimated to be 2016$ 73.7 million (Table 13).

Table 13 Total Revenue Requirement Forecasts for Aqwest ($ million nominal, except last column)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total of the 5 year review period (real $2016)
Return on asset	2.720	3.207	3.740	3.874	3.974	4.225	17.373
Depreciation	1.803	2.153	2.566	2.721	2.854	3.115	12.239
Operating expenditure	9.412	9.485	9.559	9.633	9.707	9.782	44.079
Total	**13.935**	**14.845**	**15.864**	**16.228**	**16.535**	**17.123**	**73.690**

Source ERA estimates

Recommendation or finding

The efficient revenue requirement for Aqwest is estimated to be $73.7 million (real undiscounted dollars at 30 June 2016) over the five year period commencing 1 July 2018.

4.2 Demand

The estimate of efficient costs and revenue for Aqwest is based on the ERA's forecast demand growth over the review period averaging just less than 1.0 per cent (Table 14). The detail of the ERA's forecast method is set out in Appendix 5.

Table 14 Aqwest - demand growth (per cent)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Growth in number of customers							
Residential	0.87%	1.88%	1.88%	1.88%	1.88%	1.88%	1.88%
Non-residential	0.83%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%
Growth in demand							
Residential	2.16%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Non-residential	-1.02%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%
Total	0.98%	0.98%	0.98%	0.98%	0.98%	0.98%	0.98%

Source ERA estimates

4.3 Capital expenditure

The ERA has assessed the capital expenditure expected to be incurred prior to the inquiry period, in order to establish the opening capital base. The ERA has also reviewed Aqwest's forecast capital expenditure expected to be incurred during the inquiry period. The ERA's review is to ensure that only prudent and efficient capital expenditure is included in the capital base, for the purpose of determining the return on investment and allowances for depreciation (see appendix 7 for detail).

4.3.1 Past Capital Expenditure

The ERA has reviewed Aqwest's capital expenditure between 2011-12 and 2015-16. The review has been undertaken based on a sample of projects. The ERA has not recommended any adjustments to Aqwest's capital expenditure during this period.

The ERA's recommended capital expenditure to be included in the Aqwest's asset base for 2011-12 to 2015-16 is shown in Table 15.

Table 15 ERA's Assessment of Capital Expenditure 2011-12 to 2015-16 (Real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16
Recommended capital expenditure	3.897	3.525	2.743	1.995	1.830

Source: ERA Calculations

Recommendation or finding

Aqwest's past capital expenditure has been found to be prudent and efficient. As a result, $13.991 million (real dollars at 30 June 2016) has been included in Aqwest's asset base over the five year period between 2011-12 and 2015 16.

4.3.2 Forecast Capital Expenditure

The ERA has reviewed the Aqwest's forecast capital expenditure between 2016-17 and 2022-23. The review has been undertaken based on a sample number of projects. The ERA has recommended a reduction to Aqwest's estimated capital expenditure between 2016-17 and 2022-23. The reduction is a result of applying a continuing capital expenditure efficiency of 0.25 per cent per year. The ERA recommended capital expenditure is shown in Table 16.

Table 16 ERA's Assessment of Capital Expenditure 2016-17 to 2022-23 (Real $ millions at 30 June 2016)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Recommended Capital Expenditure	3.531	10.165	11.022	3.738	3.152	5.865	2.026

Source: ERA Calculations

Recommendation or finding

The prudent and efficient capital expenditure that is included in Aqwest's projected asset base is $39.497 million (real dollars at 30 June 2016) over the seven year period between 2016-17 and 2022-23.

4.4 Inquiry asset base

As set out in section 2.2.1, the ERA maintains consistency with its standard regulatory 'roll-forward' methodology. The ERA has determined that the appropriate inquiry asset base is $43.673 million for 1 July 2011. This value is consistent with the value from the ERA's 2013 inquiry and ensures consistency across inquiries.

4.4.1 Roll forward of asset base to 30 June 2018

The opening value of Aqwest's asset base for the purposes of this inquiry is $60.622 million (real dollars at 30 June 2016). The asset base has been rolled forward from the beginning of 2011-12, as the ERA had incorporated actual capital expenditure and recommended depreciation amounts prior to this in past inquiries.

As noted in the previous section, the actual capital expenditure incurred by Aqwest up to 2017-18 has not been adjusted. All capital expenditure included in the inquiry asset base excludes gifted assets and cash contributions for assets. These capital contributions must be excluded to avoid customers being charged through tariffs for assets that have already being funded.

The depreciation amounts for 2011-12 to 2015-16 are the depreciation values that were used to determine recommended tariffs for the last inquiry. These depreciation values were based on the forecast capital base at that time. The ERA has used its calculation of forecast depreciation for 2016-17 and 2017-18 as the recommended tariffs of the previous inquiry did not include these years.

The ERA has removed assets sold or disposed from the inquiry asset base as provided by Aqwest.

The ERA's 'roll forward' Aqwest inquiry asset base to 30 June 2018 is shown in Table 17.

Table 17 ERA's Assessment of Aqwest's Opening Capital Base (Real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Opening Capital Base	43.673	46.451	48.666	49.977	50.252	50.387	52.298
Capital Expenditure	3.897	3.525	2.743	1.995	1.830	3.531	10.165
Depreciation	(1.061)	(1.192)	(1.388)	(1.538)	(1.591)	(1.521)	(1.740)
Assets Sold/Disposed	(0.059)	(0.118)	(0.044)	(0.182)	(0.104)	(0.099)	(0.100)
Closing Capital Base	46.451	48.666	49.977	50.252	50.387	52.298	60.622
Opening Capital Base at 1 July 2018							**60.622**

Source ERA Calculations

4.4.2 Forecast capital base

The ERA's forecast inquiry capital base for Aqwest is shown in Table 18. The forecast capital base includes the ERA's recommended capital expenditure (excluding capital contributions) for Aqwest. The ERA has determined the calculation of depreciation by using its recommended asset values applied to Aqwest's asset base model to determine depreciation based on asset lives for each asset.

Table 18 ERA's Assessment of Aqwest's Forecast Capital Base (Real $ millions at 30 June 2016)

	2018-19	2019-20	2020-21	2021-22	2022-23
Opening Capital Base	60.622	69.500	70.743	71.299	74.493
Capital Expenditure	11.022	3.738	3.152	5.865	2.026
Depreciation	(2.044)	(2.394)	(2.496)	(2.572)	(2.759)
Assets Sold/Disposed	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)
Closing Capital Base	69.500	70.743	71.299	74.493	73.660

Source ERA Calculations

4.5 Contributions to the revenue requirement

The estimate of efficient costs, and hence efficient revenue, is comprised of allowances for:

- the return on capital (incorporating a margin to cover statutory tax payments);
- depreciation, or the return *of* capital; and
- operating expenditure.

4.5.1 Return on capital

The ERA's estimate of the real pre-tax WACC for the review period is 5.02 per cent (see section 2.2.1.4). It is applied to Aqwest's estimated efficient capital base (Table 18), for the purpose of determining the return on capital building block.

The resulting total return on capital for the review period 2018-19 to 2022-23 is 2016$ 17.4 million (Table 13). That is 23 per cent of the estimate of total efficient costs over the review period.

4.5.2 Depreciation

The depreciation allowance is calculated based on real straight line depreciation of the efficient capital base. This is consistent with the standard current cost accounting approach applied for the ERA's other regulatory decisions.

The total depreciation for the review period 2018-19 to 2022-23 is 2016$ 12,2 million (Table 13). That is 17 per cent of the estimate of total efficient costs over the review period.

4.5.3 Operating expenditure

The ERA has based its forecast of Aqwest's efficient operating expenditure on the following:

- The 2016-17 actual operating expenditure is taken as the base year for the operating expenditure forecast.

- The CPI is used as the index to account for the expected increase in base operating expenditure unit costs.
- ERA forecasts of connections growth (Table 14) are used to account for the expected increase in base operating expenditure due to growth.
- An efficiency target of reducing real base operating expenditure per connection by 2.5 per cent per annum is applied.

This generates the ERA's recommended nominal operating expenditure forecast (Table 19).

Table 19 ERA recommended operating expenditure ($ million, nominal)

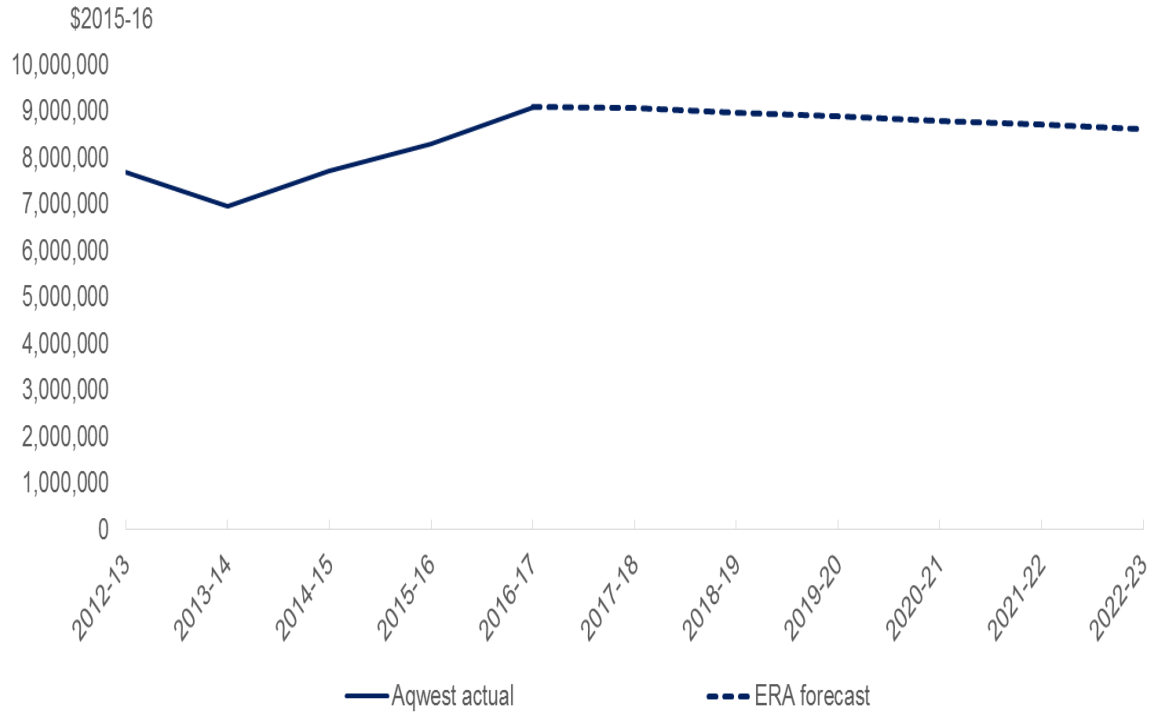
	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total 2018-19 to 2022-23
ERA recommended	9.340	9.412	9.485	9.559	9.633	9.707	9.782	48.165

Note: Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period, and the 'Total' figure in the above table. Total for 2018-19 to 2022-23 may not sum due to rounding.

Source: Economic Regulation Authority.

A comparison of the ERA's recommended operating expenditure to Aqwest's historic operating expenditure, in real terms ($2015-16), is shown in Figure 6. The recommended operating expenditure forecast – which reduces in real terms each year – is reflective of an economy characterised by lower population growth and input cost inflation relative to previous inquiries, and an efficiency target being recommended by the ERA in this inquiry.

Figure 6 Comparison of the ERA's recommended operating expenditure ($2015-16)



Source: [redacted]

The ERA has not recommended operating efficiency targets for Aqwest in previous inquiries. The efficiency of projected operating expenditure has simply been reviewed as part of the price determination process. However, since the last inquiry, Aqwest has become a statutory corporation. The ERA has therefore again considered whether an operating efficiency target for Aqwest is appropriate, given the role that corporatisation can play in increasing efficiency by introducing market-based objectives for managers.

For this inquiry, the ERA is recommending that a target reduction in real operating expenditure per connection of 2.5 per cent per annum be applied to all operating expenditure.

Aqwest does not provide specific submissions about operating efficiency targets. However, it requests that a framework be developed by the ERA to assist in times when material changes occur to operating or capital expenditure and revenue, including allowing for an impact on operating efficiency targets. This issue is considered in chapter 7 and appendix 11. Broadly however, where the ERA's recommended efficiency target would preclude operating expenditure on unexpected events from being recovered, the ERA's recommended approach to managing material variations would allow for consideration of whether the additional unexpected costs can be recovered during the review period.

The rationale for the ERA's operating expenditure input assumptions is set out in detail in appendices 6 and 8.

4.6 Other factors affecting efficient costs

4.6.1 Service standards

The ERA is required to consider Aqwest's efficient costs of providing services, including with reference to the resources necessary to meet its service standards. Appendix 6 of this report outlines the general considerations given to service standards that are applicable to Aqwest, Busselton Water and the Water Corporation, including:

- service standard terminology;
- the water licensing regime and licence requirements;
- the *Water Services Code of Conduct* and current review of this code; and
- service standards performance data.

The remainder of this section focuses on considerations applicable to Aqwest.

4.6.1.1 Aqwest licence requirements

The ERA administers the licensing regime set out in the *Water Services Act 2012* (**Water Act**). The ERA first issued Aqwest's water licence in January 1997. Aqwest is licenced to provide potable water supply services. Schedule 2 of Aqwest's licence outlines the individual performance standards that are applicable to it.[53] These individual standards include minimum and maximum static pressure standards and minimum flow standards for the delivery of potable water.

4.6.1.2 Compliance with licence requirements

As part of its licence terms and conditions, Aqwest must have an independent operational audit conducted at least every two years. An independent review of its asset management system must also occur at least every two years. The purpose of these requirements is to verify Aqwest's actual compliance with its licence obligations (including service standards) and to ensure its assets that are used to provide licenced water services are being properly maintained. The ERA has reconsidered the results of Aqwest's latest operational audit and asset management review, which both cover the period 1 October 2010 to 30 September 2013 (36 months).

- At the time the independent audit and review were completed (December 2013), the ERA concluded that Aqwest was maintaining a high level of compliance with its water licence and was also maintaining an effective asset management system.
- Based on Aqwest's performance, the ERA decided to increase Aqwest's reporting schedule from 36 to 48 months, meaning that the next audit and review will cover the period 1 October 2013 to 30 September 2017.[54]

The ERA is of the view that Aqwest's ongoing performance and compliance should not deviate significantly from its historical results, noting that:

- Aqwest received the highest compliance rating (of 5) for all of its licence obligations and the highest effectiveness rating (of A1) for its asset management system; and

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[53] Economic Regulation Authority, *Water Services Licence: Aqwest WL2: Version 9*, 1 July 2016.

[54] Aqwest is required to provide its relevant reports to the ERA by 31 December 2017.

- all recommendations from the previous audit and review have been addressed, with no new recommendations made in relation to the latest audit and review.

The ERA's *Water, Sewerage and Irrigation Performance Report* for 2015-16 supports the ERA's view with regards to Aqwest's ongoing expected performance.[55] The report, which focuses on examining the service levels provided to customers over time, indicates that the performance of large water service providers remains satisfactory. The ERA does note that some reported performance measures, such as the average frequency of unplanned interruptions and duration of supply interruptions, show a decline in service performance when compared with the previous reporting period. Changes to reporting methodologies and isolated events are thought to have contributed to this change in service performance.

4.6.1.3 Conclusions

Considering Aqwest's performance, the ERA concludes that Aqwest has the resources necessary to meet and maintain existing service standards at current levels, and that these resources are being appropriately allocated and represent an efficient use of costs.

4.6.2 Environmental and health regulations

The ERA is required to consider Aqwest's efficient costs of providing services, including with reference to the impact of environmental and health regulations on efficient costs. Appendix 6 of this report details the considerations given by the ERA, which cover:

- the legislative framework for environmental and health regulations; and
- the key health and environmental regulations that apply.

In summary, the ERA considers the effects of environmental and health regulations on efficient costs to be varied. The ERA is unable to quantify the effects of any inefficiencies because of limited information. The ERA has instead focused its considerations on the procedures and processes in place to meet and maintain environmental and health regulations and whether this represents and efficient use of resources.

The health regulations that apply for potable water and Aqwest's understanding of their obligations concerning these regulations appear to be well established. In particular, the *Memorandum of Understanding for drinking water* (**MOU**) between Aqwest and Department of Health (WA), appears to be an effective and efficient way to meet the primary health regulations in place.

As Aqwest does not provide wastewater services, the impacts of environment regulations do not impose any unreasonable costs.

[55] Economic Regulation Authority, *2015-16 Water, Sewerage and Irrigation Report*, May 2017.

5 The efficient costs and revenue of Busselton Water

This chapter presents the ERA's analysis and recommendations of the efficient costs and revenues of Busselton Water, based on the methodology described in chapter 2. The evaluation is informed by the written material and data provided by Busselton Water.

5.1 Total revenue requirement

The total of efficient costs over the five year review period 2018-19 to 2022-23, and hence the total efficient revenue requirement for Busselton Water, is estimated to be 2016$ 48.5 million (Table 20).

Table 20 Total Revenue Requirement Forecasts for Busselton Water ($ million nominal, except last column)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total of the 5 year review period (real $2016)
Return on asset	1.618	1.636	1.659	1.708	1.789	1.868	7.918
Depreciation	1.315	1.426	1.576	1.786	2.020	2.209	8.223
Operating expenditure	6.696	6.821	6.948	7.078	7.210	7.344	32.386
Total	**9.629**	**9.884**	**10.184**	**10.572**	**11.019**	**11.422**	**48.527**

Source ERA estimates

Recommendation or finding

The efficient revenue requirement for Busselton Water is estimated to be $48.5 million (real undiscounted dollars at 30 June 2016) over the five year period commencing 1 July 2018.

5.2 Demand

The estimate of efficient costs and revenue for Busselton Water is based on the ERA's forecast demand growth for the review period averaging just under 2.0 per cent (Table 21). The detail of the ERA's forecast method is set out in Appendix 5.

Table 21 Busselton Water - demand growth (per cent)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Growth in number of customers							
Residential	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%
Non-residential	1.62%	1.62%	1.62%	1.62%	1.62%	1.62%	1.62%
Growth in demand							
Residential	1.70%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
Non-residential	1.70%	1.51%	1.51%	1.51%	1.51%	1.51%	1.51%
Total	1.70%	1.97%	1.97%	1.97%	1.97%	1.97%	1.97%

Source ERA

5.3 Capital expenditure

The ERA has assessed the capital expenditure expected to be incurred prior to the inquiry period, in order to establish the opening capital base. The ERA has also reviewed Busselton Water's forecast capital expenditure expected to be incurred during the inquiry period. The ERA's review is to ensure that only prudent and efficient capital expenditure is included in the capital base, for the purpose of determining the return on investment and allowances for depreciation (see appendix 7 for detail).

5.3.1 Past Capital Expenditure

The ERA has reviewed Busselton Water's actual capital expenditure between 2011-12 and 2015-16. The review has been undertaken based on a sample number of projects. The ERA has not recommended any adjustments to Busselton Water's capital expenditure during this period.

The ERA's recommended capital expenditure to be included in the Busselton Water's asset base for 2011-12 to 2015-16 is shown in Table 22.

Table 22 ERA's Assessment of Capital Expenditure 2011-12 to 2015-16 (Real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16
Recommended Capital Expenditure	4.924	0.569	0.427	1.279	0.977

Source: ERA Calculations

Recommendation or finding

Busselton Water's past capital expenditure has been found to be prudent and efficient. As a result, $8.175 million (real dollars at 30 June 2016) has been included in Busselton Water's asset base over the five year period between 2011-12 and 2015 16.

5.3.2 Forecast Capital Expenditure

The ERA has reviewed the Busselton Water's forecast capital expenditure between 2016-17 and 2022-23. The review has been undertaken based on a sample of projects. The ERA had reduced Busselton Water's estimated capital expenditure between 2016-17 and 2022-23. The reduction is a result of applying a continuing capital expenditure efficiency of 0.25 per cent per year. The ERA's recommended capital expenditure is shown in Table 23.

Table 23 ERA's Assessment of Capital Expenditure 2016-17 to 2022-23 (Real $ millions at 30 June 2016)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Recommended capital expenditure	1.428	1.129	1.276	1.807	2.539	2.648	2.508

Source: ERA Calculations

Recommendation or finding

The prudent and efficient capital expenditure that is included in Busselton Water's projected asset base is $13.335 million (real dollars at 30 June 2016) over the seven year period between 2016-17 and 2022-23.

5.4 Inquiry asset value

As set out in section 2.2.1, the ERA maintains consistency with its standard regulatory 'roll-forward' methodology. The ERA has determined that the appropriate inquiry asset base is $30.303 million for 1 July 2011. This value is consistent with the value from the ERA's 2013 inquiry and ensures consistency across inquiries.

5.4.1 Roll forward of asset base to 30 June 2018

The opening value of Busselton Water's asset base for the purposes of this inquiry is $30.868 million (real dollars at 30 June 2016). The asset base has been rolled forward from

the beginning of 2011-12, as the ERA had incorporated actual capital expenditure and recommended depreciation amounts prior to this in past inquiries.

As noted in the previous section, the actual capital expenditure incurred by Busselton Water up to 2017-18 has not been adjusted. All capital expenditure included in the inquiry asset base excludes gifted assets and cash contributions for assets. These capital contributions must be excluded to avoid customers being charged through tariffs for assets that have already being funded.

The depreciation amounts for 2011-12 to 2015-16 are the depreciation values that were used to determine recommended tariffs for the last inquiry. These depreciation values were based on the forecast capital base at that time. The ERA has used its calculation of forecast depreciation for 2016-17 and 2017-18 as the recommended tariffs of the previous inquiry did not include these years.

The ERA's 'roll forward' Busselton Water inquiry asset base to 30 June 2018 is shown in Table 24.

Table 24 ERA's Assessment of Busselton Water's Opening Capital Base (Real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Opening Capital Base	30.303	33.998	32.049	31.375	31.198	30.868	31.104
Capital Expenditure	4.924	0.569	0.427	1.279	0.977	1.428	1.129
Depreciation	(0.704)	(0.958)	(1.008)	(1.136)	(1.208)	(1.191)	(1.269)
Asset Sold/Disposed	(0.525)	(1.559)	(0.093)	(0.320)	(0.100)	0.000	(0.056)
Closing Capital Base	33.998	32.049	31.375	31.198	30.868	31.104	30.909
Opening Capital Base at 1 July 2018							**30.909**

Source ERA estimates

5.4.2 Forecast capital base

The ERA's forecast inquiry capital base for Busselton Water is shown in Table 25. The forecast capital base includes the ERA's recommended capital expenditure (excluding capital contributions) for Busselton Water. The ERA has determined the calculation of depreciation by using its recommended asset values applied to Busselton Water's asset base model to determine depreciation based on asset lives for each asset.

Table 25 ERA's Assessment of Busselton Water's Forecast Capital Base (Real $ millions at 30 June 2016)

	2018-19	2019-20	2020-21	2021-22	2022-23
Opening Capital Base	30.909	30.792	31.130	32.035	32.866
Capital Expenditure	1.276	1.807	2.539	2.648	2.508
Depreciation	(1.352)	(1.468)	(1.635)	(1.816)	(1.951)
Assets Sold/Disposed	(0.041)	-	-	-	-
Closing Capital Base	30.792	31.130	32.035	32.866	33.423

Source ERA estimates

5.5 Contributions to the revenue requirement

The estimate of efficient costs, and hence efficient revenue, is comprised of allowances for:

- the return on capital (incorporating a margin to cover statutory tax payments);
- depreciation, or the return *of* capital; and
- operating expenditure.

5.5.1 Return on capital

The ERA's estimate of the real pre-tax WACC for the review period is 5.02 per cent (see section 2.2.1.4). It is applied to Busselton Water's estimated efficient capital base (Table 25), for the purpose of determining the return on capital building block.

The resulting total return on capital for the review period 2018-19 to 2022-23 is 2016$ 7.9 million (Table 20). That is 16 per cent of the estimate of total efficient costs over the review period.

5.5.2 Depreciation

The depreciation allowance is calculated based on real straight line depreciation of the efficient capital base. This is consistent with the standard current cost accounting approach applied for the ERA's other regulatory decisions.

The total depreciation for the review period 2018-19 to 2022-23 is 2016$ 8.2 million (Table 20). That is 17 per cent of the estimate of total efficient costs over the review period.

5.5.3 Operating expenditure

The ERA has based its forecast of Busselton Water's efficient operating expenditure on the following:

- The 2016-17 actual operating expenditure is taken as the base year for the operating expenditure forecast.

- The CPI is used as the index to account for the expected increase in base operating expenditure unit costs.
- ERA forecasts of connections growth (Table 21) are used to account for the expected increase in base operating expenditure due to growth.
- An efficiency target of reducing real base operating expenditure per connection by 2.5 per cent per annum is applied.

This generates the ERA's recommended nominal operating expenditure forecast (Table 26).

Table 26 ERA recommended operating expenditure ($ million, nominal)

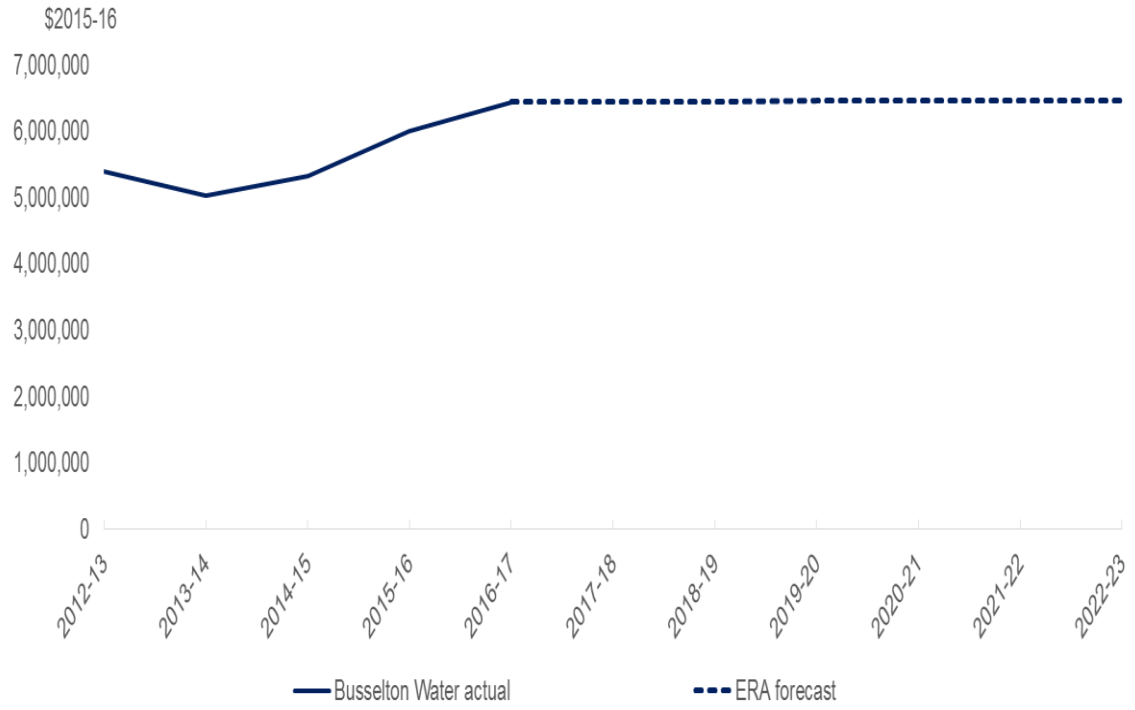
	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total 2018-19 to 2022-23
ERA recommended	6.574	6.696	6.821	6.948	7.078	7.210	7.344	35.401

Note: Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period, and the 'Total' figure in the above table. Total for 2018-19 to 2022-23 may not sum due to rounding.

Source: Economic Regulation Authority.

A comparison of the ERA's recommended operating expenditure to Busselton Water's historic operating expenditure, in real terms ($2015-16), is shown in Figure 7. The recommended operating expenditure forecast – which increases only slightly in real terms each year – is reflective of an economy characterised by lower input cost inflation relative to previous inquiries, and an efficiency target being recommended by the ERA in this inquiry.

Figure 7 Comparison of the ERA's recommended operating expenditure ($2015-16)



Source: [redacted]

The ERA has not recommended operating efficiency targets for Busselton Water in previous inquiries. The efficiency of projected operating expenditure has simply been reviewed as part of the price determination process. However, since the last inquiry, Busselton Water has become a statutory corporation. The ERA has therefore again considered whether an operating efficiency target for Busselton Water is appropriate, given the role that corporatisation can play in increasing efficiency by introducing market-based objectives for managers.

For this inquiry, the ERA is recommending that a target reduction in real operating expenditure per connection of 2.5 per cent per annum be applied to all operating expenditure. Where the ERA's recommended efficiency target would preclude operating expenditure on unexpected events from being recovered, the ERA's recommended approach to managing material variations would allow for consideration of whether the additional unexpected costs can be recovered during the review period.

The rationale for the ERA's operating expenditure input assumptions is set out in detail in appendices 6 and 8.

5.6 Other factors affecting efficient costs

5.6.1 Service standards

The ERA is required to consider Busselton Water's efficient costs of providing services, including with reference to the resources necessary to meet its service standards. Appendix 6 of this report outlines the general considerations given to service standards that are applicable to Busselton Water, Aqwest and the Water Corporation including:

- service standard terminology;
- the water licensing regime and licence requirements;
- the *Water Services Code of Conduct* and current review of this code; and
- service standards performance data.

The remainder of this section focuses on considerations applicable to Busselton Water.

5.6.1.1 Busselton Water licence requirements

The ERA administers the licensing regime set out in the *Water Services Act 2012* (**Water Act**). The ERA first issued Busselton Water's water licence in October 1996. Busselton Water is licenced to provide potable water supply services. Schedule 2 of Busselton Water's licence outlines the individual performance standards that are applicable to it.[56] These individual standards include minimum and maximum static pressure standards and minimum flow standards for the delivery of potable water.

5.6.1.2 Compliance with licence requirements

As part of its licence terms and conditions, Busselton Water must have an independent operational audit conducted at least every two years. An independent review of its asset management system must also occur at least every two years. The purpose of these requirements is to verify Busselton Water's actual compliance with its licence obligations (including service standards) and to ensure its assets that are used to provide licenced water services are being properly maintained. The ERA has reconsidered the results of Busselton Water's latest operational audit and asset management review, which both cover the period 1 April 2013 to 31 March 2016 (36 months).

- At the time the independent audit and review were completed (July 2016), the ERA concluded that Busselton Water had achieved an adequate level of compliance and had an effective asset management system. Where non-compliances were identified, recommendations to fix these were included within the post-audit implementation plan. Similarly, areas identified within the asset management system that required corrective action were included within the post-review implementation plan. These implementation plans require Busselton Water to address the recommendations by 31 December 2016.
- Based on Busselton Water's performance, the ERA decided to retain Busselton Water's reporting schedule at 36 months, meaning that the next audit and review will cover the period 1 April 2016 to 31 March 2019.[57]

The ERA is of the view that Busselton Water's ongoing performance and compliance should not deviate significantly from historical performance. This view is based on the post-audit and post-review implementation plans in place, which have identified the areas of concern and recommendations to fix them.

The ERA's *Water, Sewerage and Irrigation Performance Report* for 2015-16[58] supports the ERA's view regarding Busselton Water's ongoing expected performance. The report, which focuses on examining the service levels provided to customers over time, indicates that the

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[56] Economic Regulation Authority, *Water Services Licence: Busselton Water WL3: Version 8*, 1 July 2016.

[57] Busselton Water is required to provide its relevant reports to the ERA by 30 June 2019.

[58] Economic Regulation Authority, *2015-16 Water, Sewerage and Irrigation Report*, May 2017.

performance of large water service providers remains satisfactory. The ERA does note that some reported performance measures, such as the average frequency of unplanned interruptions and duration of supply interruptions, show a decline in service performance when compared with the previous reporting period. Changes to reporting methodologies and isolated events are thought to have contributed to this change in service performance.

5.6.1.3 Conclusions

Considering Busselton Water's performance above, the ERA concludes that Busselton Water has the resources necessary to meet and maintain existing service standards at current levels, and that these resources are being appropriately allocated and represent an efficient use of costs.

5.6.2 Environmental and health regulations

The ERA is required to consider Busselton Water's efficient costs of providing services, including with reference to the impact of environmental and health regulations on efficient costs. Appendix 6 of this report details the considerations given by the ERA, which cover:

- the legislative framework for environmental and health regulations; and
- the key health and environmental regulations that apply.

In summary, the ERA considers the effects of environmental and health regulations on efficient costs to be varied. The ERA is unable to quantify the effects of any inefficiencies because of limited information. The ERA has instead focused its considerations on the procedures and processes in place to meet and maintain environmental and health regulations and whether this represents and efficient use of resources.

The health regulations that apply for potable water and Busselton Water's understanding of their obligations concerning these regulations appear to be well established. In particular, the *Memorandum of Understanding for drinking water* (**MOU**) between the Water Corporation and Department of Health (WA), appears to be an effective and efficient way to meet the primary health regulations in place.

As Busselton Water does not provide wastewater services, the impacts of environment regulations do not impose any unreasonable costs.

6 Efficient tariffs

The ERA has been asked to consider the efficient tariffs of each service provider for the five year period commencing 2018-19.

Tariffs allocate resources within the economy. They guide the behaviour of consumers and producers.

On the demand side, to maximise benefits to the community, tariffs need to reflect the efficient costs of providing a good or service. When tariffs unnecessarily exceed costs, they act as a tax on consumers and businesses. Households are left with less income for other uses, and the competitiveness of businesses is reduced. When tariffs are below costs, this can encourage excess consumption, place pressure on existing capacity, and bring forward the need to expand capacity. Efficient tariffs therefore ensure that households and businesses make efficient decisions about their level of water usage and investments in water saving technologies or alternative sources of water, such as rainwater tanks or recycling.

On the supply side, tariffs stimulate production and signal the need for investment in capacity. Tariffs provide water utilities with revenue to recover the costs incurred in providing water services. When revenue does not reflect costs, there will not be efficient incentives for water utilities to invest. The infrastructure that provides water services to households and businesses may not be upgraded or expanded as needed, or alternatively, there may be over-investment.

Efficient tariffs require consideration of both the level and structure of tariffs. The level of tariffs refers to the total amount that is payable by a household or business for each service. The structure of tariffs refers to the mix of different charges that make up the total bill for each service. For example, tariffs for water services to most residential customers currently comprise a constant fixed charge (the service charge) and a scale of increasing usage charges.

This chapter provides the ERA's findings on the following issues:

- the efficiency of 2017-18 tariff levels — the degree to which current tariff levels deliver revenue just sufficient to cover the water corporations' efficient costs of service; and
- the efficiency of 2017-18 operating subsidies — the degree to which State Government subsidies to the water corporations cover the shortfalls between tariff revenue and efficient costs.

The foregoing is based on the existing relativities of tariffs, which are maintained for 2017-18, given the recently announced across-the-board increase of 6 per cent applying to all water services tariffs.[59]

[59] The Hon Ben Wyatt, 'Tariffs, fees and charges to assist in budget repair', *Media Statements*, 21 June 2017. The statement announced a 6 per cent increase in water, wastewater and drainage charges for 2017-18, taking effect from 1 July 2017. A change to concessions was also announced:

For seniors' households with Commonwealth concessions cards, the Government will continue to provide the 50 per cent rebates for water service charges capped at $600 and local government rates capped at $750, and a 50 per cent rebate on the underground electricity connection charge.

However, as of July 1, 2017, for households with only a WA Seniors Card, these rebates will be capped at $100 each.

The ERA finds that the revenue that will be delivered for each of the water corporations is higher than needed to recover efficient costs.

Accordingly, the ERA evaluates what the efficient level of tariffs would be. The ERA has estimated a set of adjustments to water, wastewater and drainage tariffs for 2017-18 through to 2022-23 which would deliver revenue just sufficient to cover the water corporations' efficient costs of service, including for each line of business for the Water Corporation.

In evaluating the efficient level of tariffs, the ERA has not adjusted the *structure* of tariffs. For example, while the water tariff is increased to its efficient level, the relativities of the water service charges and volumetric charges for water are not adjusted. The Water Corporation is currently considering undertaking a tariff reform project and is engaging with its customers through 2017 to 'understand their needs and expectations around the price of services'.[60] The ERA has therefore included in this chapter recommendations about principles for efficient tariff structures, to inform the Government's future considerations of tariff reform.

6.1 Current tariffs

The following tariffs are currently applied for water by the Water Corporation, Aqwest and Busselton Water (see appendix 12 for further detail):

- Residential customers pay a fixed per annum charge (the service charge) which is capped at a uniform level state-wide under the Government's uniform Tariff Cap Policy; plus usage charges based on their level of water consumption.
    - Different inclining block tariffs are adopted for the usage charge, depending on whether the customer is a Water Corporation customer in metropolitan or country areas, or an Aqwest or Busselton Water customer.[61] Under the Tariff Cap Policy, the first two tiers of the usage charge are capped at a uniform level state-wide.[62]
- Non-residential customers pay the same service charge state-wide, which increases according to the property's meter size. Seven tiers of meter size are applied for the Water Corporation's metropolitan customers, and ten for the Water Corporation's country customers. Seven tiers are applied for Aqwest and Busselton Water's customers. All customers pay a single tiered usage charge, but the level of the charge varies across geographic location and water business.[63]

Figure 8 summarises the Water Corporation's water tariffs.

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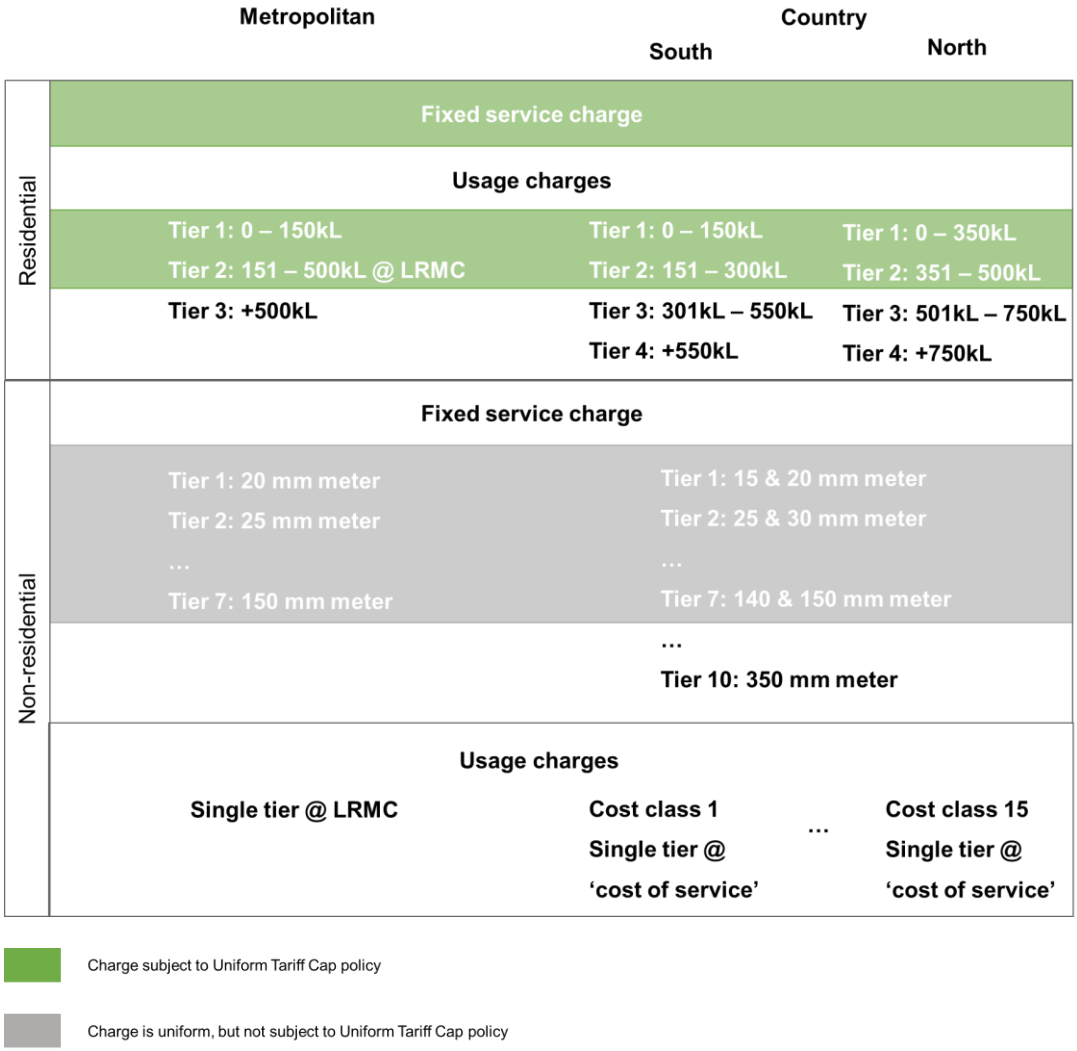
60 Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 73. The Water Corporation states that the project will take into consideration the following pricing principles: simplicity; transparency; supports water, wastewater and drainage resource management; equity; user pays.

61 An inclining block tariff structure is one where the per unit charge (in the case of water, $/kL) increases with higher levels of consumption. For the Water Corporation's customers, there are three tiers of consumption in metropolitan areas and four in country areas; for Aqwest's customers, there are four tiers; and for Busselton Water's customers, there are six tiers. For the Water Corporation's country customers, the cut-off points for the four tiers are higher in the north of the state; and the $/kL charge for tiers three to five varies depending on which of five cost classes the customer resides in.

62 For water use up to 300 kL in the south of the state, and 500 kL in the north of the state, charges are capped at the level of charges for the same amount of water use in the metropolitan area.

63 For the Water Corporation's non-residential customers, there are 15 different cost classes, and the level of the usage charge varies across these cost classes.

Figure 8 Water tariffs



Source: Economic Regulation Authority

For the wastewater services supplied by the Water Corporation:

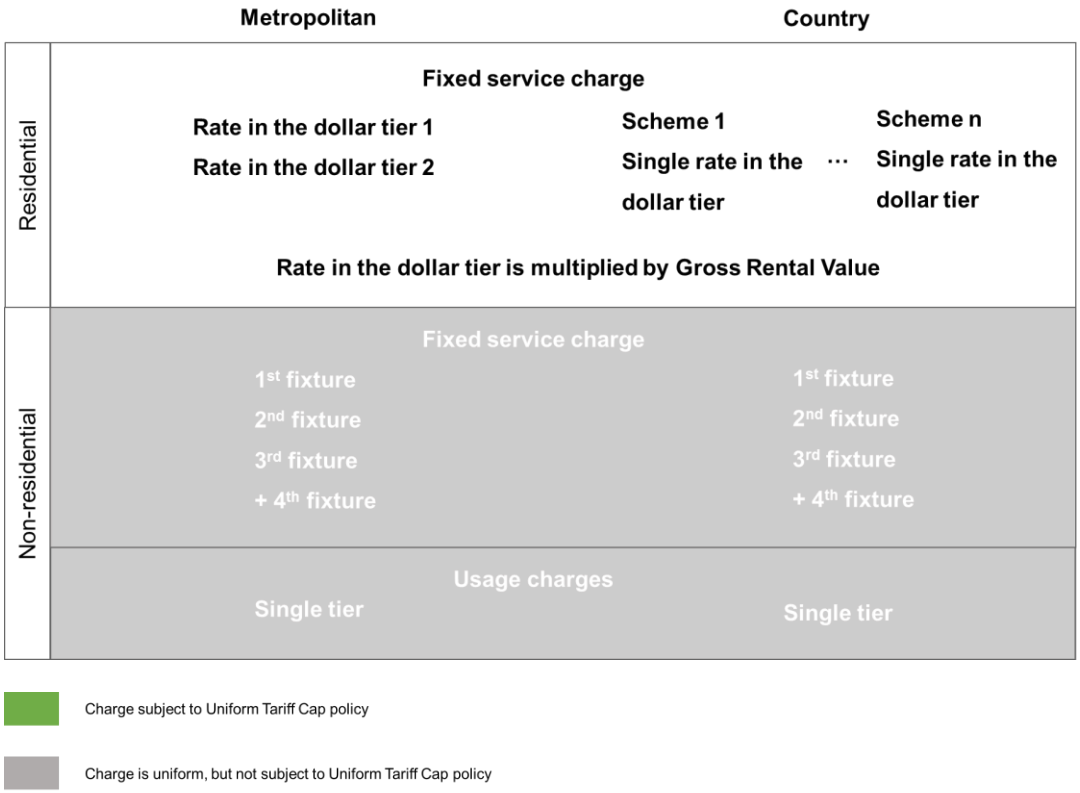
- Residential metropolitan and country customers pay a fixed per annum charge. The level of that charge is based on Gross Rental Value (**GRV**) multiplied by a wastewater charge rate per GRV dollar.[64] For metropolitan services, there are two rate in the dollar tiers. For country services, there is one rate in the dollar tier for each of the five cost classes.
- Non-residential metropolitan and country customers pay a fixed per annum charge which varies by the number of fixtures (toilets), as well as a single tier $/kL charge.[65] The level of charges is the same across metropolitan and country customers.

[64] GRV is defined under the *Valuation of Land Act 1978* as: "[T]he gross annual rental that the land might reasonably be expected to realise if let on a tenancy from year to year upon condition that the landlord was liable for all rates, taxes and other charges thereon and the insurance and other outgoings necessary to maintain the value of the land." That is, GRV represents the annual equivalent of a fair weekly rental.

[65] There is no charge for the first 200kL per annum of discharge.

Figure 9 summarises the Water Corporation's wastewater tariffs.

Figure 9 Wastewater tariffs



Source: Economic Regulation Authority

For drainage services supplied by the Water Corporation:

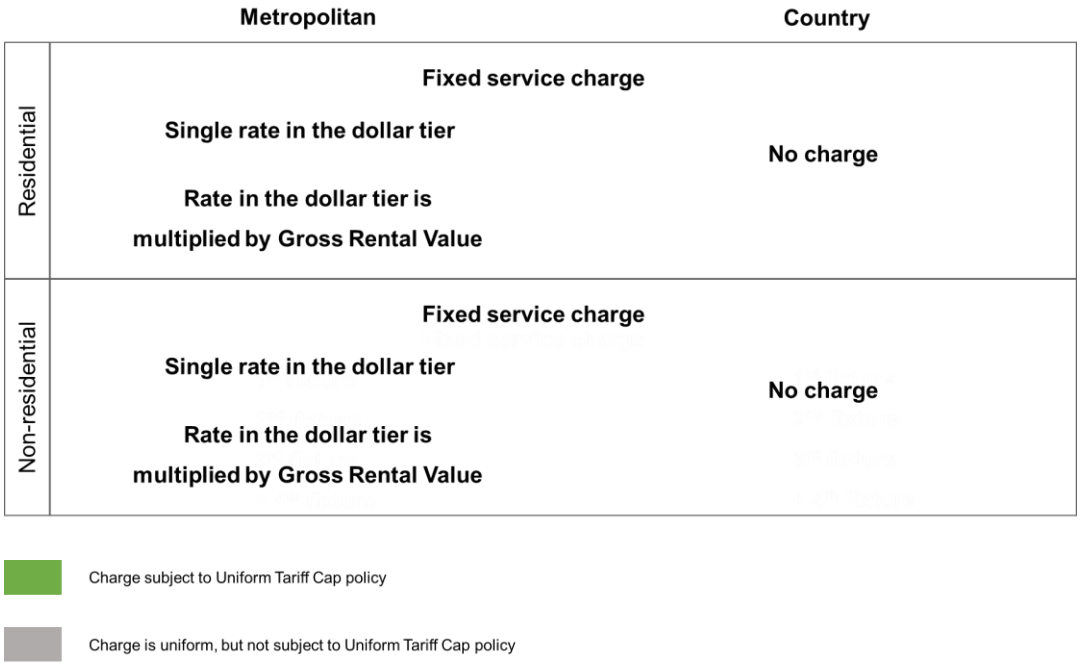
- In the metropolitan Declared Drainage Area,[66] both residential and non-residential customers pay a fixed per annum charge, based on GRV multiplied by a single drainage rate per GRV dollar.[67]
- Drainage services supplied by the Water Corporation in country areas are 100 per cent funded by the operating subsidy.

Figure 10 summarises the Water Corporation's drainage tariffs.

[66] The Water Corporation's Declared Drainage Area is the area subject to annual drainage charges. The Water Corporation can recommend to the Minister that an area be designated a Declared Drainage Area if the area contributes to the need for, or benefits from, a main drainage service. In the past, the Water Corporation typically became involved in providing main drainage services in metropolitan areas where drainage flows crossed individual local government boundaries, or where the local government requested assistance. While metropolitan main drains are the responsibility of the Water Corporation, the local drainage network is the responsibility of local government. The local drainage network comprises road drainage and piped drains, and provides the link between properties and the Water Corporation's main drains. The Water Corporation also provides rural main drain services to Albany, Harvey, Waroona, Roelands, Mundijong, and Busselton. See ACIL Tasman, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, pp. 5-6.

[67] For a metropolitan area property with a $15,000 GRV, the current drainage charge is $113.93. This compares to the service charge for water of $250.39 and the service charge for wastewater of $629.70.

Figure 10 Drainage tariffs



Source: Economic Regulation Authority

As an overlay on the above, some customers in metropolitan and country regions – for example, holders of a WA Seniors Card – receive tariff discounts (or 'concessions').[68] The revenue foregone due to concessions is funded by the State Government as part of the water corporations' operating subsidy.

In addition, the tariff revenues for many of the Water Corporation's schemes — particularly those in the country regions — are not sufficient to cover their efficient costs. To address this, the State Government provides the Water Corporation a further operating subsidy for any country loss.

The sum of the tariff revenue and the operating subsidies to cover concessions and country losses should deliver revenue sufficient to just cover the water corporations' efficient costs.

6.2 Efficient tariff levels

The inquiry evaluates two scenarios for each water corporation for the review period:

- a base case scenario; and
- an efficient tariff scenario.

The State Government recently announced that tariffs would increase across the board by 6 per cent in 2017-18, and that some concessions would be capped.[69] This outcome

[68] The following customers are eligible for concessions: holders of a Pensioner Concession, State Concession WA Seniors or Commonwealth Seniors Health card.

[69] The Hon Ben Wyatt, 'Tariffs, fees and charges to assist in budget repair', *Media Statements*, 21 June 2017. The statement announced a 6 per cent increase in water, wastewater and drainage charges for 2017-18, taking effect from 1 July 2017. A change to concessions was also announced:

provides the anchor for the base case scenario. In the base case scenario, 2017-18 revenue for each water corporation is indexed through to 2022-23, by applying the ERA's forecast consumer price inflation of 1.79 per cent.[70] This maintains the water corporations' 2017-18 revenue level in real terms.[71] In addition, each of the water corporation's revenue is grown by their expected rate of growth in connections.

The ERA finds that in the base case scenario, tariffs for each of the water corporations are not efficient. That is, given forecast demand growth, the resulting revenue does not equate to the efficient cost of service, either in 2017-18 or in the out-years.

Under the efficient tariffs scenario, the level of the water corporations' revenue is therefore changed to ensure they recover efficient costs and no more.

For the Water Corporation, the level of revenue is changed to remove any under- or over-recovery of efficient costs in the metropolitan area only. This then allows for the change that would be needed to ensure metropolitan tariffs are cost-reflective to be assessed. The ERA has also assessed, for 2017-18 only, the effect this change in the Water Corporation's metropolitan revenue would have on the efficient operating subsidies for country lines of business, given uniform tariff arrangements.

6.2.1 Efficiency of the Water Corporation's tariffs and operating subsidy

The efficiency of the Water Corporation's revenues and operating subsidies in 2017-18 is evaluated under the two alternate scenarios.

6.2.1.1 Efficiency of base case tariffs in 2017-18

Forecast total revenue from tariffs and operating subsidies – under the base case tariff scenario – can be compared to the ERA's estimate of the efficient tariff revenue.[72] Any divergence between the two indicates that the existing or forecast levels of tariffs are not efficient.

For 2017-18, the ERA finds that the Water Corporation's total revenues – derived from estimated tariff revenues (column A in Table 27) plus income from State Government operating subsidies (column B) – exceed the ERA's estimates of the efficient tariff revenue

For seniors' households with Commonwealth concessions cards, the Government will continue to provide the 50 per cent rebates for water service charges capped at $600 and local government rates capped at $750, and a 50 per cent rebate on the underground electricity connection charge.

However, as of July 1, 2017, for households with only a WA Seniors Card, these rebates will be capped at $100 each.

[70] This is the ERA's estimate of inflation over the forward review period. All historic indexing in this report is based on Tables 3 and 4 from Australian Bureau of Statistics, *Consumer Price Index: Weighted Average of Eight Capital Cities*, Catalogue 6401.0, March 2017.

[71] All indexing in this report is based on Tables 3 and 4 from Australian Bureau of Statistics, *Consumer Price Index: Weighted Average of Eight Capital Cities*, Catalogue 6401.0, March 2017.

[72] The efficient tariff revenue is given by the net cost of service, which is equal to the total cost of service developed from the ERA's Revenue Requirement Model (see section 2.1.1), less the costs associated with commercial special agreements or other revenue.

(column D) by $219.6 million (column E).[73] Total revenues are therefore estimated to exceed the ERA's efficient tariff revenue by 9.7 per cent. This figure is derived as the:

- estimated total revenue of $2,480.4 million (column C);[74]
- divided by the ERA's estimate of efficient tariff revenue (or equivalently, efficient net costs) of $2,260.8 million (column D).

Table 27 ERA's estimate of the Water Corporation's operating subsidies, by line of business, 2017-18 (nominal $ million)

	Tariff revenue	Operating subsidy	Total revenue	Efficient tariff revenue	Under (-) or over (+) recovery	Operating subsidy plus under or over recovery
	(A)	(B)	(C)	(D)	(E)	(F)
Water	919.3	407.0	1326.2	1,406.1	-79.9	327.1
Metro	*651.1*	*32.8*	*683.9*	*763.8*	*-79.9*	*-47.0*
Country	*268.2*	*374.1*	*642.3*	*642.3*	*0.0*	*374.1*
Wastewater	953.6	93.4	1046.9	744.0	302.9	396.3
Metro	*730.8*	*67.8*	*798.5*	*495.6*	*302.9*	*370.7*
Country	*222.8*	*25.6*	*248.4*	*248.4*	*0.0*	*25.6*
Drainage	56.5	20.6	77.1	80.6	-3.5	17.1
Metro	*56.5*	*4.3*	*60.8*	*64.3*	*-3.5*	*0.8*
Country	*0.0*	*16.3*	*16.3*	*16.3*	*0.0*	*16.3*
Irrigation	0.2	29.9	30.1	30.1	0.0	29.9
Metro	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Country	*0.2*	*29.9*	*30.1*	*30.1*	*0.0*	*29.9*
Total	**1,929.5**	**550.8**	**2,480.4**	**2,260.8**	**219.6**	**770.4**
Metro	***1,438.3***	***104.9***	***1,543.2***	***1,323.7***	***219.6***	***324.5***
Country	***491.2***	***445.9***	***937.1***	***937.1***	***0.0***	***445.9***

Notes Total revenue includes the value of tariff revenue and operating subsidies. Operating subsidies are the sum of the value of revenue foregone due to concessions, plus operating subsidies to cover country losses. Concessions include those given to pensioners, seniors and charities.

The efficient tariff revenue is equivalent to the net cost of service, which is obtained by deducting, from the gross cost of service, the revenue from asset sales, special agreements and 'other' revenue.

Under or over recovery on tariffs occurs only in the metro area. ('Under (-) or over (+) recovery' in the metro region = 'Total revenue' – 'Efficient tariff revenue').

There is no country over- or under-recovery, as by definition the efficient country operating subsidy should only cover concessions plus any remaining under-recovery of efficient costs. There are no country schemes which over-recover.

Source ERA analysis based on Water Corporation data

[73] The Government operating subsidies cover the cost of concessions, and also any losses on providing services in country areas.

[74] The tariff revenue estimates for 2017-18 were developed by the Water Corporation consistent with the base case tariff scenario. The ERA has accepted the Water Corporation's demand growth estimates and the tariff revenue that is implied (see section 3.2).

The over-recovery of efficient revenue occurs because the revenues earned from metropolitan tariffs under the base case do not balance with the metropolitan area's efficient costs. Metropolitan revenue in 2017-18 is estimated to be (column E in Table 27):

- for wastewater, $302.9 million higher than the ERA's estimated efficient costs;
- for water, $79.9 million lower than the ERA's estimated efficient costs; and
- for drainage, $3.5 million lower than the ERA's estimated efficient costs.[75]

For country services, under current pricing the estimates of total revenues collected by Water Corporation in 2017-18 from regional customers ($491.2 million) plus revenues received through the State Government subsidies to cover concessions ($41.7 million) are substantially less than the ERA's estimated efficient cost of supply of $937.1 million:

- For water services, regional customers are currently charged $374.1 million (56 per cent) less than the ERA's estimated efficient cost of supply.
- For wastewater services, regional customers are charged $25.6 million (0.5 per cent) less than the ERA's estimated efficient cost of supply.
- For drainage services, regional customers pay $0 towards the $16.3 million estimated efficient cost of supply.
- For irrigation water supply and drainage services, irrigation farmers contribute $11.4 million towards the estimated efficient cost of supply of $41.3 million.[76]

The Water Corporation receives a subsidy payment from the State Government to meet the additional costs of supplying services to the regions.

- In 2017-18, the subsidy needed to be paid to the Water Corporation to meet the efficient cost of regional services is estimated at $446.0 million, or 43 per cent of the efficient cost of supply.[77]

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[75] Stormwater WA submitted that drainage costs are not transparent, as the Water Corporation does not report its drainage activities separately. See Stormwater WA, *Inquiry into the efficient costs of tariffs of the Water Corporation, Aqwest and Busselton Water – Submission by Stormwater Western Australia*, 20 January 2017, p. 4.

The ERA has examined the actual and forecast costs and revenue of the Water Corporation for drainage assets and services, as part of its assessment of the Water Corporation's overall efficient revenue (Table 28). The ERA concludes that the tariffs for metropolitan drainage services, based on the current boundaries, need to increase to cover the costs. The total net cost of drainage services to the Water Corporation is estimated to be $80.6 million in 2017-18.

[76] The estimate of efficient tariff revenue – of $30.1 million set out in Table 27 – provides the ERA's estimate of the efficient revenue required to cover the Water Corporation's irrigation asset base and operating expenditures. The amount of $30.1 million is the net cost of service, which is obtained by deducting tariff revenue of $217,000 and other contract revenue of $11.2 million from the gross cost of service, which is $41.3 million.

[77] Re-setting charges for country services, so as to achieve levels of tariff revenue commensurate with the efficient cost of supply, over the five year period 2018-19 to 2022-23 would require, in 2018-19:

- increasing water charges by 125 per cent;
- increasing wastewater charges by 0.5 per cent;
- setting drainage charges to recover $16.3 million (drainage services are currently provided free of charge); and
- increasing revenues to recover the current shortfall of $29.9 million on the efficient costs of irrigation services.

If these charges were re-set to cover costs, the cost of subsidising regional services in the country would fall to just the $64.4 million needed to cover tariff concessions for country residents.

Irrigation tariffs are also not cost reflective in the base case (Table 27). The majority of the costs of irrigation services are funded through operating subsidies. The ERA in its 2013 report examined these issues in detail, finding:[78]

> The Authority recommends that the storage charges to Harvey Water should be reduced from $1.96 million in 2012/13 to $1.90 million in 2013/14, being limited to inflation thereafter.
>
> If the Authority's recommendations are implemented, there will be no need for the phase-in operating subsidy that has been paid by the Government to the Water Corporation to date, as a result of the ten year price path recommended by the Authority in 2007. From 2013/14 onwards, the operating subsidy will only need to provide the Water Corporation with the costs that are attributed to public recreational use. It is estimated that recreational costs will amount to $0.62 million (in nominal dollars) in 2013/14.

The ERA's 2013 recommendations for irrigation charging were not adopted. Additional work has not been undertaken for this draft report to estimate the efficiency of the irrigation operating subsidies; these have been accepted as reflective of the State Government's policies.

Recommendation or finding

The Water Corporation's forecast revenue for 2017-18, from its tariff charges and the State Government's operating subsidy, is estimated to exceed its efficient costs by $219.6 million.

The main contributor to the excess is the forecast revenue earned from metropolitan wastewater customers, which is estimated to be $302.9 million higher than the efficient costs of the metropolitan wastewater network. This more than offsets an estimated under-recovery of efficient costs for potable water services in the metropolitan area of $79.9 million, and for drainage services in the metropolitan area, of $3.5 million.

For country services, under current pricing, the estimate of tariff revenues collected by the Water Corporation, in 2017-18, is $491.2 million. This is substantially less than the ERA's estimated efficient cost of supply, of $937.1 million. The State Government therefore will provide an estimated subsidy of $446.0 million to country customers, under its Uniform Tariff Cap policy, to meet the shortfall. However, even with this subsidy, the Water Corporation is not receiving revenue for the country regions in excess of its costs. (Chapter 6)

6.2.1.2 Operating subsidy required for 2017-18 with efficient tariffs

The ERA has estimated the tariff revenue and operating subsidy that would have been required in 2017-18 if tariffs in the metropolitan area recovered only the efficient costs. In conducting the analysis, the ERA has made the following simplifying assumptions:

- The revenues earned from metropolitan and country water customers increase at the same rate.

[78] Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board: Revised Final Report*, 28 March 2013, p. 137.

  - Revenue earned from metropolitan customers for 2017-18 would need to be 11.7 per cent higher than in the base case for efficient costs to be recovered in the metropolitan area. This increase is assumed to lead to an 11.7 per cent increase in revenue earned from country customers.[79]
  - Concessions in both regions are assumed to change in proportion to the change in revenue.[80]

- The revenues earned from metropolitan drainage customers would need to be 5.7 per cent higher than in the base case for efficient costs to be recovered in the metropolitan area.
  - Concessions in the metropolitan area change in proportion to this change in revenue.[81] There are no concessions in the country, as costs in these areas are completely funded by the State Government operating subsidy.
  - The country loss operating subsidy for drainage also changes in proportion to this change in revenue.
- The revenues earned from metropolitan wastewater customers would need to be 38 per cent lower than in the base case for efficient costs to just be recovered in the metropolitan area.
  - Concessions in the metropolitan area change in proportion to this change in revenue.[82]
  - However, country revenue and concessions are not changed, because country wastewater revenue is very close to being cost reflective (Table 27).[83] For completeness, an additional scenario is considered (set out in Table 28), where the 38 per cent reduction in wastewater revenues is also applied to the country regions. The estimates in this scenario are indicative only, as the interaction between tariff uniformity (for non-residential customers across the State in this case), concessions and country losses is complex.

The ERA has considered changes in the *level* of revenue, and hence proportionate changes in all elements of the tariff structure. However, tariff levels could be changed in different ways to deliver a given change in revenue. For example, a reduction in revenue could be achieved by reducing tariffs for residential customers only, or for non-residential customers only, or for both customer classes. These considerations would add a further overlay to the changes adopted here.

The ERA's analysis suggests that, if the revenue earned in metropolitan areas in 2017-18 was to cover the efficient cost of service and no more, revenue from the operating subsidy

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79 This assumption is based on the existence of the Tariff Cap Policy. However, tariffs are not uniform for all water charges. For example, usage charges are different in country areas at high levels of use for residential customers, as are usage charges for non-residential customers. However, the degree of imprecision is not likely to be large compared to the size of the overall impacts being generated in this scenario.

80 Again, this is a simplification of the likely effects, given that there are caps on concessions. The level of concessions will not be entirely linear to the level of tariffs. However, also again, the resulting imprecision is considered unlikely to be large.

81 This is a simplification of the likely effects given the caps on concessions. However, the resulting imprecision is unlikely to be large.

82 Again, this is a simplification of the likely effects given the caps on concessions.

83 This implies some break in the uniformity of wastewater tariffs by geographic region for non-residential customers.

and over-recovery in the metropolitan area, combined, would fall from $770.4 million to $497.9 million in 2017-18 (Table 28):

- The operating subsidy would decrease from $550.8 million to $497.9 million.
- The over-recovery from metropolitan services would decrease by $219.6 million.

Table 28 Water Corporation –estimates of total operating subsidies by line of business under alternate cost and tariff scenarios, 2017-18 (nominal $ million)

	Tariff revenue (A)	Operating subsidy (B)	Total revenue (C)	Efficient revenue (D)	Under (-) or over (+) recovery (E)	Operating subsidy plus under or over-recovery (F)
ERA estimates with efficient costs, but base case revenue						
Water	919.3	407.0	1326.2	1,406.1	-79.9	327.1
Wastewater	953.6	93.4	1046.9	744.0	302.9	396.3
Drainage	56.5	20.6	77.1	80.6	-3.5	17.1
Irrigation	0.2	29.9	30.1	30.1	0.0	29.9
Total	**1,929.5**	**550.8**	**2480.4**	**2,260.8**	**219.6**	**770.4**
ERA estimates with efficient costs and efficient tariffs (country wastewater revenue unchanged)						
Water	1026.6	379.5	1406.1	1,406.1	0.0	379.5
Wastewater	676.4	67.6	744.0	744.0	0.0	67.6
Drainage	59.7	20.9	80.6	80.6	0.0	20.9
Irrigation	0.2	29.9	30.1	30.1	0.0	29.9
Total	**1,762.9**	**497.9**	**2260.8**	**2,260.8**	**0.0**	**497.9**
ERA estimates with efficient costs and efficient tariffs (country wastewater revenue reduced by 38 per cent)						
Water	1026.6	379.5	1406.1	1,406.1	0.0	379.5
Wastewater	591.9	152.2	744.0	744.0	0.0	152.2
Drainage	59.7	20.9	80.6	80.6	0.0	20.9
Irrigation	0.2	29.9	30.1	30.1	0.0	29.9
Total	**1,678.4**	**582.4**	**2260.8**	**2,260.8**	**0.0**	**582.4**

Notes: As for Table 27.

Source: ERA analysis based on Water Corporation data

The operating subsidy for water services would decrease from $407.0 million to $379.5 million, because the increase in the operating subsidy required to cover concessions would be more than offset by a decrease in the operating subsidy required to fund country losses. In addition, the revenue earned from metropolitan customers would be sufficient for the Water Corporation to be able to recover the $79.9 million shortfall in efficient costs estimated in the base case.

The operating subsidy for wastewater services would decrease from $93.4 million to $67.6 million in the scenario where wastewater tariffs are not changed in the country. This is because the decrease in wastewater revenues leads to a decrease in the operating subsidy required to cover concessions in the metropolitan area, while the operating subsidy required to fund country concessions and country losses remains the same in this scenario.[84]

Recommendation or finding

If the revenue earned in the Water Corporation's metropolitan area in 2017-18 was to cover the efficient cost of service and no more, revenue from the operating subsidy and over-recovery in the metropolitan area, combined, would fall from $770.4 million to $497.9 million in 2017-18:

- The operating subsidy would decrease from $550.8 million to $497.9 million.
- The revenue from metropolitan services could fall by $219.6 million, while still recovering efficient costs.

6.2.1.3 The efficient revenue and tariff path

The ERA has estimated both the base case and efficient revenue paths for the review period 2018-19 to 2022-23 (Table 29). Three factors influence the rate of growth in revenue in the ERA's analysis. These are the rate of growth in:

- demand;
- efficient costs; and
- inflation.

For the base case, revenue grows from its 2017-18 level at the combined rate of inflation and demand growth. The latter varies between 3.1 per cent and 3.6 per cent per annum over the review period. In the base case, revenue continues to exceed the efficient level of revenue over the whole review period. The resulting total excess of revenue, over efficient costs, is estimated to be $1.46 billion in net present value terms.

For the efficient revenue path, a 'P_0' adjustment is made to revenue in 2018-19. This estimates the initial reduction in revenue in 2018-19 (the first year of the review period) that would allow revenue to grow only at the combined rate of inflation and demand growth, and

[84] Where the tariff reductions are applied in the country, the operating subsidy rises (Table 28), to cover the increased country loss (i.e. shortfall on efficient costs).

for efficient costs to (just) be recovered. The required overall reduction in revenue in 2018-19 is 10.4 per cent.

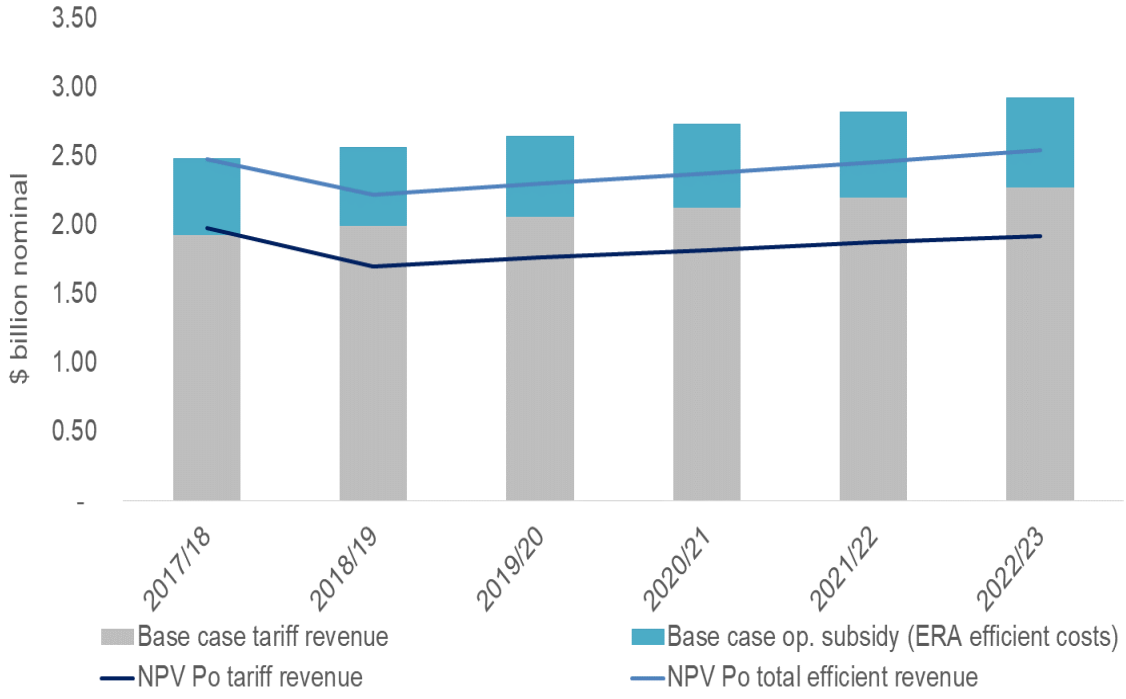
Table 29 Base case and efficient revenue path estimates for the Water Corporation ($billion nominal and % increase over previous year)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Base case revenue path (2018$ billion)	2.480	2.565	2.643	2.730	2.823	2.925
Annual change in revenue	*7.9%*	*3.4%*	*3.1%*	*3.3%*	*3.4%*	*3.6%*
P_0 adjustment efficient revenue path (2018$ billion)	2.480	2.223	2.299	2.377	2.458	2.541
Annual change in revenue	*7.9%*	*-10.4%*	*3.4%*	*3.4%*	*3.4%*	*3.4%*

Source: ERA analysis based on Water Corporation data

In each year, annual revenues earned with the efficient revenue path remain below those earned with the base case path (Figure 11).

Figure 11 Efficient and base case revenue path estimates for the Water Corporation ($billion nominal)



Source: Economic Regulation Authority and Water Corporation estimates.

The ERA has also estimated both the base case and efficient revenue and tariff paths for the metropolitan area separately for the review period 2018-19 to 2022-23 (Table 30 to Table 32). The ERA has conducted this analysis because it has found that for 2017-18,

revenues earned from metropolitan customers are higher than efficient costs. For the efficient tariff path, a 'P_0' adjustment is made in 2018-19. This estimates the initial reduction in tariffs for 2018-19 (the first year of the review period) that would allow tariffs to grow only at the rate of inflation thereafter, and for efficient costs to (just) be recovered.

To ensure that only efficient costs were recovered, this 2018-19 adjustment would require:

- water tariffs to increase by 4.4 per cent (Table 30);
- drainage tariffs to fall by 3.6 per cent(Table 31); and
- wastewater tariffs to fall by 41.2 per cent (Table 32).

From this adjusted level, tariffs would then be maintained in real terms for the remainder of the review period.

Table 30 Base case and efficient revenue and tariff path estimates for the Water Corporation, metropolitan water ($billion nominal and % increase over previous year)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Base case revenue path (2018$ billion)	0.684	0.708	0.733	0.759	0.786	0.814
Annual change in revenue	*7.9%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*
P_0 adjustment efficient revenue path (2018$ billion)	0.684	0.726	0.752	0.780	0.809	0.839
Annual change in revenue	*7.9%*	*6.2%*	*3.6%*	*3.6%*	*3.7%*	*3.7%*
Annual change in tariffs	*6.0%*	*4.4%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*

Source: ERA analysis based on Water Corporation data

Table 31 Base case and efficient revenue and tariff path estimates for the Water Corporation, metropolitan wastewater ($billion nominal and % increase over previous year)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Base case revenue path (2018$ billion)	0.799	0.828	0.859	0.890	0.923	0.957
Annual change in revenue	*2.0%*	*3.7%*	*3.7%*	*3.7%*	*3.7%*	*3.7%*
P_0 adjustment efficient revenue path (2018$ billion)	0.799	0.479	0.496	0.515	0.535	0.556
Annual change in revenue	*2.0%*	*-40.1%*	*3.7%*	*3.8%*	*3.9%*	*3.9%*
Annual change in tariffs	*0.0%*	*-41.2%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*

Source: ERA analysis based on Water Corporation data

Table 32 Base case and efficient revenue and tariff path estimates for the Water Corporation, metropolitan drainage ($billion nominal and % increase over previous year)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Base case revenue path (2018$ billion)	0.061	0.063	0.065	0.068	0.070	0.073
Annual change in revenue	*1.9%*	*3.7%*	*3.7%*	*3.7%*	*3.7%*	*3.7%*
P_0 adjustment efficient revenue path (2018$ billion)	0.061	0.060	0.062	0.064	0.067	0.069
Annual change in revenue	*1.9%*	*-1.8%*	*3.7%*	*3.7%*	*3.7%*	*3.7%*
Annual growth in level of tariffs on previous year	*6.0%*	*-3.6%*	*1.8%*	*1.8%*	*1.8%*	*1.8%*

Source: ERA analysis based on Water Corporation data

Recommendation or finding

The Water Corporation's tariff levels in the metropolitan area – following the recent 6.0 per cent increase for 2017-18 – are not reflective of efficient costs. Instead, to be cost-reflective, tariff levels in the metropolitan area in 2018-19 would need to:

- for water, increase by 4 per cent;

- for drainage, decrease by 4 per cent; and
- for wastewater, decrease by 41 per cent.

For the rest of the review period, tariffs in the metropolitan area could then remain the same in real terms, and the Water Corporation would be able to recover its efficient costs.

6.2.2 Efficiency of Aqwest's tariffs and operating subsidy

The efficiency of Aqwest's tariffs and operating subsidies are evaluated under the two alternate tariff scenarios.

6.2.2.1 Base case

The efficient revenue requirement is given by the efficient cost of service (see Table 13 in section 4.1 above). The total revenue requirement is reported for 2017-18 and for the five year review period – 2018-19 to 2022-23 – in the second row of Table 33 below. It totals $73.7 million, in undiscounted real 2016 dollars

It compares to the estimates of revenue under the base case scenario assumptions (which provides for the actual tariffs for 2017-18, then increases at only the rate of expected inflation thereafter). Under this scenario, the Aqwest's current tariff revenue over-recovers efficient costs. The average over-recovery over the review period is 10.0 per cent (Table 33). The over-recovery in 2017-18 is 16.5 per cent.

Table 33 Total revenue requirement forecasts for Aqwest ($ milion nominal, except last column)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total of the 5 year review period (real $2016)
Efficient revenue	13.935	14.845	15.864	16.228	16.535	17.123	73.690
Actual revenue	16.239	16.701	17.197	17.708	18.234	18.777	81.036
Over-recovery of revenue in the base case (per cent)	**16.5%**	**12.5%**	**8.4%**	**9.1%**	**10.3%**	**9.7%**	**10.0%**

Source ERA estimates

Recommendation or finding

Aqwest's expected revenue in 2017-18 is estimated to exceed its efficient revenue by $2.3 million, or by 16.5 per cent.

6.2.2.2 Efficient tariffs case

Under the P_0 efficient tariffs case, Aqwest's tariffs are reduced in 2018-19 to recover only efficient costs. Tariffs rise by the expected rate of inflation thereafter.

The required reduction in tariffs in 2018-19 is 7.9 per cent (Table 34). Tariffs would then only have to rise by the rate of inflation in the subsequent years to match efficient costs over the review period.

Table 34 Total revenue requirement forecasts for Aqwest ($ million nominal, except last column)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	NPV of the 5 year review period (real $2016)
Efficient revenue	13.935	14.845	15.864	16.228	16.535	17.123	57.737
Actual revenue	16.239	15.185	15.634	16.097	16.574	17.067	57.737
Change in tariffs		**-7.9%**	**1.8%**	**1.8%**	**1.8%**	**1.8%**	

Source ERA estimates

Recommendation or finding

Aqwest's tariffs – following recent increases – are not reflective of efficient costs. Instead, to be cost-reflective, Aqwest's tariffs in 2018-19 would need to decline by 7.9 per cent.

6.2.3 Efficiency of Busselton Water's tariffs and operating subsidy

The efficiency of Busselton Water's tariffs and operating subsidies are evaluated under the two alternate tariff scenarios.

6.2.3.1 Base case

The efficient revenue requirement is given by the efficient cost of service (see Table 20 in section 5.1 above). The total revenue requirement is reported for 2017-18 and for the five year review period – 2018-19 to 2022-23 – in the second row of Table 35 below. It totals undiscounted real 2016$ 48.5 million for Busselton Water.

It compares to the estimates of revenue made under the base case scenario assumptions (actual tariffs for 2017-18, then increases in tariffs only at the rate of expected inflation thereafter). Under this scenario, the current tariff revenue over-recovers efficient costs. The average over-recovery over the review period is 13.1 per cent (Table 35). The over-recovery in 2017-18 is 11.0 per cent.

Table 35 Total revenue requirement forecasts for Busselton Water ($ million nominal, except last column)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total of the 5 year review period (real $2016)
Efficient revenue	9.629	9.884	10.184	10.572	11.019	11.422	48.527
Actual revenue	10.684	11.166	11.503	11.901	12.439	13.004	54.860
Over-recovery of revenue in the base case (per cent)	**11.0%**	**13.0%**	**12.9%**	**12.6%**	**12.9%**	**13.8%**	**13.1%**

Source ERA estimates

Recommendation or finding

Busselton Water's revenue in 2017-18 exceeds its efficient revenue by $1.1 million, or by 11.0 per cent.

6.2.3.2 Efficient tariffs case

Under the P_0 efficient tariffs case, Busselton Water's tariffs are reduced in 2018-19 to recover only efficient costs. Tariffs rise by the expected rate of inflation thereafter.

The required reduction in tariffs in 2018-19 is 11.3 per cent (Table 36). Tariffs would then only have to rise by the rate of inflation in the subsequent years to match efficient costs over the review period.

Table 36 Total revenue requirement forecasts for Busselton Water ($ 000's nominal, except last column which is real $2016 000's)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	NPV of the 5 year review period (real $2016)
Efficient revenue	9.629	9.884	10.184	10.572	11.019	11.422	38.006
Actual revenue	10.684	9.892	10.176	10.518	10.999	11.503	38.006
Change in tariffs		**-11.3%**	**1.8%**	**1.8%**	**1.8%**	**1.8%**	

Source ERA estimates

Recommendation or finding

Busselton Water's tariffs – following recent increases – are not reflective of efficient costs. Instead, to be cost-reflective, Busselton Water's tariffs in 2018-19 would need to decline by 11.3 per cent.

6.3 Efficient tariff structures

This section sets out issues relevant to the reform of tariff structures. The State Government may wish to consider tariff structure reform for the following reasons:

- The tariff charges for the Water Corporation, Aqwest and Busselton Water are complex — simplifying certain tariff structures would be easier for customers to understand, administratively simpler and therefore less costly for the water businesses to implement. They might also encourage more efficient investment decisions and resource use, if prices more closely reflect the costs of supply.
- For some services, there are tariff structures that will arguably lead to more efficient outcomes than the tariff structures currently adopted.

Changing the levels of tariffs to make them more cost-reflective (as set out above) could, for some water services, allow for reforms to tariff structures to be implemented without leaving customers worse off. However, given the overall effect that tariff structure reform would have on customers' bills, the views of, and financial effect on, customers need to be considered prior to any changes being made.

The Water Corporation is also of the view that, given the number and complexity of tariffs, the ERA should recommend reforms to simplify tariff structures.[85] The Water Corporation is currently considering undertaking its own tariff reform project, for which it is engaging with customers throughout 2017.[86]

In this context, a broader question is the degree of flexibility that the water corporations should have to determine their own tariff structures. Price caps (in effect, the approach the State Government currently applies to the water utilities) set specific prices for individual services, or alternatively for a basket of services. Revenue caps set an overall revenue requirement consistent with efficient costs, generally for the total aggregate of the business's activity. With revenue caps, the business may then set the prices of individual services.

As set out in appendix 11, the current inquiry framework for reviewing and determining the water corporations' efficient costs and prices is unlikely to allow for a binding revenue cap approach to be implemented. For example, there is no ability for an independent body to ensure compliance with a revenue cap (albeit this could be managed with the State Government via the process of estimating the efficient operating subsidy). There is also no certainty for the water utilities as to when revenues will be re-set for the next review period. In addition, there is no mechanism to establish 'side controls' to protect customers from

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85 Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 34-73. The Water Corporation states that the project will take into consideration the following pricing principles: simplicity; transparency; supports water, wastewater and drainage resource management; equity; user pays.

86 Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 34-73.

frequently changing price structures and levels. How the approach would work in conjunction with the budget process would also need to be considered.

Another consideration is that a pure total revenue cap operates as both a ceiling and a guarantee of revenue. It eliminates volume risk, provided that the entity retains a customer base willing to pay higher prices if volumes decline, and provided that there are no constraints on the firm increasing prices. More generally, in comparison with a price cap, a pure revenue cap reduces the pressure to operate efficiently and/or to pursue increased sales that may otherwise be efficient. Revenue caps may also bring about a high degree of variability in consumer prices, in the absence of mechanisms to control against this.

On the other hand, when demand cannot be exactly predicted and when the tariff structure does not perfectly align with the cost structure, a revenue cap provides more certainty than a price cap that allowable revenues will be recovered. Put another way, it provides certainty to the water utility that it will be able to recover its efficient cost of service, and no more (subject to appropriate mechanisms being in place to ensure compliance with the revenue cap). It might also enhance allocative efficiency, to the extent that the water utilities are best placed to gauge how their customers will respond to changes in tariff structures. In addition, the approach could reduce the costs of undertaking price reviews, by eliminating the need to evaluate tariff structures in any inquiry processes.

Recommendation or finding

Efficient tariffs require consideration of both the level and structure of tariffs.

- The structure of tariffs refers to the mix of different charges that make up the total bill for each service. The water corporations' current tariff structures are unnecessarily complex. Developing simpler tariff structures would be less costly for the water corporations to implement and facilitate better customer understanding of the costs of consuming water services.

- Changing the levels of the water corporation's tariffs to make them more cost-reflective could, for some water services, allow for reforms to tariff structures to be implemented, without leaving customers worse off. However, given the impact that tariff structure reform could have on customers' bills, the views of, and financial effect on, customers need to be considered prior to any changes being made. The Water Corporation is currently engaging with customers about their needs and expectations around the price of water services. That engagement could focus on simplifying tariff structures and aligning them with efficient costs.

- How tariffs for individual services are set, and in particular the degree of flexibility given to the water corporations to set their own tariffs, is a threshold issue when considering tariff reform. Providing the water corporations with more flexibility to set their own tariffs could lead to more efficient outcomes, given that they are best placed to gauge how their customers will respond to changes. Changing from price cap control to a revenue cap would allow the water corporations to set tariffs for individual services, in contrast to the current arrangements where the Minister for Water sets the price control tariffs. However, appropriate constraints would still be required to protect customers from bill shock and ensure the State Government's equity objectives are met.

6.3.1 Residential water tariff structures

The current two-part tariff for water charges is recommended by the National Water Initiative Pricing Principles and generally adopted by regulators and water businesses around Australia (Table 37). The usage component is generally set with reference to the long run marginal cost (**LRMC**) of supply, and sometimes comprises more than one tier of usage. The fixed component is typically determined as the residual amount to be recovered after the revenue from usage charges has been estimated, and often varies between customer classes depending on service demands and equity considerations.[87]

[87] Natural Resource Management Ministerial Council, *National Water Initiative Pricing Principles*, 23 April 2010, p. 9.

Table 37 Selection of residential water use tariffs across jurisdictions

Jurisdiction	Tariff structure
ACT	Single fixed charge; usage — two tier inclining block tariff
New South Wales Sydney Water, Hunter Water and Local Councils Essential Energy	Single fixed charge; usage — single tier Single fixed charge; usage — single tier that varies by water quality
Northern Territory	Single fixed charge; usage — single tier
Queensland Queensland Urban Utilities and Unity Water Local Councils	Single fixed charge; usage — two tier inclining block tariff; plus $ p/KL State Government Bulk Water charge Single fixed charge; usage — single tier; plus $ p/KL State Government Bulk Water charge
South Australia	Single fixed charge; usage — three tier inclining block tariff
Tasmania	Single fixed charge; usage — single tier that varies by water quality
Victoria Metropolitan Regional	Single fixed charge; usage — three tier inclining block tariff Single fixed charge; usage — single tier, or two or three tier inclining block tariff, depending on the water business
Western Australia Water Corporation Aqwest Busselton Water	Single fixed charge; usage — three tier inclining block tariff Single fixed charge; usage — four tier inclining block tariff Single fixed charge; usage — six tier inclining block tariff

Note: In New South Wales, Queensland and Victoria, the levels of fixed and usage charges are not uniform state wide. They vary across both providers and regions. In Western Australia, the level of the fixed charge is subject to a uniform tariff cap, as are the levels of the first two tiers of the usage charge.

Source: Independent Competition and Regulatory Commission, *Draft Report: tariff review 2016 – regulated water and sewerage services*, September 2016, p. 56; Independent Pricing and Regulatory Tribunal, *Water Determination – Sydney Water Corporation*, June 2016, p. 7; Independent Pricing and Regulatory Tribunal, *Water Determination – Hunter Water*, June 2016, p. 6; Independent Pricing and Regulatory Tribunal, *Water Determination – Essential Energy*, June 2014, p. 5; Independent Pricing and Regulatory Tribunal, *Water Determination – Wyong Shire Council*, May 2013, p. 6; Power Water, 'Pricing and Tariffs', available at: https://www.powerwater.com.au/customers/my_account/pricing, accessed on 3 July 2017; Queensland Urban Utilities, 'Prices and charges 2017-18', available at: https://www.urbanutilities.com.au/residential/accounts-and-billing/prices-and-charges-2017-18, accessed on 3 July; Unity Water, 'Pricing', available at: http://www.unitywater.com.au/Contact-

us/Account-charges-and-pricing-FAQs.aspx, accessed on 3 July; Redland City Council, 'Residential Charges', available at: https://www.redland.qld.gov.au/info-20235/water_billing_and_charges/535/residential_charges, accessed on 3 July 2017; SA Water, '2017-18 pricing schedule', available at: https://www.sawater.com.au/__data/assets/pdf_file/0005-163895/Pricing-Schedule-2017-18.pdf, accessed on 3 July 2017; Taswater, 'Understanding my bill', available at: http://www.taswater.com.au/Your-Account/Understanding-My-Bill, accessed on 3 July 2017; Essential Services Commission, *Price Review 2013: Greater Metropolitan Water Businesses*, p. 179; Essential Services Commission, *2017-18 Tariff Schedules — Yarra Valley Water, Westernport Water, South East Water, Goulburn-Murray Water*; Water Corporation, 'Your bill and charges', available at: https://www.watercorporation.com.au/my-account/your-bill-and-charges, accessed on 3 July 2017; Aqwest, 'Residential pricing structure', available at: http://aqwest.com.au/Customers/PricingStructure.aspx, accessed on 3 July 2017; Busselton Water, 'Water charges', available at: http://www.busseltonwater.wa.gov.au/customers/water-charges, accessed on 3 July 2017.

The ERA considers that the two-part tariff structure, with the variable charge based on the LRMC of supplying water, should be retained.[88] The Water Corporation is also of the view that LRMC continues to represent a reasonable benchmark for the tariff for discretionary water consumption.[89]

However, the ERA considers that modifications could be made to simplify the charging regime for both customers and the water corporations. In addition to the economic efficiency arguments set out below, simplifying the charging regime would be both easier for customers to understand, and administratively simpler and therefore less costly for the water businesses to implement.

This section of the report sets out the ERA's recommendations about:

- the LRMC of water supply; and
- simplifying the charging regime by reducing the number of usage tiers.

6.3.1.1 Estimates of long run marginal cost

Two-part tariffs are often applied because they allow for:

- marginal prices to be set equal to marginal cost, thereby promoting efficient consumption and supply; and
- for the residual amount of the revenue requirement to be recovered from fixed charges, thereby ensuring the ongoing financial viability of the business and its investments, promoting dynamic efficiency.

Marginal cost is typically defined as the cost of supplying an additional unit of a good or service. The concept is important in setting tariffs. Ideally, the variable component of a tariff structure should signal the true cost of the last unit of additional consumption, because this will promote efficient consumption and supply. If tariffs reflect the marginal cost of supply, consumers will consume up to the point they consider the costs are equal to the benefit they receive. This consumption signals society's value of the resource to suppliers, thereby indicating how to efficiently allocate factors of production to meet supply.

Conceptually, LRMC is the additional cost associated with supplying an additional unit of demand when all factors of production are variable. LRMC can be thought of as including

[88] As set out below, while the State Government has in recent times not explicitly set the mid-tier usage charge at the LRMC of water, the current level of the charge is broadly in line with the ERA's estimates of LRMC.

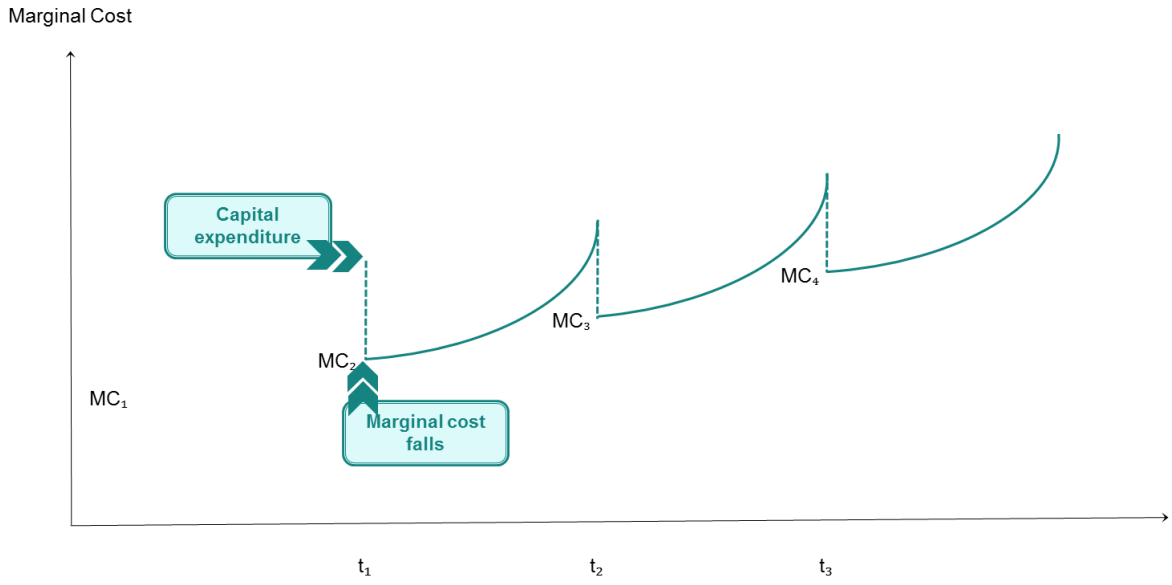
[89] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 63.

both capital and operating expenditure. For water supply, the relatively fixed inputs are the capital items such as dams, desalinisation plants, pumping stations and pipeline upgrades to accommodate such infrastructure. LRMC assumes these capital investments can be varied so as to deliver the lowest cost water required to meet a particular demand scenario.

LRMC is likely to fluctuate over time, because it is often based on the present value of a program of future capital expenditure. The closer (or further) capital expenditure is to (or from) the present day, the higher (or lower) the present value of a required future infrastructure augmentation is, due to less (or more) compound discounting (Figure 12). As time passes and an expansion of fixed infrastructure becomes imminent LRMC will rise towards the cost per unit of the additional supply provided.[90]

The LRMC will then fall after the capital has been sunk in the asset, for a time. This is because, with the recent augmentation, it will cost very little to add additional units of demand.

Figure 12 Fluctuation in LRMC over time



Source: Economic Regulation Authority.

As an overlay, if the projects delivering new capacity become increasingly more expensive, due to exhausting available technologies or diminishing natural resources, LRMC will trend upward with the passage of time.

[90] Technically, the LRMC is the discounted cost of an augmentation divided by the discounted stream of supply that it provides. Under Turvey's approach, a 'perturbation' of additional demand – say one year's worth – is added to the base case. See R. Turvey, 'Marginal Cost', *The Economic Journal*, vol. 79, No. 314, 1969, pp.282-299. The approach considers two different demand scenarios. These costs are calculated in two separate financial models which take the present value of a stream of capex and opex associated with (or 'triggered' by) each of two, marginally different, demand scenarios. The chronological ranking of the capex and opex associated with supply options is often predetermined on consideration of factors such as least cost and/or risk. The time between the triggering of each project and the associated costs is a function of existing supply and demand. The resulting difference between the present value in each financial model is then divided by the present value of the difference in demand forecasts to arrive at an estimate of long run marginal cost.

Charging for marginal water supply at LRMC essentially means that it becomes possible to meet any supply shortfall with a new water source without a significant change in the variable consumption charges.

The Water Corporation has a model to estimate the LRMC of water supply, which was initially developed for producing benchmark LRMC estimates for the Integrated Water Supply System.[91] In turn these estimates were considered to be an appropriate benchmark for transitioning tariffs over time, for each band of consumption. The Water Corporation's LRMC estimates, as amended by the ERA, have — up to 2012 — informed the tariff tiers (for example see Table 38).[92]

Table 38 Metropolitan LRMC based residential charges in 2011-12 (June 2012 $/kL)

	ERA recommendation for 2011-12 (made in 2008)	Actual 2011-12
Lowest tier charge	1.52	1.19
Mid-tier (mean) charge	1.99	1.90
Highest tier charge	2.34	2.17

Note: Lowest and highest tier charge were at the 95th and 5th percentiles.

Source: Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 40. Water Corporation data for actual 2011-12 tiers. Economic Regulation Authority analysis.

Since that time, however, there have been across-the-board tariff increases. The resulting changes in tariff levels for each tier were not informed by LRMC considerations.

The Water Corporation in recent times has used its LRMC model as a tool to support strategic decision making, rather than to inform efficient tariff pricing.[93] This is an important distinction of application. The Water Corporation's model incorporates fairly specific parameters, options and constraints that take technical realities and risks into account. This makes it more suitable for strategic decision making. Specifically, the scenario analysis in the Water Corporation's model is mainly focussed on supply or inflow outcomes, rather than demand scenarios.

For this inquiry the ERA has developed a simplified version of the Water Corporation's LRMC model. The objective is to assess the effect of numerous demand (rather than inflow) scenarios. The distribution of LRMC estimates resulting from demand are of interest, because it allows the probability of different levels of future demand to be mapped to different future LRMC scenarios, and their probability of occurring. For example, extreme levels of consumption can be matched with the more extreme LRMC of supply estimates. This information can assist in associating various bands of water usage with various levels of LRMC. This can aid in the structuring of tariffs. The trend in LRMC over time is also useful information when formulating the tariff structure.

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91 Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation*, Aqwest and Busselton Water, 28 March 2013, p. 67.

92 The ERA recommended that the tariff tiers be transitioned towards the LRMC estimates over the period 2012-13. See Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 24 and p. 40.

93 Correspondence from Water Corporation (WC8), 'Long Run Marginal Cost notes for 2016-17 ERA Inquiry', received 21 February 2017.

As set out in further detail in appendix 4, the ERA has used its LRMC model to simulate demand scenarios under three discrete settings — conservative, optimistic and middle. The conservative scenario assumes high population growth, no inflow and no change in consumption per capita (that is, there is more risk for future adequate water supplies). The optimistic scenario assumes low population growth, high inflow and low consumption per capita projections (that is, there is less risk for future adequate water supplies). The middle scenario assumes average population growth, the Indian Ocean Climate Initiative 3 based inflow and an average level of consumption per capita (mid-point risk).[94]

Inflow assumptions have a major impact on both the level and dispersion of estimates. The use of conservative demand (high) and supply (low inflow) forecasts may result in excessively high LRMC estimates. This produces lower risks in terms of higher than expected expenditure, tariffs and severity of water restrictions, but has social costs in terms of forgone economically efficient consumption. An overly optimistic demand (low) and supply (high inflow) forecast may result in excessively low LRMC estimates. In turn, this may encourage excessive consumption which increases the likelihood of expensive supply projects being bought forward, more severe water restrictions and more rapid increases in tariffs.

In the current context of a drying climate, the zero inflow scenario appears to be the most appropriate in order to avoid increases in the likelihood of severe water restrictions and rapid increases in LRMC-based tariffs. Accordingly, for the ERA best estimates, all three scenarios are modified to use the zero inflow assumption.

The current outlook for population growth appears subdued on the basis of easing economic conditions. Perth consumption per capita has been declining in recent years, but is still fairly high relative to other Australian cities. For these reasons the middle demand scenario in between conservative and optimistic is considered to be the most likely. The ERA's best estimates are therefore based on an average of the three (zero inflow modified) scenarios, in order to better reflect the mean outcome.

Table 39 compares the resulting ERA best LRMC estimates to 2015-16 usage charges and also those recommended for 2015-16 by the ERA in its 2012 inquiry (see appendix 4 for more detail).

As a general rule, the usage charge for the highest usage tier should not be set above the highest estimate of the LRMC of water supply. However, there can be grounds for doing so under certain approaches to dealing with uncertainty and risk. Dealing with uncertainty and risk is a key element of efficient tariffs. There are various approaches to dealing with this.

For example, the long run marginal cost analysis reported above accounted for uncertainty about likely future costs of water supply by examining three scenarios – based on optimistic, medium and conservative water inflow outcomes.

[94] Based on the average of firstly, the lowest Water Corporation LRMC model consumption per capita projections, and secondly, constant consumption at current level projections.

Table 39 Comparison of metropolitan LRMC based residential charges (2015-16 $/kL)

Usage band	2015-16 volumetric charges	ERA recommendation for 2015-16 (made in 2012)	ERA best estimate
Highest tier charge	2.99	3.11	3.60
Mid-tier (mean) charge	2.11	2.06	2.32
Lowest tier charge	1.59	1.49	0.97

Note: 2015-16 service charge is as at 26 June 2017 – charges changed on 1 July 2017. Usage bands for the 2012 inquiry were the 90th and 10th percentiles; usage bands for the ERA best estimate are the 95th and 5th percentiles. ERA best estimate values are in forecast $2018.

Source: Water Corporation website: https://www.watercorporation.com.au/my-account/your-bill-and-charges viewed on 26 June 2017. Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board: Revised Final Report*, 28 March 2013, p. 69. Economic Regulation Authority analysis.

Beyond that, it is possible to apply options theory to pricing. In contrast to the net present value condition imposed under traditional regulatory building block pricing frameworks, options theory seeks to recognise that there is additional value in the options embedded in corporate actions. For water pricing, this could be by allowing usage tariffs above the highest estimate of the LRMC of water supply, in order to capture the value associated with the option of deferring a capital investment (for example, in a new desalination plant).[95] There is value in the option of deferring the investment, because it may ultimately prove to be unnecessary.

Options theory could therefore provide a rationale for the level of the usage charge to be above the highest estimate of the LRMC of water supply. The ERA is however not aware of the approach having been implemented by water utility regulators in Australia to date.

6.3.1.2 Simplifying the number of usage tiers

The current tariff structure for residential water users includes multiple tiers for the usage charge. In the metropolitan area there are three tiers and in country schemes there are four tiers for the Water Corporation and Aqwest's customers, and six for Busselton Water's customers (Table 40).

The per kL charge recommended by the ERA for each of the Water Corporation's usage tiers has in the past been estimated as follows:

- In 2004, it was recommended that the first tier be set at the lower estimate of LRMC and the second tier be set at the upper estimate of LRMC.[96] The range of LRMC estimates was based on different assumptions about source development plans.
- In 2008, it was recommended that the first tier be set at the lower estimate of LRMC and the second tier be set at the upper estimate of LRMC. It was recommended that the third tier be set at the tariff level that is likely to achieve the same amount of water savings as two day per week sprinkler restrictions.
- In 2012 it was recommended that the first tier be set at the lower estimate of LRMC; the second tier at the central estimate of LRMC; and the third tier at the upper

[95] Tariffs would then fall below LRMC after the capital investment had taken place.

[96] Only two tiers were recommended by the ERA in this inquiry.

estimate of LRMC. Three estimates of LRMC were derived, recognising the uncertainty surrounding the estimation of LRMC.

The levels of the Water Corporation's country charges for each tier have been set on various different bases, due to practical difficulties with estimating the LRMC of water in country regions.[97] Broadly however, the levels of country charges for tiers not subject to the State Government's Tariff Cap Policy have been loosely based on the direct cost of water supply in the different country schemes.

Table 40 Current tiers for water usage charges – the Water Corporation, Aqwest and Busselton Water

Customer group	Consumption thresholds for tiers
Water Corporation Metropolitan	• 0-150kL • 151-500kL • >500kL
Water Corporation Country	Each country scheme is placed in 1 of 5 cost classes – each cost class has different $/kL charge Within cost class, $/kL increases across 4 tiers. Definition of the tiers varies by location: • 0-150kL (south), 0-350kL (north) • 151-300kL (south), 351-500kL (north) • 301-550kL (south), 501-750kL (north) • >550kL (south), >750kL (north) $/kL in first and second tiers must be no more than $/kL for equivalent metropolitan customers
Aqwest	Increases across 4 tiers: • 0-150kL • 151-350kL • 351-500kL • > 500kL Highest usage charge capped at the highest usage charge for Water Corporation metropolitan customers
Busselton Water	Increases across 6 tiers: • 0-150kL • 151-350kL • 351-500kL • 501-700kL • 701-1000 • >1000kL Highest usage charge capped at the highest usage charge for Water Corporation metropolitan customers

Source: Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 79.

[97] ERA, *Final Report: Inquiry on Country Water and Wastewater Pricing in Western Australia*, 23 June 2006, p. 19.

Economically efficient usage charges

On economic efficiency grounds, a single usage tier is preferable to multiple usage tiers. A single tier set at LRMC will ensure that the price for marginal water use is set at the LRMC of water. Where there are multiple tiers, a household's marginal use of water may fall in a consumption tier which has a per kL price that is either higher or lower than the LRMC of water.

The National Water Initiative pricing principles set out that, on economic efficiency grounds, the usage charge should comprise only a single usage charge.[98]

The Productivity Commission has also found that the volumetric component of two-part tariffs is distorted by the prescription of inclining block tariffs, which create inefficiencies and inequities.[99] It considers that inefficiencies are created because inclining block tariffs result in water consumed in some of the tiers being priced above or below LRMC.[100] It considers that inequities are created because large households, with higher essential needs than small households, are disadvantaged.[101] It argues that substantial efficiency gains are available from no longer prescribing inclining block tariff structures.[102]

Freebairn argues that the market model for efficient allocation requires a single price for all water uses, unless there are different marginal costs of supply.[103] As set out in appendix 12, Freebairn finds that if marginal costs are increasing – specifically, where marginal costs are above average costs – a single usage charge allows the water utility to recover its efficient costs, hence promoting efficiency.[104]

The National Water Initiative pricing principles do however acknowledge that more than one tier is sometimes adopted for policy reasons.[105] As can be seen in Table 37, each State/Territory currently varies as to whether there is a single usage charge or inclining block tariffs — and if inclining block tariffs are adopted, whether two or three tiers are applied. The maximum number of tiers adopted in other jurisdictions is three.

Affordable water for non-discretionary use

A common policy objective is to ensure that water for non-discretionary use is available to all households at an affordable price. For this reason, the current State Government policy provides for a lower volumetric water charge for residential customers with relatively low usage (of less than 150 kL of water use, or less than 350 kL in the north of the State – with the 200 kL difference in the tier threshold reflecting the hotter climate in the north).

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98 Natural Resource Management Ministerial Council, *National Water Initiative Pricing Principles*, 23 April 2010, p. 10.

99 Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1,* No. 55, 31 August 2011, p. 161.

100 Ibid, p. 161.

101 Ibid, p. xxvii.

102 Ibid, p. 160.

103 J. Freebairn, 'Some emerging issues in urban water supply and pricing', *Economic Papers*, vol. 27, No. 2, June, 2008, pp. 184-193.

104 Ibid, pp.184-193. The ERA's analysis suggests that the LRMC of water is likely to be rising over time, but is not yet higher than average costs.

105 Natural Resource Management Ministerial Council, *National Water Initiative Pricing Principles*, 23 April 2010, p. 10.

Such an approach also recognises that the service charge is fixed, with households consuming lower volumes paying relatively more in average cost terms than large volume households. Very large volume households are often likely to be wealthier, with large gardens. Very low volume households are more likely to be utilising water only for their non-discretionary needs, and may be those less able to afford water services. Providing more than one tier in an inclining block can work to reduce the average cost of water for households that use a low volume of water.

The ERA has previously found that charging lower tariffs for a level of water use regarded as non-discretionary is probably only partly effective in providing affordable access to an essential requirement for water.[106] This is because water businesses do not typically have information on the number of occupants in a household, which means that the level of usage below which the low price applies is an arbitrary threshold – arbitrary because the single largest determinant of non-discretionary household water use is the number of occupants.[107]

The low price on the first 150 kL of water use may also make it necessary to charge a higher usage price for higher levels of water use and/or to increase the service charge, both of which would be likely to penalise large families.[108] Put another way, because the discount on the usage charge goes not only to low volume customers but to all customers, the reduction in revenue (relative to if no discount was applied) can be large — this revenue shortfall needs to be balanced somehow.[109] If the revenue shortfall is made up by increasing the service charge, the total combined impact of the low usage discount and the increase in the service charge may imply that water bills for low water usage customers are not significantly different from the bill outcome if no low usage discount was applied.[110]

Further, charging lower tariffs for a level of water use regarded as non-discretionary is a departure from LRMC pricing and therefore has implications for the efficient use of water.[111] Even for households consuming relatively small qualities of water – which may generally be regarded as for non-discretionary use – usage charges at levels of LRMC would provide signals as to the value of water. This would play a role in driving household investment in water-efficient appliances and fittings.[112]

Encouraging customers to save water

One rationale for adopting a third tier, or more higher tiers, is to manage demand for water by making high use households pay more per kL of water.

It was for this purpose that, following the 2005 inquiry, the State Government decided to retain a tariff at a level that was almost twice as high as the (then) estimate of LRMC for

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[106] Economic Regulation Authority, *Final Report: Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, p. 40.

[107] Ibid, p. 40.

[108] Ibid, p. 40.

[109] Economic Regulation Authority, *Final Report: Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 34.

[110] Ibid, p. 34.

[111] Economic Regulation Authority, *Final Report: Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, p. 40.

[112] Ibid, p. 40.

residential usage above 950 kL per year.[113] However, as noted above, on economic efficiency grounds, the only rationale for charging above the highest estimate of the LRMC of water supply is to achieve the explicit objective of deferring a capital investment (that may ultimately prove unnecessary).

Whether adopting a higher usage tier actually deters higher levels of water use is also an open question. A large body of economic literature finds the responsiveness of residential water demand to changes in price to be low in the short run, but higher in the long run.[114] The ERA has also found that there is uncertainty as to the effects of seasonal pricing on demand (particularly in the presence of water restrictions). Demand elasticity is generally greater in the long run than the short run, because households take time to change their consumption habits.[115]

On the other hand, the economic literature also finds that non-price approaches to managing water demand, especially water restrictions, lead to economic inefficiencies, are inequitable and unpopular, and place an unnecessary administrative burden on water utilities.[116]

These issues were considered by IPART when it introduced a two tiered usage charge for Sydney Water in 2005, and then moved to a single tiered usage charge in 2008 (Box 2).[117] IPART noted that it introduced the two tiered usage charge when Sydney was in the middle of a drought, and reducing water use was a high priority – but that by 2008, water was deemed unlikely to be scarce in the short to medium term.[118] It therefore moved to a single tiered usage charge for Sydney Water from 2008.

[113] Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 35.

[114] Price elasticity estimates were generally found in the range of zero to 0.5 in the short-run and 0.5 to unity in the long-run. See Hoffman and Worthington, 'An empirical survey of residential water demand modelling', *Journal of Economic Surveys,* vol. 22(5), 2008, p. 16.

[115] Economic Regulation Authority, *Final Report: Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, p. 33.

[116] Hoffman and Worthington, 'An empirical survey of residential water demand modelling', *Journal of Economic Surveys,* vol. 22(5), 2008, p. 16.

[117] IPART, *Final Report and Determination – review of prices for Sydney Water Corporation*, 2008, p. 91.

[118] Ibid.

Box 2 - IPART's considerations of two tiered usage charges[119]

IPART found that the outcomes of a two tiered inclining block tariff were mixed. IPART found that a two tiered inclining block tariff had the following pros:

- It may be an effective tool for curbing usage when water is in short supply, because it can provide an equitable way to reflect the scarcity value of water. Setting a higher charge for discretionary water uses is likely to produce a more significant demand reduction than setting a higher charge for non-discretionary uses, because demand for the former is likely to be more elastic than demand for the latter. However, IPART noted that discretionary water use is also targeted by water restrictions, meaning that an inclining block tariff is likely to have less impact on discretionary water use than if it was applied in isolation.
- It may be desirable from a social equity perspective if low income households pay a relatively low charge to meet basic water needs, while high income households pay a relatively high charge to meet discretionary needs.

IPART found that a two tiered inclining block tariff had the following cons:

- It could result in larger households incurring a higher charge to meet their basic water needs, with smaller households paying a lower charge to meet their discretionary needs. This is because tiers are generally set on a per household basis rather than a per capita basis, so the relatively high and low prices are unlikely to accurately target discretionary and non-discretionary uses, respectively.
- It could also result in socially inequitable outcomes because large, low income households will not be protected from high prices, while small, high income households will. (To address this, IPART had set the consumption level at which the higher usage charge started applying at 400kL per annum; and low income households with six or more occupants were made eligible for a rebate of up to $40 per annum if they consumed more than 400kL per annum.)
- It may result in some customers changing their consumption behaviour in response to the higher tier price, even if they are low water users. If the Tier 2 price is set too high, it may have the unintended consequence of causing some customers (particularly vulnerable customers) to restrict their basic usage beyond what is necessary to avoid paying the higher price.
- It is less efficient than a single usage charge (set at the marginal cost of supply) because it results in at least some consumption being priced at a level either above or below marginal cost. Setting usage charges at the marginal cost of supply represents the sacrifice that society makes in producing this product over others. This is also known as the opportunity cost. It signals to consumers the costs imposed (or avoided) if they increase (or reduce) their consumption by a small amount.

[119] Ibid, p. 91.

The ERA's recommendation

In principle, the ERA considers that – on economic efficiency grounds – a single usage tier is preferable to multiple usage tiers. The evidence that inclining block tariffs deliver equity objectives or help to conserve water is mixed, at best. Simplifying the charging regime would be easier for customers to understand. It would be administratively simpler and therefore less costly for the water businesses to implement.

Moving from multiple usage tiers to a single usage tier would however have an effect on customers' bills, which needs to be quantified and considered.

Conceptually, removing the discount for the first 150kL of consumption would increase the revenue earned from water use charges, which should provide scope to reduce the level of the service charge. While removing the uplift for consumption above 500kL would reduce the revenue earned from water use charges, this would not be by the same quantum as the increase in revenue earned from removing the discount[120] — hence, the net effect should be to reduce the level of the service charge.

In the 2008 inquiry, the ERA found that applying a discount for the first 150kL of water consumption leaves very low water users worse off, but low to medium water users better off.[121] If the metropolitan water usage charge in 2009-10 had been set at a flat rate of $0.84 per kL, the service charge would have been $196.[122] Applying a discount of 50 per cent to water usage up to 150kL per year (i.e. applying a charge of $0.42 per kL) increased the service charge by $37 (from $196 to $233).[123] The ERA found that the net outcome was that customers using:[124]

- less than 89kL per year would be in a worse financial position from having the 50 per cent discount;
- between 89kL and 150kL per year would benefit by up to $26 from having the 50 per cent discount; and
- more than 150kL per year would benefit by $26 from having the 50 per cent discount.

In previous inquiries, the ERA has recommended that – to avoid bill shock from moving away from having a low price for the first 150kL of water use – price increases over time should be smoothed, by limiting the amount of the price increase in any one year.[125] The

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120 This is because all customers receive the discount for their first 150kL of water consumption, whereas only a smaller subset face the higher per kL charge associated with water consumption over 500 kL. In the 2008 inquiry, it was found that only 7 per cent of total water sales in the metropolitan area are above 500 kL/year. See Economic Regulation Authority, *Final Report: Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 35.

121 Ibid, p. 34.

122 Ibid.

123 Ibid.

124 Ibid.

125 Economic Regulation Authority, *Final Report: Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, pp. 41-43. In that inquiry, the customer groups highlighted as being most affected were tenants and seniors. As noted above, pensioners are the only group of customers who receive a concession on the first tier of water consumption. See Economic Regulation Authority, *Final Report: Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 46. In that inquiry, the ERA considered the effects on low volume customers and households with large families, finding that a three year transition period would benefit households with large families and leave low volume customers indifferent (compared to an immediate transition).

current inquiry has also found that wastewater tariffs should be decreased – this could partially or fully offset the effect on customers' bills of moving towards higher water usage charges.

Moving from multiple usage tiers to a single usage tier would also have implications for the way in which the State Government's uniform Tariff Cap Policy could be implemented. This issue is discussed below.

The ERA recommends that the views of, and financial effect on, customers be considered prior to any changes to the current tariff structure being made, along with the approach to transition required to avoid bill shock. The Water Corporation notes that it is currently engaging with customers about tariffs, as part of a prospective tariff reform project.[126]

The ERA also recognises that the State Government may wish to adopt more than one usage tier because it has objectives that are broader than encouraging economic efficiency. The manner in which broader policy objectives are achieved is a matter for the State Government.

However, if a lower tier of water use based on a low consumption level is retained, the level of the charge for that tier could be informed by the ERA's lower estimate of the LRMC of water supply. If a higher tier of water use based on a high consumption level is retained, the level of the charge for that tier could be informed by the ERA's highest estimate of the LRMC of water supply. This would create some link between tariffs for the higher and lower usage tier and cost.

Recommendation or finding

The Water Corporation's residential water tariffs have three usage tiers for metropolitan customers and four usage tiers for country customers. Aqwest's residential water tariffs have four usage tiers and Busselton Water's residential water tariffs have six usage tiers. A single usage tier is preferable to multiple usage tiers because it promotes economic efficiency, by signalling the cost of new water supplies. However, the effect on customers' bills and implementation of the Uniform Tariff Cap policy would need to be considered prior to any reduction in the number of usage tiers. If the effect on customers' bills is found to be substantial, consideration would need to be given to how to phase in any changes in order to avoid bill shock.

The ERA recognises that the State Government has objectives for water pricing that are broader than just efficiency objectives, and that three usage tiers may therefore continue to be adopted in the metropolitan area. The ERA has developed a lower, mean and upper estimate of the Long Run Marginal Cost of water that can be used to inform the level of tariffs for the three metropolitan usage tiers, as follows, in 2017 18 dollars:

- Lower estimate: $0.97/kL, compared to $1.68/kL currently;
- Mean estimate: $2.32/kL, compared to $2.24/kL currently; and
- Higher estimate: $3.60/kL, compared to $3.17/kL currently.

[126] Water Corporation, *Submission to the Economic Regulation Authority,* p. 63 and p. 73.

Water service charges for metropolitan customers should continue to be set to recover the residual revenue requirement after revenue from the usage charge has been taken into account.

6.3.2 Residential wastewater tariff structures

The same broad principles of efficient tariffs apply for wastewater as for water — that is, cost-reflective pricing is important for the financial viability of water utilities and for efficient use of wastewater services.[127]

In principle the efficient tariff structure for residential wastewater customers is a two-part tariff. However, in practice there are challenges in cost-effectively and reliably measuring the amount of wastewater that a household discharges. This has meant that two-part tariffs for residential customers have tended not to be adopted.[128]

Different tariff structures are adopted instead. These include fixed charge approaches (based on GRV, average costs or other metrics) and volumetric charges.[129] While all of these tariff structures meet the objective of allowing the water utility to recover its efficient costs of supplying wastewater services, they each have different implications for the contribution of different customer groups to the recovery of those costs.

Around Australia volumetric charging for wastewater is currently only applied in Victoria and Queensland, as part of a two-part tariff (Table 41). Tariffs based on a single fixed charge are more common. In Western Australia, the fixed charges paid by the Water Corporation's residential metropolitan and country wastewater customers are based on GRV multiplied by a rate in the dollar. South Australia is the only other jurisdiction that adopts the GRV-based approach.

[127] NERA, *Setting Efficient Tariffs for Wastewater Infrastructure*, 25 March 2013, p. 1.

[128] Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1: No. 55*, 31 August 2011, p. 142.

[129] The GRV of a property is the value 'the land might reasonably be expected to realise if let on a tenancy from year to year upon condition that the landlord were liable for all rates, taxes and other charges thereon and the insurance and other outgoings necessary to maintain the value of the land' (*Valuation of Land Act 1978*).

Table 41 Residential wastewater tariffs across jurisdictions

Jurisdiction	Tariff structure
ACT	Single fixed charge
New South Wales	Single fixed charge
Northern Territory	Single fixed charge
Queensland	Mix of: • Single fixed charge • Single fixed charge; plus usage charge (calculated by multiplying the variable sewage price by the sewage disposal volume — the sewage disposal volume is calculated as a proportion of the water that enters the property through the water meter)
South Australia	Rate in the dollar applied to the value of the property
Tasmania	Single fixed charge
Victoria	Mix of: • Single fixed charge • Single fixed charge; plus usage charge (calculated by multiplying the variable sewage price by the sewage disposal volume — the sewage disposal volume is calculated based on metered water use multiplied by a discharge and a seasonal factor)
Western Australia	Rate in the dollar applied to the value of the property

Note: In New South Wales, Queensland, South Australia and Victoria, the level of charge/rate in the dollar is not uniform state wide — it varies across providers and/or regions.

Source: Independent Competition and Regulatory Commission, *Draft Report: tariff review 2016 – regulated water and sewerage services*, September 2016, p. 45; Independent Pricing and Regulatory Tribunal, *Water Determination – Sydney Water Corporation*, June 2016, p. 19; Independent Pricing and Regulatory Tribunal, *Water Determination – Hunter Water*, June 2016, p. 16; Independent Pricing and Regulatory Tribunal, *Water Determination – Essential Energy*, June 2014, p. 20; Independent Pricing and Regulatory Tribunal, *Water Determination – Wyong Shire Council*, May 2013, p. 17; Power Water, 'Pricing and Tariffs', available at: https://www.powerwater.com.au/customers/my_account/pricing, accessed on 3 July 2017; Queensland Urban Utilities, 'Prices and charges 2017-18', available at: https://www.urbanutilities.com.au/residential/accounts-and-billing/prices-and-charges-2017-18, accessed on 3 July; Unity Water, 'Pricing', available at: http://www.unitywater.com.au/Contact-us/Account-charges-and-pricing-FAQs.aspx, accessed on 3 July; Redland City Council, 'Residential Charges', available at: https://www.redland.qld.gov.au/info-20235/water_billing_and_charges/535/residential_charges, accessed on 3 July 2017; SA Water, '2017-18 pricing schedule', available at: https://www.sawater.com.au/__data/assets/pdf_file/0005-163895/Pricing-Schedule-2017-18.pdf, accessed on 3 July 2017; Taswater, 'Understanding my bill', available at: http://www.taswater.com.au/Your-Account/Understanding-My-Bill, accessed on 3 July 2017; Essential Services Commission, *Price Review 2013: Greater Metropolitan Water Businesses*, p. 191; Essential Services Commission, *2017-18 Tariff Schedules — Yarra Valley Water, Westernport Water, South East Water, Goulburn-Murray Water*; Water Corporation, 'Your bill and charges', available at: https://www.watercorporation.com.au/my-account/your-bill-and-charges, accessed on 3 July 2017; Aqwest, 'Residential pricing structure', available at: http://aqwest.com.au/Customers/PricingStructure.aspx, accessed on 3 July 2017; Busselton Water, 'Water charges', available at: http://www.busseltonwater.wa.gov.au/customers/water-charges, accessed on 3 July 2017.

Allocating cost recovery among households according to their contribution to costs

The economic efficiency benefits of two-part tariffs are set out in section 6.3.1.1. Broadly, two-part tariffs promote efficiency because they allow for:

- marginal prices to be set equal to marginal cost, thereby promoting efficient consumption and supply; and
- the residual amount of the revenue requirement to be recovered from fixed charges, thereby ensuring the ongoing financial viability of the business and its investments, promoting dynamic efficiency.

For wastewater, the volumetric component of a two-part tariff would apply to the kilolitre of wastewater discharged, and the fixed charge would be set to recover the residual amount of the revenue requirement. This is the tariff structure that is currently applied for non-residential wastewater customers.

However there is a barrier to implementing two-part tariffs for residential wastewater, due to the cost of implementing volumetric charges. The Productivity Commission finds that while the variable costs of wastewater can be considerable, giving rise to a possible efficiency case for volumetric charging, it would require separate wastewater metering which is likely to be prohibitively expensive.[130] It recommends that utilities are best placed to weigh up the costs and benefits of implementing volumetric charging.[131]

In the absence of wastewater metering, proxies could be used to estimate the volume of wastewater a household discharges. As set out in Table 41, this is the approach adopted for calculating volumetric charges in Victoria and Queensland. In Victoria, wastewater disposal volume is calculated based on metered water use, which is multiplied by a discharge factor and a seasonal factor. In Queensland, wastewater disposal volume is calculated as a proportion of the water that enters the property through the water meter.

In applying water use as a proxy, the fact that some households water their gardens and fill their pools while others do not — meaning that the ratio of water supplied to water returned to the wastewater system varies across consumers — might need to be taken into account. This is potentially a bigger consideration in Western Australia than other jurisdictions, given the high average percentage of outside water use (around 40 per cent of residential water use, compared to, for example, around 10 per cent in Victoria),[132] and the resulting variability of outside water use between customers in Western Australia.

There is also a question as to whether volumetric charging for wastewater would actually affect households' decisions about how much wastewater to discharge, given that they cannot choose whether to discharge water or not, once it has been consumed.

On balance, the cost of implementing a two-part tariff for residential wastewater customers may outweigh any efficiency benefits.

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[130] Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1,* No. 55, 31 August 2011, p. 142.

[131] Ibid, p. 143.

[132] Water Corporation, *Perth Residential Water Use Study*, 2008-09, p. 6; K. Gan and M. Redhead, *Melbourne Residential Water Use*, June 2013, p. 16.

Alternative ways to allocate cost recovery among customers

If two-part tariffs are not adopted, a fixed per household charge is the alternative.[133] There are two bases that are generally considered for determining the level of the fixed charge a household faces.

The first of these, and the approach that is currently adopted in Western Australia, is to allocate cost recovery according to capacity to pay. GRV is used as the proxy for capacity to pay.

The perceived strength of the GRV-based wastewater charge is that it results in lower charges for those with lower capacity to pay.

However, in previous inquiries the ERA recommended moving away from GRV-based wastewater charging because:[134]

- the ERA has not been aware of reliable evidence to support the view that there is a strong correlation between property values and income;
- it is not an effective or well-targeted approach to charging on the basis of capacity to pay; and
- there are administrative costs to the Water Corporation, estimated at $3 million to $4 million per year in 2012.

A recent study by Fogarty et al found that GRV property based charging *over-estimates* the capacity to pay of those on low incomes (that is, household incomes below around $80,000 per annum).[135] While there is generally a positive correlation between property GRV and household income, this relationship breaks down at the lowest and highest household income levels.[136]

An alternative to allocating cost recovery among households is for all households to contribute an equal amount, for example, by setting the fixed charge at the level of average per household cost. This approach would be administratively simple to implement and could be considered equitable, in the sense that all customers contribute an equal amount. However, it has been found that those with lower capacity to pay would, on average, pay more than under a GRV-based charging arrangement.[137]

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[133] There might also be efficiency arguments in favour of fixed charges — namely that because wastewater transmission and distribution networks account for a significant proportion of the total cost of supplying wastewater services, this tends towards applying some form of fixed charge. The Productivity Commission finds that because distribution network costs are driven by the number of customers, not the volume of wastewater, a fixed charge per connection is appropriate (Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1,* No. 55, 31 August 2011, p. 149). Fogarty et al also argue that, to the extent that fixed costs are the primary driver of overall wastewater service cost, reliance on a volumetric charge could be seen as reducing the link between costs and customer service charges (Fogarty, J., et al., *Wastewater service charges in Western Australia: there is no equity-efficiency trade-off,* February 2017, p. 15).

[134] Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation*, Aqwest and Busselton Water, 2012, p. 6.

[135] Fogarty, J., et al., *Wastewater service charges in Western Australia: there is no equity-efficiency trade-off*, February 2017, p. 4.

[136] Ibid, p. 4 and p. 8. There could however be a stronger relationship between GRV and wealth, as opposed to income. The ERA has not investigated the relationship between GRV and wealth at this time.

[137] Ibid, *Wastewater service charges in Western Australia: there is no equity-efficiency trade-off*, February 2017, p. 16.

These effects could however be reduced if wastewater tariffs were decreased, in line with the ERA's findings that wastewater revenues in the metropolitan area currently substantially exceed efficient costs. Based on the efficient metropolitan costs, the ERA estimates that the average cost per available residential wastewater service would be around $562 per annum, and for non-residential, $1,245 per annum.

However, the current lowest charges for wastewater are below these amounts:

- The current minimum annual wastewater charge for metropolitan residential customers is approximately $404, and for vacant land $304.
- The non-residential first fixture costs $940 per annum, with a discount percentage of 73 per cent for concessional entities such as aged homes.

That suggests that the bill of a minimum charge payer could rise by around $160 per annum. First fixture businesses could face a rise of around $300. If the government wishes to mitigate these increases, it could consider a targeted concession.

Over the longer term, in an environment where recycled water may play a bigger role in water supply, cost reflective wastewater tariffs could become important in ensuring that development of the market is not geographically distorted.[138] The ERA has previously recommended that customers using recycled water should be able to gain access to wastewater on the same terms and conditions (including prices) as the Water Corporation, in order to increase possible competition in the market for non-potable water.[139] With this type of competitive retail/regulated network market structure — where residential customers could choose which recycler disposed of their wastewater — if charges vary across suburbs, recyclers might be encouraged to only invest in those suburbs with high wastewater tariffs. Put another way, development of the market could be geographically distorted if wastewater charges vary across locations in order to meet equity objectives. Average cost pricing would mean that recyclers' decisions about where to invest are made on the basis of factors other than the price of wastewater.[140]

The ERA's recommendation

The efficient tariff structure for residential wastewater customers is a two-part tariff. However, it is not possible to cost-effectively and reliably measure the amount of wastewater that a household discharges in Western Australia. The cost of implementing a two-part tariff structure is therefore likely to outweigh the efficiency benefits of doing so.

It follows that the choice of tariff structure to apply for residential wastewater is between the current GRV-based approach, or an approach based on the average cost per household of supplying wastewater services. Each approach has implications for the sharing of cost

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[138] ACIL Allen, in a study for Waterwest, contend that consumers would pay up to 20 per cent less for fit-for-purpose recycled water than for scheme potable water. See Waterwest, *Future Opportunities for Water Services in Perth*, December 2016.

[139] A third party access regime would allow other parties to transport wastewater through the Water Corporation's natural monopoly infrastructure (in exchange for an appropriate access), which would facilitate the provision of recycled water services. See Economic Regulation Authority, *Final Report: Inquiry into Pricing of Recycled Water in Western Australia*, 6 February 2009, p. iv.

[140] The same argument *could* apply to two-part wastewater tariffs, but only if these are cost effective to implement and are favoured on efficiency grounds to control demand in the presence of capacity constraints (the volumetric charge would then be based on the LRMC of augmentation). However, given the large contribution of fixed capital costs to total wastewater costs, and the costs of implementing two part charging, it may be that average cost charging is just as efficient (see also footnote133).

recovery among different households, with the latter approach leading to all households contributing the same amount irrespective of their capacity to pay.

In the past, transitioning from the GRV approach to an average per household cost approach would have led to large increases in tariffs for households with a low GRV, in turn raising an equity concern. However the ERA's finding in the current inquiry that wastewater tariffs need to decrease in order to reflect efficient costs reduces this particular equity concern.

An average cost based fixed charge would be less costly for the Water Corporation to administer and easier for customers to understand than the GRV approach. In addition, in an environment where recycled water has the potential to play a bigger role in delivering water supplies to customers who would otherwise use scheme water, basing the fixed charge on the average cost per household could create fewer distortions in the development of the recycled wastewater industry. If residential wastewater tariffs vary by suburb as they do with a GRV approach, recyclers might be encouraged to only invest in those suburbs with high wastewater tariffs. If tariffs are the same across the metropolitan area, other factors would determine recyclers' decisions about where to invest.

On balance, the ERA again recommends that a fixed charge based on the average cost per household, rather than GRV, be adopted for residential wastewater customers. The ERA is however seeking the views of industry participants about the impact of the current, and alternative, tariff structures on development of the recycled wastewater sector.

Recommendation or finding

The efficient tariff structure for wastewater customers is a two-part tariff. However, this cannot be implemented in Western Australia because it is not currently possible to cost-effectively and reliably measure the amount of wastewater that a household discharges. The choice of tariff structure is therefore between the current Gross Rental Value approach, or an approach based on average cost. Each has implications for the sharing of costs among different households, with the latter leading to all households contributing the same amount, irrespective of their capacity to pay.

An average cost based charge:

- would be less costly for the Water Corporation to administer and easier for customers to understand; and
- could lead to fewer distortions in the geographic development of the recycled wastewater industry, in an environment where recycled water has the potential to play a bigger role in delivering water — if residential wastewater tariffs vary by suburb as they do with Gross Rental Value, recyclers decisions about where to invest might be influenced by the higher price received for wastewater in some suburbs over others.

6.3.3 Drainage tariff structures

Drainage services involve the collection, transmission and discharge of stormwater. The stormwater system includes the local drainage (distribution) system that collects stormwater, and stormwater transmission network infrastructure, such as main drains, rivers and creeks.

The Water Corporation supplies main drain services in metropolitan areas in Declared Drainage Areas. Around 325,000 premises in Perth are serviced by the Water Corporation's drainage infrastructure and hence pay drainage charges to the Water Corporation.[141] The Water Corporation can recommend to the Minister that an area be designated a Declared Drainage Area if the area contributes to the need for, or benefits from, a main drain service.

The Water Corporation also provides rural main drain services to a number of rural districts, namely: Albany, Harvey, Waroona, Roelands, Mundijong and Busselton. These services are entirely funded by the operating subsidy.

The ERA has considered the following issues:

- The GRV-based approach to setting charges for residential and non-residential customers in Declared Drainage Areas.
- Whether all of the Water Corporation's metropolitan customers should contribute towards the cost of drainage.

Stormwater Western Australia submitted a range of views about drainage services, some of which fall outside the scope of this inquiry.[142] Those that fall within the scope of the inquiry are addressed in this section of the report and in section 6.3.4.3.

6.3.3.1 The GRV based approach to setting tariffs

Cost reflective drainage tariffs are important for water utilities' financial viability.

However, because there are few variable costs in providing drainage services, typically only a fixed charge is applied.[143] Volumetric charges or two-part tariffs would offer little scope for encouraging efficient use of drainage services.[144] Property owners can do little to change their impact on the need for drainage services once building and landscaping has been completed, and even if they could, the impact would be difficult to measure and reflect in charges.[145] Further, to the extent that the community at large benefits — as opposed to individual households or business — it is difficult to justify, on efficiency grounds, charging one property more than another.[146]

In addition, as there is currently no drainage water recycling industry, tariff structures for drainage do not have the same efficiency implications as wastewater tariff structures when it comes to the future development of the industry.

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[141] This is around 40 per cent of premises. See Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 82 and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, p. 13.

[142] Specifically, those relating to governance arrangements and headworks charges. Stormwater Western Australia, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and Busselton Water – Submission by Stormwater Western Australia*, 20 January 2017, pp. 3-6.

[143] Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1: No. 55*, 31 August 2011, p. 144.

[144] Ibid.

[145] Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 27.

[146] Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Wate*r, 14 August 2009, p. 81.

Drainage services therefore tend to be priced as fixed periodic charges around Australia,[147] and equity rather than efficiency objectives are a greater consideration than for water and wastewater.[148]

The perceived strength of the current GRV-based drainage charge is that it results in lower charges for those with lower capacity to pay than other options. The limitations of using GRV as the proxy for capacity to pay are outlined in section 6.3.2.

GRV-based charging means that non-residential drainage customers pay more than the average cost of supplying drainage services and residential customers pay less than the average cost.[149] The Water Corporation notes that [redacted] Whether this is considered equitable depends on the definition of equity that is adopted — for example, whether equity is defined as properties that have a greater capacity to pay contributing more, or whether it is defined as all properties contributing the same amount.

The ERA has previously recommended that a single fixed drainage charge replace the current GRV based charge.[151] In the 2008 and 2012 inquiries, it was recommended that:[152]

- for residential customers, the same fixed charge be applied to all households. (In the 2012 inquiry it was recommended that this be based on the average annual cost of service per household.)
- for non-residential customers, the fixed charge be based on a series of three fixed charges that are levied according to land area, on the basis that the larger the land is, the higher the fixed charge will be.

The larger the land area, the larger is the possible creation of drainage water and hence the greater is the contribution to the need for drainage infrastructure.[153] Charging on the basis of land area was therefore argued to improve equity.[154] In 2008 it was found that implementing this recommendation would have led to a 50 per cent increase in charges to residential customers and vacant land, and a 70 per cent reduction in charges to non-residential and exempt properties.[155] However, in 2012, it was found that adopting the recommendation would result in lower charges for both residential and non-residential

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147 Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1: No. 55*, 31 August 2011, p. 141.

148 Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 27.

149 Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 28.

150 Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 81.

151 See Economic Regulation Authority, *Inquiry on Urban Water and Wastewater Pricing,* 4 November 2005, Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009 and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, pp. 8-18.

152 See Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. iv and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, p. 18.

153 See Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. iv; Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, p. 27 and Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 48.

154 See Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. iv, Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, p. 27 and Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 48.

155 Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 34.

customers.[156] This was in part due to the reduction in the overall efficient cost of drainage services at the time.[157] This inquiry has also found that there needs to be a reduction in revenues earned from drainage customers, which has the potential to offset some (albeit probably not all) of the impact on customers' bills.

Land size has however been found not to be the only driver of drainage costs — the cost drivers of drainage services are complex and not easily measured.[158] While the impermeable surface on a property is the key driver for drainage need, characteristics such as the incline of the property and elevation will also affect the need for and cost of services. Properties at high elevations or on an incline are more likely to cause run-off problems for others; properties at low elevations are more likely to require drainage service for protection from run-off or to avoid flooding from groundwater.[159]

In the 2008 inquiry the Water Corporation also proposed using land area as the method for charging non-residential customers. However, it now states that [redacted]

6.3.3.2 *Applying drainage tariffs to 100 per cent of metropolitan customers*

Stormwater Western Australia argues that 100 per cent of the Water Corporation's customers in the metropolitan area should face tariffs for drainage, because the service is a public good.

There are likely to be instances in certain areas where the general public benefits from the provision of the Water Corporation's drainage infrastructure. For example, everyone benefits at some time from the drainage for recreational parks and roads (for example, from preventing flooding or water-borne diseases) as well as improved water quality (for example, by managing pollutants discharged into the Swan River).[161] In these circumstances, it may be fairer if all metropolitan customers share in the cost of those drainage systems.

However, there are circumstances where the benefits are more private in nature and the expenditure would not be incurred were it not for the benefit it provides to one particular group. For example, the residents of new developments are the primary beneficiaries of the drainage infrastructure required in those developments.[162] Charging all metropolitan customers for the cost of this drainage infrastructure may not be fair or efficient.

In 2009 Acil Allen estimated that, if no substantial quality improvement program was in place, roughly two thirds of the cost of providing drainage would go towards creating private benefits, with the remaining one third of the cost providing public benefits.[163] The

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156 Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, pp. 78-79.

157 Ibid.

158 Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 15.

159 Ibid.

160 Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 81.

161 Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, pp. 15-17.

162 Ibid.

163 Acil Allen, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 24.

contribution to public benefits is substantially higher if there is a full program of expenditure on drainage quality in place.[164]

An approach suggested to deal with this in the ERA's 2008 inquiry was to have a separate drainage levy (itemised separately on the water bill) that applies to all of the Water Corporation's customers in Perth, with the proceeds from the levy being used to fund all drainage expenditure that creates public benefits, primarily on improving drainage quality.[165] (Customers in Declared Drainage Areas would still face the fixed drainage tariff discussed in the preceding section, to recover the cost of delivering private benefits.) At the time of the 2008 inquiry, the Water Corporation was not proposing any expenditure on improving drainage quality, so the levy was not adopted.[166]

Under the *Metropolitan Water Authority Act 1982*, only land declared by the Water Corporation to be a main drainage area is subject to charges. For land to be declared a main drainage area, it must derive a benefit from the drainage service or contribute to the need for the service.[167] It is not clear why this mechanism has not been capable of providing the avenue through which the above issues can be considered. New legislation might be required if a separate drainage levy were to be applied to 100 per cent of the metropolitan area.

6.3.3.3 The ERA's recommendation

Unlike for water, tariff structures for drainage are less likely to influence efficiency, because property owners can do little to change their impact on the need for drainage services once building and landscaping has been completed. Further, as there is currently no drainage water recycling industry, tariff structures for drainage do not have the same efficiency implications as wastewater tariff structures when it comes to the future development of the industry.

The effects of different tariff structures on equity are therefore the primary consideration in setting drainage charges.

As for residential wastewater tariff structures, while the current GRV approach is not a perfect proxy for capacity to pay, an average cost per household approach does not take into account capacity to pay at all. Transitioning from GRV could also lead to an increase in tariffs for households with a low GRV, raising an equity concern.

This equity concern could however be partially offset by the ERA's finding that drainage revenues need to decrease in order to reflect efficient costs. Further, an average cost fixed charge would be less costly for the Water Corporation to administer – particularly if GRV is discontinued for residential wastewater charging – and easier for customers to understand. On this basis, a move to average cost charging should be considered.

The ERA also recommends that consideration be given to adopting a separate drainage levy that applies to all of the Water Corporation's customers in the metropolitan area, with the proceeds from the levy being used to fund all drainage expenditure that creates public

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[164] Ibid.

[165] Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. iv.

[166] Ibid.

[167] Division 3, *Metropolitan Water Authority Act 1982.*

benefits, primarily on improving drainage quality.[168] This is because there are instances where the general public benefits from the Water Corporation's drainage infrastructure — everyone benefits at some time from the drainage for recreational parks as well as improved water quality (for example, by managing pollutants discharged into the Swan River). It may be fairer if all metropolitan customers share in the cost of those drainage systems.

Such a levy could also reduce the amount of drainage costs to be recovered through the existing drainage tariff, which would continue to be charged to those 40 per cent of properties that derive private benefits from the Water Corporation's drainage infrastructure.

Recommendation or finding

Currently around 40 per cent of the Water Corporation's metropolitan customers are charged for drainage services, based on a Gross Rental Value annual fixed charge. The tariff structure for drainage is less likely to influence efficiency than the tariff structure for water. The effects of different tariff structures on equity therefore can be a primary consideration in setting a drainage tariff structure.

An alternate charging approach, through a uniform fixed charge based on average cost per connection, would affect the sharing of costs among different households and businesses. The average cost method would lead to households, for example, contributing the same amount irrespective of their capacity to pay. A move to average cost charging could however be considered on the basis that it would be less costly for the Water Corporation to administer than Gross Rental Value (particularly if Gross Rental Value is discontinued for residential wastewater) and easier for customers to understand.

Finally, adopting an additional separate drainage levy for all of the Water Corporation's metropolitan customers could mean that the costs of providing drainage services that create public benefits (e.g. that prevent flooding of parks and roads and improve water quality) are shared among all those that benefit. Such a levy would reduce the amount of drainage costs to be recovered through the existing drainage tariff, assuming this continues to be charged to the 40 per cent of metropolitan properties that are in Declared Drainage Areas.

6.3.4 Cost reflective tariffs across geographic locations

Tariffs may be differentiated or uniform across geographic locations. The differentiated approach identifies the cost of delivering services to customers within a given geographic location. Differentiating tariffs on this basis requires that customers in each geographic location pay:

- at least the avoidable cost; but
- no more than the standalone cost;

of providing services in the geographic location.

There is currently uniformity in tariffs across geographic locations for the following charges:

[168] Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. iv.

- Residential water services — under the State Government's Tariff Cap Policy, the tariff levels for the first two usage tiers are uniform across the State, as is the service charge (Figure 8).
- Non-residential water services — the service charge is uniform across the State (Figure 9).
- Non-residential wastewater services — both the usage charge and the service charge are uniform across the State (Figure 10).

Further, the Water Corporation's supply of drainage services to residential and non-residential customers in country regions is 100 per cent funded by the operating subsidy. The ERA's recommendations for each of these tariffs are set out below.

More generally, the ERA recognises that there are policy objectives the State Government wishes to pursue via uniform pricing, which are in addition to economic efficiency objectives. Any relaxation of uniform pricing will entail a trade-off between equity (defined as customers paying the same amount irrespective of where they live) and efficiency.

There is scope for efficiency benefits from location-specific pricing where there are large differences in costs across locations and these are easy to quantify.[169] If a uniform tariff is charged in these circumstances — with the level of the tariff set at the average cost of providing services across locations — it can lead to inefficiencies because those living in low-cost areas subsidise those living in high-cost areas.[170] When tariffs unnecessarily exceed costs, households are left with less income for other uses, and the competitiveness of businesses is reduced. When tariffs are below costs, this can encourage excess consumption, place pressure on existing capacity, and bring forward the need to expand capacity.

In Western Australia, there are large differences in costs across locations. This reflects the breadth and diversity of the geographic area the Water Corporation supplies services to. The Water Corporation currently quantifies those differences in costs.[171]

However, the ERA's analysis finds that, although customers living in the metropolitan area are paying more than the efficient cost of supplying them with services, this additional revenue is not necessarily being used to subsidise service provision in country areas. Instead, the Water Corporation is provided with an operating subsidy to recover the financial losses it makes in supplying services in country areas. This suggests that the largest efficiency benefits could come from re-balancing metropolitan tariffs, rather than making substantial changes to the Tariff Cap Policy and other uniform tariffs.

6.3.4.1 The uniform Tariff Cap Policy for residential water tariffs

In principle a single usage tier for residential water use charges, set at the mean estimate of the LRMC of water supply ($2.32/kL), is preferable to multiple usage tiers on economic efficiency grounds. However, as noted above, moving from multiple usage tiers to a single

[169] Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1,* No. 55, 31 August 2011, p. 166; Natural Resource Management Ministerial Council, *National Water Initiative Pricing Principles*, 23 April 2010, p. 11.

[170] The Productivity Commission argues that this is also inequitable. Productivity Commission, *Australia's Urban Water Sector: Inquiry Report Volume 1,* No. 55, 31 August 2011, p. 165.

[171] The Water Corporation currently identifies the cost of providing services down to the scheme level. Each scheme is categorised into a 'cost class'. There are five cost classes for residential service provision, and 15 cost classes for non-residential service provision.

usage tier would affect customers' bills. It would also have implications for the way in which the State Government's uniform Tariff Cap Policy could be implemented. The original intent of the Tariff Cap Policy was to provide:[172]

- "affordable cost of water across the State at a consumption level considered to be the minimum for basic human needs (water for drinking, cleaning and sanitation purposes); and
- subsidised cost of water across the State, at a consumption level considered to be the average consumption of a household."

One way in which the Tariff Cap Policy could be implemented with a single usage tier could be to apply the $2.32/kL charge State-wide as a capped charge. This would ensure that all households across the State pay no more than the uniform tariff cap, but would also allow for lower usage charges to be applied in country schemes where the LRMC is lower than the mean. Any shortfall in higher cost country schemes would continue to be met as a country loss operating subsidy, as is the case currently.

This approach would have a number of effects on households in country areas.

Firstly, it would lower the price that households consuming high volumes of water (above 300kL in the south and above 500kL in the north) pay for those higher levels of water consumption. Usage charges for water consumption above 300kL in 'country south' and 500kL in 'country north' are currently set with reference to the direct cost of supplying water in the particular cost class that a scheme falls into. Usage charges therefore tend to be much higher than the mean estimate of the LRMC of water supply to the metropolitan area. For example, the usage charge for schemes in country north cost class five (the highest cost class) pay $4.58 for water consumption from 500kL to 750kL, and $7.88 for water consumption above 750kL.[173]

However, as noted above, moving to a single usage tier would increase the price paid for the first tier of water consumption for all households across the State. The service charge (which is uniform State-wide) would also be affected — in 2009-10 it was found that having a metropolitan water usage charge set at a flat rate of $0.84 per kL allowed for a service charge that was $37 lower than if a 50 per cent discount was applied to water usage up to 150kL.[174]

Whether individual households would be better or worse off under this proposal therefore ultimately depends on their level of water consumption.

The level of the operating subsidy required would also be affected — given the reduction in charges paid by country customers at higher levels of water use, it is likely that the value of the operating subsidy required to support the Tariff Cap Policy would increase.

The approach would also mean that the usage charge for country areas could not be set at the LRMC of water supply in country schemes where the LRMC is above the mean for the metropolitan area, which has implications for the economically efficient use of water.

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[172] Department of Premier and Cabinet, *Submission to the Country Water and Wastewater Pricing Inquiry*, 2006.

[173] Water Corporation, '*Your bill and charges', Coral Bay,* [website], 2017, https://www.watercorporation.com.au/my-account/your-bill-and-charges (accessed 27 July 2017).

[174] Economic Regulation Authority, *Final Report: Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 34.

To address these issues, a preferred approach could be to retain two usage tiers for country schemes. The consumption threshold for the first tier could be set, as it is currently, at 150kL in the south of the State and 350kL in the north of the State. The charge for water consumption up to these cut off points could be capped at the mean estimate of the metropolitan LRMC ($2.32/kL) retaining tariff uniformity across the State up to this point.

Usage charges for water consumption in country areas above the cut off points could be set to reflect estimates of the cost of supplying water in the cost class that the country scheme falls into. This would result in there being a single usage tier for metropolitan schemes and two tiers for country schemes.

This approach would increase the price paid for the first tier of water consumption for all households across the State, but as noted, has the potential to reduce the service charge.

For schemes that are higher cost than the metropolitan area, it would also result in higher usage charges than currently for water consumption from 150kL – 300kL in the south and 351 – 500kL in the north. The price increase could be substantial, particularly in cost classes three, four and five, so consideration would need to be given to how to phase in the change to avoid bill shock. (The current spread of usage charges across the five cost classes for each usage tier is set out in Table 42.) Depending on the estimate of LRMC for the cost class that the scheme falls into, the approach could result in lower charges than currently for water consumption above 300kL in the south and 500kL in the north.

Table 42 Current spread of usage charges for country cost classes, 2017-18

Usage	Cost class 1	Cost class 2	Cost class 3	Cost class 4	Cost class 5
0 – 150kL south 0 – 350kL north	$1.284	$1.681	$1.681	$1.681	$1.681
151 – 300kL south 351 – 500kL north	$1.709	$2.241	$2.241	$2.241	$2.241
301kL – 550kL south 501 – 750kL north	$1.808	$2.487	$3.314	$3.896	$4.583
> 550kL south > 750kL north	$2.110	$3.173	$4.224	$5.843	$7.880

Note: The first two tiers of usage are currently subject to the Tariff Cap Policy.

Source: Water Corporation, 'Your bill and charges', available at: https://www.watercorporation.com.au/my-account/your-bill-and-charges accessed on 27 July 2017

Again the level of the operating subsidy required to support the Tariff Cap Policy would be affected. The net effect would depend on the change in the level of the service charge, the number of households that currently fall into each usage tier in each cost class, and the difference between the current level of the charge for each usage tier in each cost class and the estimated LRMC for each cost class. These variables determine the change in the revenue a particular scheme would earn, and in turn the change in country losses.

More broadly, the ERA recognises that the State Government may wish to continue to maintain three usage tiers in the metropolitan area and four in country areas for policy reasons.

If the current inclining block tariff structures are maintained, then consideration could be given to lowering the consumption threshold for the uniform Tariff Cap Policy, for example,

to 150kL in the south of the State and 350kL in the north of the State. For country residential water customers, this would increase the number of customers paying tariffs which reflect the costs of their water supply, for water usage above the threshold. Ultimately this is a matter for Government to decide, and it turns on whether the policy objective is for uniform pricing to apply to basic needs or average household consumption.

When the ERA first considered the level of the threshold in 2005, it consulted a range of international guidelines and academic literature[175] and concluded that:[176]

> …the threshold for the uniform pricing policy could be lowered (from 350kL to 300kL for Group A towns, and from 550kL to 500kL for Group B towns) without compromising the objective of providing all households with affordable water to meet basic needs.

Current average indoor consumption for Perth households is around 140kL per annum.[177] Average total indoor and outdoor consumption per household in Western Australia is 328kL per annum.[178] Average total indoor and outdoor household consumption has previously been found to be around 200kL per annum higher in the north of the State than in the south of the State — at 317kL per annum and 525kL per annum respectively in 2005-06.[179]

Lowering the consumption threshold would result in higher usage charges than currently for water consumption from 150kL – 300kL in the south and 350 – 500kL in the north, for schemes that are higher cost than the metropolitan area. However, this could in turn allow for lower charges for the third and fourth consumption tiers, and/or a reduction in the operating subsidy required to support the Uniform Tariff Cap policy.

All of the above approaches would have an effect on customers' bills, particularly in country areas, as well as the operating subsidy required to fund country losses. The ERA has not at this time empirically assessed these effects, but recommends this task be undertaken prior to any consideration of reforming the tariff structure.

Recommendation or finding

In principle, economic efficiency benefits could be obtained from relaxing the uniform Tariff Cap Policy. However, these benefits need to be weighed against the costs of

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[175] This included UNESCO research including P. Gleick, 'Basic water requirements for human activities: meeting basic needs', *Water International*, vol. 21, no. 2,pp. 83-92, G. Howard, J. Bartram and S. Water, 'Domestic water quantity, service level and health', *World Health Organization*, Ofwat, *The Development of the Water Industry in England and Wales*, 2006, p. 93; and M. Loh and P. Coghlan, *Domestic Water Use Study in Perth, Western Australia 1998-2001*, 2003.

[176] ERA, *Final Report: Inquiry on Country Water and Wastewater Pricing in Western Australia*, 23 June 2006, p. 12.

[177] This estimate is based on a study for Perth by the Water Corporation for 2008-09. It found that 52 per cent of water use is indoors. The average Perth household water use in the study was 106 kL per person. See Water Corporation, *Perth Residential Water Use Study*, 2008/09, p. 5 and p. 8. There were around 2.55 persons per household on average in 2006. See *.id, Western Australia Household Size*, [website], 2008, http://profile.id.com.au/australia/household-size?WebID=140, (accessed 27 July 2017). Total Perth household water use was therefore (106*2.55=) 270kL at the time of the study. A 52 per cent proportion of 270kL is 140kL.

[178] Australian Bureau of Statistics, *Water Account Australia 2014-15: State and Territory Summaries*, 25 November 2016. It should be noted that this figure abstracts from differences in both consumption levels in the north versus the south of the State, and household sizes.

[179] ERA, *Final Report: Inquiry on Country Water and Wastewater Pricing in Western Australia*, 23 June 2006, p. 13. At that time, households in Perth were found to consume 279kL per annum, in total, on average.

adopting alternate means for the State Government to achieve its equity objectives in country areas. Where the uniform Tariff Cap Policy is retained in some form, then:

- If a single usage tier was to be adopted in the metropolitan area, two usage tiers might need to be adopted for country schemes in order to implement the uniform Tariff Cap Policy. The tariff for water use in the first usage tier could be capped at the metropolitan level, and the tariff for water use in the second tier could be set to reflect the cost of supplying water to the particular cost class the scheme belongs to.

- If the current multi-tiered tariff structure is maintained in metropolitan and country areas, then consideration could be given to lowering the consumption threshold for the uniform Tariff Cap Policy, for example from 350kL to 150kL in the south, and 550kL to 350kL in the north. Water consumption in country schemes in usage tiers above this amount could be set to reflect the cost of supplying water to the particular cost class the scheme belongs to.

The policy objective of the uniform Tariff Cap Policy — and in particular whether the objective is to promote uniform tariffs for basic needs or average household consumption — is a matter for the State Government to decide. The objective of the policy in turn informs the level of consumption up to which the uniform tariff cap applies.

Changes to the implementation of the uniform Tariff Cap Policy would have an effect on customers' bills and the operating subsidy required to fund country losses. These effects would need to be empirically assessed prior to any changes being made. If the effect on customers' bills is found to be substantial, consideration would need to be given to how to phase in any changes in order to avoid bill shock.

6.3.4.2 Varying non-residential wastewater charges across schemes

Currently both the service charge and usage charges for the Water Corporation's non-residential wastewater customers are uniform across the metropolitan area and country schemes (see appendix 12).[180] This contrasts with tariffs for residential wastewater customers, for whom the rate in the dollar component of the fixed GRV-based charge is different in the metropolitan area compared to the country, and is different across each country scheme.

Setting wastewater charges for non-residential customers to reflect variation in costs across regions has the potential to promote efficiency. The ERA has found that — while revenue earned from country wastewater services is broadly cost-reflective — revenue earned from metropolitan wastewater customers over-recovers the cost of supply. Lowering metropolitan non-residential wastewater tariffs and decoupling them from country non-residential wastewater tariffs is one way in which this issue could be addressed.

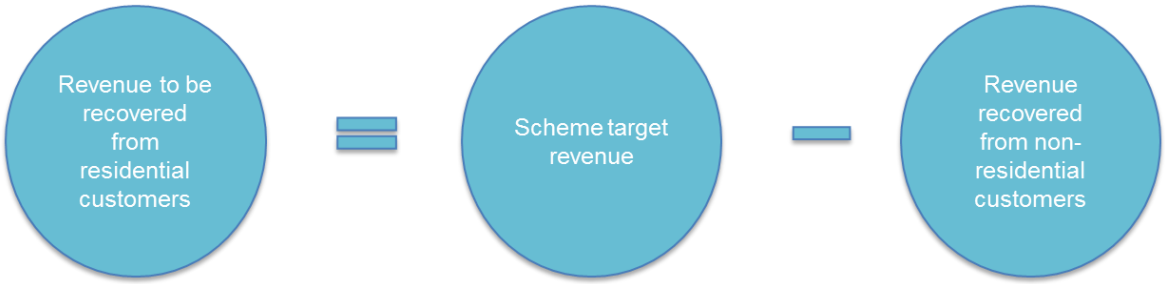
[180] Non-residential wastewater tariffs take the form of a two-part tariff. The ERA has previously found that non-residential customers have a greater ability to control their discharge than residential customers, and so the efficiency benefits of a two-part tariff outweigh the costs of its implementation. Economic Regulation Authority, *Final Report: Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 79.

The equity trade-offs involved in location-based residential water use pricing are less acute for non-residential wastewater customers. This was noted by the Department of Premier and Cabinet in its response to the ERA's 2005 inquiry on country water and wastewater pricing:[181]

> The intention of the UPP [uniform pricing policy] is not to provide further subsidies to country areas above and beyond that which is considered necessary for basic human needs and the average amount consumed by an average household.

In addition, if tariffs for country non-residential wastewater customers were decreased in line with metropolitan non-residential customers, the revenue earned from country non-residential customers would fall — tariffs for country residential wastewater customers would in turn need to rise. This is because the Water Corporation sets residential wastewater charges to recover a residual scheme revenue target *after* revenues from non-residential wastewater charges have been taken into account (Figure 13). The rationale for adopting this approach is not clear. However without consistent treatment between residential and non-residential wastewater customers, there is a risk that residential customers pay more than their share of a scheme's target wastewater revenue.[182]

Figure 13 The Water Corporation's approach to calculating wastewater tariffs



Note: Country scheme target revenue is set on the basis of scheme cost. Country scheme costs were last set in 2013-14 using 2009-10 to 2011-12 data. The 2013-14 scheme costs have subsequently been escalated each year at the same rate as the increases to wastewater tariffs approved by the State Government. Metropolitan scheme target revenue is set on the basis of current revenue, plus any tariff increases approved by the State Government.

Source: Water Corporation, *Wastewater Pricing Overview,* July 2017; Water Corporation, correspondence to the ERA on 27 July 2017.

Whatever tariff structure is used for non-residential wastewater customers, wastewater tariff levels for both residential and non-residential customers are currently not cost-reflective, due to the fact that tariffs are set to recover the current level of revenue from these tariffs plus approved price increases.[183] There would be significant efficiency gains from addressing the current over-recovery of wastewater revenue in the metropolitan area. On the demand side, when tariffs unnecessarily exceed costs, they act as a tax on consumers and businesses. Households are left with less income for other uses, and the competitiveness of businesses is reduced. On the supply side, when revenue over-

[181] ERA, *Final Report: Inquiry on Country Water and Wastewater Pricing in Western Australia*, 23 June 2006, p. 52.

[182] ERA, *Final Report: Inquiry on Country Water and Wastewater Pricing in Western Australia*, 23 June 2006, p. 61.

[183] For country schemes, the target revenue is set on the basis of scheme cost. For metropolitan schemes, the target revenue is set on the basis of current revenue, plus approved price increases. Water Corporation, correspondence to the ERA on 27 July 2017.

recovers costs, this can encourage overinvestment in upgrading or expanding capacity, at the expense of other more efficient investments.

The ERA therefore recommends that a cost-based approach to setting wastewater tariffs in the metropolitan area be implemented as a priority.

Recommendation or finding

Either or both of residential and non-residential wastewater tariffs could be decreased to ensure that only the efficient cost of service in the metropolitan area is recovered. However, because non-residential wastewater tariffs are currently uniform across geographic locations, decreasing metropolitan non-residential wastewater tariffs would either increase country losses or lead to higher wastewater tariffs for country residential customers, if country losses are to stay the same. Any decrease in non-residential wastewater tariffs in the metropolitan area therefore should not be matched with lower country non-residential wastewater tariffs.

6.3.4.3 Allowing charges to be applied for country drainage services

The Water Corporation provides rural main drain services to Albany, Harvey, Waroona, Roelands, Mundijong, and Busselton. These services are entirely funded by the Water Corporation's operating subsidy.

In most rural communities, drainage services are provided by local councils and the costs recovered from ratepayers. Funding the costs of the drainage services in the six drainage districts serviced by the Water Corporation from general revenues (via the Water Corporation's operating subsidy) would seem to be inconsistent with equity principles.

The ERA has previously recommended that the Water Corporation's costs in providing drainage services in the six rural drainage districts be passed on to local councils in a cost reflective manner.[184] The ERA again recommends that the State Government consider this reform.

Implementing cost-reflective pricing could result in different charges for each district, to the extent that the cost of drainage services varies across districts. However, many of the costs arising from increased drainage requirements for new developments are borne by developers via the standard headworks charge and ultimately passed on to the buyers of properties in those developments. Thus, these drainage costs are also recovered on a 'user pays' basis. Cost-reflective pricing for rural drainage services would therefore not be unique.

Stormwater WA points to further inequities in drainage, given the current delineation of the metropolitan and country schemes:

> Because of the unique hydrogeology of the Swan Coastal Plain groundwater may flow in different directions to surface managed flow. Thus rainfall that occurs in areas outside the 'charging areas', may also be eventually managed by the infrastructure, but these landowners currently don't pay a 'drainage charge'.

[184] Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. viii.

> Another 'charging inequity' that has evolved as the urban expansion of Perth has occurred is the overlap of the urban areas into catchments service by the former (PWD constructed) Agricultural/Rural Drains. Thus landowners of new residential suburbs in the City of Kwinana (Bertram, Wellard, Anketell & Wandi) who benefit from the presence of the Peel Drain receive the benefit of a 'Government Subsidy' to the Water Corporation, whereas the landowners in the adjacent City of Rockingham benefiting from 'Government constructed' urban drains, constructed by the former Metropolitan Water Authority, are paying the excessive metropolitan drainage charge.

While this is an issue for policy and is beyond the scope of this inquiry, it is an issue which warrants thorough review.

In light of the issues identified in this section and section 6.3.3, the ERA recommends that the State Government initiate a holistic review of drainage pricing, with a view to addressing the potential inequities inherent in the current approach.

Recommendation or finding

In most rural communities, drainage services are provided by local councils and the costs recovered from ratepayers. Funding the costs of drainage services in the six rural drainage districts serviced by the Water Corporation from general revenues (via the Water Corporation's operating subsidy) would seem to be inconsistent with equity principles. On this basis, consideration could be given to allowing the Water Corporation to pass its efficient costs of providing rural drainage services on to local councils in a cost-reflective manner. A review of drainage pricing should be initiated, with a view to addressing the potential inequities inherent in the current approach.

A review of drainage pricing should be initiated, with a view to addressing the potential inequities inherent in the current approach.

7 Managing material variations

The terms of reference require the ERA to recommend an approach for managing material variations in capital or operating expenditure that may be encountered over a five-year regulatory period.

Unexpected events may cause the water corporations to incur additional operating or capital expenditure. As water tariffs are set at the beginning of the regulatory period, the water corporations are not able to recover these additional costs during this period. Similarly, if costs are lower than forecast, customers will pay a higher tariff than is required to meet the efficient costs of providing water services.

Previous inquiries have covered a three-year review period. As directed by the terms of reference, this inquiry recommends tariffs for a five-year review period. Over a longer period, there is greater scope for circumstances to change because the forecasting of expenditure and demand is more difficult and there is more time for operating environments to change, introducing unexpected events. However, the benefits of a longer review period may include stronger incentives for the water corporations to achieve cost efficiencies, which are retained by the corporations. The ERA has considered approaches to managing material variations for unexpected costs to maintain these incentives.

In the 2012 inquiry, the ERA recommended that the State Government establish a formal arrangement that obliges the water corporations to not pass on the costs of any inefficient expenditures to consumers. The ERA recommended that a 'charter' be established between the State Government, the water corporations and the ERA. The charter would be an open and transparent document that set clear guidelines about what is expected of the water corporations, including the amount of revenue that each are able to earn. The State Government did not implement this recommendation.[185]

The ERA now recommends that material variations in capital expenditure be managed through an 'options test' and 'expenditure test' approach, and that any adjustment to tariffs to account for these variations occur at the next review (inquiry) period. A detailed explanation of the options test and expenditure test is provided in appendix 11. In summary, the options test would require an assessment of the options available prior to making a decision to invest in capital, with the objective being to consider all viable options (including non-capital options, such managing customer demand). Once a decision is made to invest in capital, the expenditure test would require an assessment of the proposed investment to confirm it represents efficient expenditure.

The ERA considers material variations in operating expenditure should be managed through an annual cost pass-through mechanism. Appendix 11 provides further explanation of this mechanism. In summary, cost pass-throughs allow businesses to pass on increases (or decreases) in operating costs arising from unexpected events to customers through higher (or lower) tariffs. In order to qualify for cost pass-through, the event should be unexpected and outside the control of the water corporations. It should also be an event that cannot be managed or mitigated. The ERA considers cost pass-through should be restricted to an unexpected change in tax or law.

The main objective of any approach for managing material variations should be to maintain incentives for the water corporations to incur only efficient and prudent expenditure. The ERA considers that a move to a five-year review (inquiry) period may strengthen the water

[185] Economic Regulation Authority, 2013, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Revised Final Report*, pp. 31-33.

corporations' incentives to accurately forecast demand and expenditure, and to realise further efficiencies during the longer period if available. For example, by not adjusting tariffs during the review period, the water corporations have incentives to realise further efficiencies because they may be able to retain higher tariff revenue than necessary for efficient costs. During the following review period, the asset base is adjusted and operating expenditure levels reset to return the savings to customers. The overall result is that both customers and the water corporations share in the benefits of realising efficiencies from expenditure levels over the regulatory period.

The ERA considers that any approach should complement the incentive properties of setting prices over a review period. Any compensation mechanism through tariffs for material variations should therefore only apply if actual total expenditure for the review period exceeds forecast total expenditure, and the expenditure is deemed efficient and prudent.

Recommendation or finding

The following approach for treating material variations – that arise from an unexpected expenditure incurred (or expected forecast expenditure not incurred) by the water corporations during the review period – is recommended.

- Material variations in capital expenditure could be addressed through the introduction of an options test and expenditure test, which have similar characteristics to the regulatory test and new facilities investment test in the Electricity Networks Access Code (currently applicable to Western Power's regulated electricity network).
- Tariffs would be reset at the next inquiry for any approved material capital expenditure variations. The options test could occur prior to any investment commencing, while the expenditure test could occur either during the review period – to provide the water corporations some investment certainty – or at the next inquiry.
- Material variations in operating expenditure could be addressed through a cost pass-through mechanism, albeit restricted to variations that result from tax or law change events. Variations in operating expenditure could be recovered by the water corporations through adjustments to tariffs during the review period, or otherwise at the next inquiry.
- All approaches should be net present value neutral in application, to allow adjustments to be made during the next review period.

There are administration costs associated with assessing variations in expenditure, and for this reason, the ERA considers variations should only be assessed if the variations exceed a materiality threshold. Materiality thresholds will allow businesses to recover expenditure (or return savings) when required, but not if the administration costs are excessive when compared to the change in expenditure (or savings). In determining materiality thresholds to apply for the water corporations, the ERA has considered the thresholds applied to manage variations in expenditure in other industries and jurisdictions (see appendix 11).

Recommendation or finding

Materiality thresholds for capital and operating expenditure variations could apply to allow the water corporations to recover expenditure when required, but not if the administration costs are excessive when compared to the change in expenditure. The following materiality thresholds could apply:

For the Water Corporation:

- Capital expenditure – one per cent of annual required revenue (approximately $25 million)
- Operating expenditure – 0.25 per cent of annual require revenue (approximately $6 million)

For Aqwest and Busselton Water:

- Capital expenditure – five per cent of annual required revenue (approximately $800,000 and $530,000 respectively)
- Operating expenditure – two per cent of annual required revenue (approximately $320,000 and $210,000 respectively)

The ERA recommends that material variations in capital expenditure be managed through an "options test" and "expenditure test" approach and that material variations in operating expenditure be managed through an annual cost pass-through mechanism. Depending on the nature of the variation, the variation could be assessed either during the review (inquiry) period, or at the next review (inquiry) period. In any case the ERA considers the assessment should be undertaken by an independent body and, where possible, coincide with the annual budgetary processes that the water corporations must undertake.

Recommendation or finding

The assessment of material variations should ideally be undertaken by an independent body and, where possible, coincide with the annual budgetary processes that the water corporations must undertake.

Appendix 1 Terms of Reference

INQUIRY INTO THE EFFICIENT COSTS AND TARIFFS OF THE WATER CORPORATION, AQWEST AND BUSSELTON WATER

TERMS OF REFERENCE

I, Dr Michael Dennis Nahan, Treasurer and pursuant to section 32(1) of the *Economic Regulation Authority Act 2003*, request that the Economic Regulation Authority (the ERA) undertake an inquiry into the efficient costs and tariffs for the services of the Water Corporation, Aqwest and Busselton Water for the five year period commencing 2018-19.

The ERA must give consideration to the following:

- the efficient costs of providing services, with a focus on:
  - cost effectiveness in the supply of services, including the services funded by operating subsidies;
  - resources necessary to meet the service standards;
  - operating efficiency targets appropriate for the growth scenarios expected over the regulatory period;
  - the impact of environmental and health regulations on efficient costs;
  - the Water Corporation's country schemes;
- a recommended approach for managing material variations in capital or operating expenditure that may be encountered over a five year regulatory period;
- the revenue requirement of each service provider for the five year period commencing 2018-19; and
- the efficient tariffs of each service provider for the five year period commencing 2018-19.

The ERA will release an issues paper as soon as possible after receiving this terms of reference. The paper is to facilitate public consultation on the basis of invitations for written submissions from government, industry, and all other stakeholder groups, including the general community.

A draft report is to be made available for further public consultation on the basis of invitations for written submissions. The ERA will complete a final report, including recommendations, no later than the close of business on 10 November 2017.

HON DR. MICHAEL DENNIS NAHAN MLA

TREASURER, MINISTER FOR ENERGY; CITIZENSHIP AND MULTICULTURAL INTERESTS

Appendix 2 Glossary

ABS	Australian Bureau of Statistics
ADF	Augmented Dickey Fuller
ADWG	Australian Drinking Water Guidelines
AER	Australian Energy Regulator
AIC	Akaike Information Criterion
AIP	Asset Investment Program
ATCO	ATCO Australia Pty. Ltd.
BoM	Bureau of Meteorology
Cardno	Cardno Limited
CCA	Current Cost Accounting
CGS	Commonwealth Government Securities
CPI	Consumer Price Index
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSO	Community Service Obligation (also, operating subsidy)
DGM	Dividend Growth Model
DORC	Depreciated Optimised Replacement Cost
DPLH	Department of Planning, Lands and Heritage
DRC	Depreciated Replacement Cost
DRP	Debt Risk Premium
EBIT	Earnings Before Interest and Tax
EBITDA	Earnings Before Interest, Taxation, Depreciation and Amortisation
ERA	Economic Regulation Authority
ESC	Essential Services Commission of Victoria
ESCOSA	Essential Services Commission of South Australia
FIS	Financial Impact Statements
GDP	Gross Domestic Product
GRV	Gross Rental Value
GSL	Guaranteed Service Level
GWR	Groundwater Replenishment
HCA	Historic Cost Accounting
IOCI 3	Indian Ocean Climate Initiative stage 3
IPART	Independent Pricing and Regulatory Tribunal of New South Wales
IRCR	Independent Competition and Regulatory Commission
IWSS	Integrated Water Supply System
kL	Kilolitres
KPIs	Key Performance Indicators

LRMC	Long Run Marginal Cost
ML	Megalitres
MOU	Memorandum of Understanding (for drinking water)
MRP	Market Risk Premium
NPV	Net Present Value
NWI	National Water Initiative
OCI	Operating Cost Index
OEPA	Office of the Environmental Protection Authority
Ofwat	Office of Water (United Kingdom)
QCA	Queensland Competition Authority
RAB	Regulatory Asset Base
RBA	Reserve Bank of Australia
ROA	Return on Asset
RRM	Revenue Requirement Model
S&P	Standard & Poor's
SIBC	Strategic Investment Business Case
SL-CAPM	Sharpe-LinterCapital Asset Pricing Model
SRMC	Short Run Marginal Cost
SSDP	Southern Seawater Desalination Plant
WACC	Weighted Average Cost of Capital
WACOSS	Western Australian Council of Social Services
Water Act	Water Services Act 2012
WWTP	Wastewater Treatment Plant

Appendix 3 Pre- versus post-tax revenue modelling

The water corporations are State government-owned enterprises. They are subject to federal corporate income taxes under the National Tax Equivalent Regime. This promotes competitive neutrality.[186] The taxes levied under the Regime are assessed by the Australian Taxation Office, but are paid to whichever State government owns the enterprise.

The amount of taxation is calculated consistent with the corporate income tax rate. Similar to any other corporate entity, this tax on earnings before tax should be passed through to consumers as a cost of service.

It is therefore estimated in the cost of service modelling. There are two possible approaches:

- the post-tax modelling approach – the building block for taxes is estimated explicitly; or
- the pre-tax modelling approach – the building block for taxes is estimated implicitly, as part of the rate of return calculation.

These two approaches are discussed in more detail in what follows.

The post-tax approach

Tax may be dealt with explicitly in the cost of service modelling. This is achieved by incorporating a nominal tax module. It estimates the tax payment cash flows in each year, which are then included as a separate building block in the revenue modelling.

This post-tax approach was adopted by the ERA for its recent series of access arrangement decisions for gas and electricity. It is post-tax, because the rate of return applied in the modelling in this case is a post-tax rate, which abstracts from any tax issues. It recognises that taxes are estimated separately, in the cash flows.[187]

The nominal tax module may be linked to either a real or a nominal building block model.[188] In either case, the tax module *must* be estimated in nominal terms. This ensures that the impact of eligible deductions – for example, for the cost of interest – on corporate earnings before tax, is calculated correctly.[189]

A nominal tax module may be linked to a real model, by taking the final tax estimate in nominal terms and converting it to the real value, which is then included in the real model.

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[186] Australian Taxation Office, *Manual for the National Tax Equivalent Regime*, April 2016.

[187] In this post-tax context, the ERA's practice is to utilise a 'vanilla' weighted average cost of capital. 'Vanilla' refers to the recognition of actual tax amounts in the *cash flows*, after the effect of tax (debt) shields. See N. Hathaway, *Imputation WACCs: Descriptions and Numerical Valuation Comparisons*, November 2004, p. ii. Therefore, the rate of return does not need to account for tax.

[188] For application of a nominal tax module in a real post-tax revenue model, see Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012. For application in a nominal post-tax revenue model, see Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020*; *Appendix 4 – Rate of Return*, 30 June 2016.

[189] This is also known as the 'debt shield'.

The post-tax approach is data intensive. It requires, as a first step, the development of a nominal tax asset base. The tax asset base may be different to the regulatory asset base (**RAB**). Differences may relate to the assumptions for:

- acquisition costs – for example, the tax asset base will use historic costs, as opposed to, for example in the RAB, deprival values;
- the effective lives of assets;
- the method of depreciation;
- the inclusion or otherwise of tax rebates and offsets;
- the treatment of accumulated tax losses or deferred revenue, which can affect the timing of tax liabilities; and
- the inclusion or otherwise of land (tax asset bases exclude land, the RAB includes it).

Capital contributions are excluded for regulatory purposes from either asset base. When using the post-tax method, the ERA excludes capital contributions from both the RAB and the tax asset base. First, capital contributions have already been funded by the contributor; therefore no return on the asset is required, so contributors' funded assets should not be included in the RAB. Secondly, the ERA's position is that no account of the tax liability arising from capital contributions should be made for 'regulatory' purposes.[190] Including the capital contribution in the tax building block would lead to the broader customer base paying for a portion of the tax liability of the contributor. This violates the principle of 'user pays', leading to economic distortions and a reduction in efficiency (see appendix 13).

Given the above caveats, the resulting post-tax estimate may provide an accurate reflection of the actual tax position of the service provider.

The pre-tax approach

Alternatively, an allowance for tax may be made using a 'pre-tax' rate of return. Under this method, the rate of return is increased, to allow for the tax margin on the return paid to equity. This pre-tax rate of return is then applied, in the usual way, to the RAB. This provides for a return on capital, and in addition, now, for the costs of statutory tax requirements.

Specifically, the pre-tax rate of return is derived by 'grossing up' the return on equity element in the weighted average cost of capital (**WACC**) formulation.[191] There are two ways to this, using either:

- the forward transformation method; or
- the reverse transformation method.

The forward transformation method

The ERA has in past inquiries used the forward, market transformation method. Under this method, the nominal *pre-tax* WACC is derived, first, from the nominal *post-tax* WACC by

[190] The service provider *does* have a tax liability associated with capital contributions. However, that tax liability should be paid by the contributor. It is a matter for the service provider and the contributor to determine the best means of paying for the tax implications for the service provider of any contribution.

[191] The return on debt is not grossed up as it is shielded from tax, being tax deductible.

grossing up the return on equity by 1/(1-T(1-γ)). The nominal pre-tax WACC is then expressed, following the Officer/Monkhouse WACC framework, as:

$$WACC_{\text{nominal}} = E(R_e) \times \frac{E}{V} \times \frac{1}{(1-T_c(1-\gamma))} + R_d \times \frac{D}{V} \quad (1)$$

where:

$E(R_e)$ is the nominal post-tax expected rate of return on equity – the cost of equity (grossed up for the value of imputation credits);

R_d is the nominal pre-tax expected rate of return on debt – the cost of debt;

$\frac{E}{V}$ is the proportion of equity in the total financing (which comprises equity and debt);

$\frac{D}{V}$ is the proportion of debt in the total financing;

T_c is the tax rate; and

γ (gamma) is the value of franking credits

The real pre-tax WACC is obtained, second, by discounting expected inflation (π^*) out of the nominal pre-tax WACC using the Fischer equation:

$$WACC_{\text{real}} = \frac{1+WACC_{\text{nominal}}}{1+\pi^*} - 1 \quad (2)$$

However, the nominal to real transformation method introduces bias. As noted by Davis:[192]

> In applying the "real pre tax" approach initially favoured by Australian legislators, the "transformation problem" (the method of deriving a "real pre tax required rate of return" from the more commonly estimated "nominal post tax required rate of return") has proved contentious. The so-called market transformation and reverse transformation methods give different (biased) results, and this has given rise to ad hoc, judgemental, solutions involving some averaging of the two results. Partly for this reason, some regulators have moved away from the real pre-tax approach to a nominal post-tax approach

The forward market transformation method tends to overstate the cost of tax. The bias derives from the differences between the treatment of depreciation in the tax asset base and in the RAB, noted in the previous section. For example, a real regulatory model utilises current cost accounting, whereas nominal tax estimates derived using a nominal tax asset base tend to adopt historic cost accounting. The two approaches have distinct timing differences in the return *of* capital. The problem then arises:[193]

> The market transformation implicitly equates tax depreciation with regulatory depreciation and thus assumes that the amount of the allowable cash flow shielded from tax by depreciation is less (more) in the earlier (later) years of the asset's life than is actually the case. Because the calculation of the present value of the depreciation tax shield is biased

[192] K. Davis, 'Access Regime Design and Required Rates of Return: Pitfalls in Adjusting for Inflation and Tax Effects', *Journal of Regulatory Economics*, vol. 29, no. 1, January 2006, p. 104.

[193] Ibid, p. 108.

> downwards, the estimate of the pre tax rate of return on capital to generate a cash flow series giving a zero NPV investment will be biased upwards.

The reverse transformation method

In contrast, under the 'reverse transformation' approach, the nominal post-tax WACC is first converted to real terms, then, second, converted to a pre-tax WACC. This swaps the order of the manipulation compared to the forward transformation approach.

The reverse transformation tends to understate the cost of tax:[194]

> Tax depreciation which allows only for the nominal return of capital involves a smaller tax shield than assumed by the reverse transformation approach, and thus a larger after tax cash flow for a given pre tax cash flow than is appropriate. Consequently, the upward adjustment used to obtain the pre tax real rate from a post tax real rate is smaller than it should be given the actual nature of the tax treatment of depreciation.

The degree of over-estimate with the pre-tax approach

Alternative methods to estimate the potential over-statement of efficient costs and revenues given by the pre-tax rate of return estimated, using the market transformation method, include:

- averaging the market and reverse transformation approaches, as a means to provide a more accurate estimate;
- comparing outcomes for the same regulatory decision, with the pre-tax and post-tax methods, holding all other things equal.

These are considered in what follows.

Averaging the market and reverse transformation approaches

The first estimate of the bias is informed by taking an average of the reverse and market transformation approach.[195] If the reverse transformation is an under-estimate, and the market transformation an over-estimate, then the average of the two estimates is likely to give an estimate closer to the 'true' value.

The ERA's estimate of the real pre-tax WACC using the market transformation approach is 5.02 per cent (section 2.2.1.4). The gamma parameter for estimating the value of imputation credits is 0.4.

The reverse transformation estimate of the real pre-tax market transformation based on the same data is 4.85 per cent.

The average of the reverse and market transformation estimates is 4.93 per cent. If this is taken as approximating the 'true' estimate, then the market transformation method overstates the rate of return by (5.02 – 4.93 =) 0.09 per cent, or 9 basis points.

That represents an over-statement of (0.09 / 4.93 =) 1.76 per cent on the real pre-tax rate of return. If the return on capital contributes 40 per cent of the revenue in any year (two thirds of the roughly 60 per cent provided by the return on and of capital, with the other

[194] Ibid, p. 110.

[195] Ibid, p. 103.

40 per cent provided by operating expenditure), then the over-statement in total revenue is (0.0176 * 40 =) 0.7 per cent in total.

This value is sensitive to both the value for gamma and to the overall value for the WACC. The following sensitivities are calculated:

- Reducing gamma from 0.4 to 0.25, all other things equal, increases the over-statement from 0.7 per cent to 0.9 per cent.
- Increasing the overall value for the real pre-tax WACC, all other things equal (including gamma at 0.4), from 5.02 per cent to 6.02 per cent reduces the over-statement to 0.58 per cent.

Comparing outcomes for the 2012 Western Power decision

The ERA's 2012 Western Power decision utilised a real post-tax model. The real post-tax rate of return was 3.60 per cent. The gamma parameter for estimating the value of imputation credits for that decision was 0.25. The NPV of the resulting total reference service target revenue over the third access arrangement was 2012$ 6,025 million.[196] Contributing to that estimate were the following net cost of service amounts:

- transmission network - 2012$ 1,469 million; and
- distribution network - 2012$ 4,556 million.

Re-evaluating the transmission network estimate, utilising the forward transformation real pre-tax WACC of 4.33 per cent (as opposed to the 3.60 per cent post-tax method), provides a useful insight as to differences in the two approaches for estimating the tax building block. Implementing the pre-tax WACC estimate in the Western Power 2012 transmission model changes the target revenue from the post-tax estimate of 2012$ 1,469 million to 2012$ 1,486 million. This is an increase of 1.29 per cent.

In part this quite large difference is driven by the low value for the value for gamma used in the 2012 Western Power decision, which was 0.25.

Substituting in the real pre-tax (5.02 per cent, market transformation) and real post-tax rates of return (4.34 per cent) – used for this inquiry – into the 2012 Western Power decision, reduces the size of the difference between the two approaches, to 0.7 per cent. The reduced difference in this case suggests that the sensitivity to the changed value of gamma (reducing the estimate) outweighs the impact of the increase in the value of the WACC (increasing the estimate – see sensitivities discussed above).

This value of 0.7 per cent is identical to the amount evaluated using the average of the reverse and market transformation methods with the 5.02 per cent real pre-tax estimate, reported above, which also was 0.7 per cent.

Together, the two different approaches suggest that the over-statement of the real pre-tax market transformation method as compared to the post-tax method is around 0.7 per cent.

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[196] This equates to the net cost of service. The net cost of service is the gross cost of service, less adjustments relating to the Service Standards Adjustment Mechanism and the Investment Adjustment Mechanism see Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, *Appendix 1: Target Revenue Calculation*, 5 September 2012.

The ERA therefore takes this as the potential over-statement of revenue produced in its pre-tax modelling.

Choice of approach for this review

In light of the foregoing issues, regulators now – almost universally – have adopted the post-tax approach for their statutory decisions. In line with that trend, the ERA utilises the post-tax approach for its gas and electricity decisions.[197] The post- tax estimate is more accurate.

However, this review is not a statutory undertaking. It provides advice to the Treasurer.

Given the work involved in developing tax asset bases for the water corporations, the ERA elected to use the pre-tax method for this inquiry. The real pre-tax approach is simpler, more tractable and less data intensive. It has reduced the time and resources required to develop the ERA's advice.

The ERA concludes that the impact of the real pre-tax estimate is likely to be an over-estimate. On balance, it is probable that the correct post-tax estimate of efficient costs and revenue is 0.7 per cent lower than the raw review estimate.

To address this issue with greater precision, the ERA recommends that the Water Corporation take steps to develop a regulatory tax asset base, so that a post-tax estimate of efficient costs can be undertaken for any future review. This exercise could follow a similar approach to that taken by Western Power for its 2012 review of the access arrangement.[198]

[197] The post-tax method is a statutory requirement under the National Gas Rules. The electricity Code in Western Australian does not prescribe the method. However, the ERA elected to move to the post-tax approach at the last access arrangement review.

[198] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012, pp. 262-269.

Appendix 4 Water Corporation - long run marginal cost of new sources

Marginal cost is typically defined as the cost of supplying an additional unit of good or service. The concept is important in setting tariffs. Ideally, the variable component of the tariff structure should signal the true cost of the last unit of additional consumption. This marginal cost will promote efficient consumption and supply. If tariffs reflect the true marginal cost of supply, consumers will consume up to the point they consider the costs being equal to the benefit they receive. This consumption signals society's true value of the resource to suppliers thereby indicating how to efficiently allocate factors of production to meet supply.

Marginal cost is affected by time in two ways. Firstly, the time *horizon* constrains the ability to alter factors of production to meet significant changes in demand. Secondly, the *passage* of time means that marginal cost is a dynamic, rather than a static concept. That is, marginal cost – whether constrained or unconstrained by time horizon – is likely to change with the passage of time.

The time horizon distinguishes long run marginal cost (**LRMC**) from short run marginal cost (**SRMC**). Conceptually, LRMC is the additional cost associated with supplying an additional unit of demand when all factors of production are variable. In contrast, over a relatively short time horizon, high cost units of fixed infrastructure, which have the greatest impact on capacity to supply at lower additional cost, are fixed.

From this perspective SRMC can be thought of as operating expenditure relating to existing (sunk) investments required to meet additional demand. Operating expenditure relates to items such as chemicals and energy costs to treat and move water.

LRMC can be thought of as relating to both capital and operating expenditure. In the context of water, the relatively fixed inputs are the capital items such as dams, desalinisation plants, pumping stations and pipeline upgrades to accommodate such infrastructure. LRMC assumes these capital investments can be varied so as to deliver the lowest cost water required to meet a particular demand scenario.

Marginal cost is a dynamic concept. Both SRMC and LRMC are likely to fluctuate over time. SRMC tends to rise as demand increases and capacity constraints associated with fixed infrastructure are approached. For example, the maintenance cost of fixed assets that are used more intensively increase. Costs also increase as less efficient assets are deployed. After fixed infrastructure has been expanded (that is, new capital has been invested), say to accommodate rising demand, SRMC falls dramatically, because asset utilisation becomes less intensive.

SRMC is dynamically efficient in the sense of quicker transmission of imminent additional supply costs through the price signal. However, for water utilities the efficiency of SRMC translates into volatile price signals, given the lumpy costs of large indivisible fixed capital expenditures, which are generally required to increase capacity. When the resulting SRMC is plotted across time it tends to resemble a 'sawtooth' pattern, where costs are increasing up to the point where a new large fixed investment is made and then dropping very rapidly thereafter. This rising pattern then repeats approaching the time to the next large fixed capital expenditure.

LRMC tends to be less volatile than SRMC. This is because the lumpy schedule of projects, which results in a 'sawtooth' pattern given the relatively short horizons of SRMC, is smoothed (in present value terms) due to the longer time period for the schedule of projects

in LRMC. The inclusion or exclusion of costs in relation to one particular project tends to have less of an impact on this present value compared to SRMC, which considers fewer projects, on account of the shorter horizon. However, storage facilities such as dams can smooth SRMC by allowing production assets to operate at higher capacity. This generates a surplus to store and supply in future, smoothing peaks and troughs. The presence of storage such as dams can therefore reduce the differences between SRMC and LRMC, by reducing the volatility of SRMC.

Despite this, LRMC will still fluctuate over time. Since LRMC is often based on present values of a program of future capital expenditure, the closer (or further) capital expenditure is to (or from) the present day, the higher (or lower) the present value is due to less (or heavier) discounting. As time passes and an expansion of fixed infrastructure becomes imminent LRMC will rise and then fall after the capital has been sunk in the asset, similar to SRMC, but typically in a much less volatile fashion. If the new capacity projects become increasingly more expensive due to exhausting available technologies or diminishing natural resources such as land LRMC will also tend to trend upward with the passage of time.

Long run marginal cost estimation

The Water Corporation's long run marginal cost model

The Water Corporation's long run marginal cost model was initially developed for producing benchmark long run marginal cost estimates for the Integrated Water Supply System (**IWSS**). In turn these estimates were considered to be an appropriate benchmark for setting tariffs on bands of consumption. The LRMC model in recent times has been used more as a tool to support strategic decision making.[199] It is important to note the distinction between using the model for tariff setting and using it for strategic decision making. The Water Corporation's model incorporates fairly specific parameters, options and constraints that have taken technical realities and risks into account that make it more suitable for strategic decision making. The scenario or 'simulation' analysis in its model is mainly focussed on simulated supply or inflow outcomes rather than demand.

The model is based on the 'Turvey' or 'perturbation' approach.[200] The approach considers two different demand scenarios, but only for the purpose assessing the effect of a marginal change in demand or 'perturbation' on costs. These costs are calculated in two separate financial models which take the present value of a stream of capex and opex associated with (or 'triggered' by) each of two, marginally different, demand scenarios. The chronological ranking of the capex and opex associated with supply options is often predetermined on consideration of factors such as least cost and/or risk. The time between the triggering of each project and the associated costs is a function of existing supply and demand. The resulting difference between the present value in each financial model is then divided by the present value of the difference in demand forecasts to arrive at an estimate of long run marginal cost.

The Water Corporation acknowledges that the model cannot resolve all of the nuances involved in the asset planning process. An example of some of the important assumptions are that it assumes only one new source can be triggered per year, and that a new source

[199] Correspondence from Water Corporation (WC8), *Long Run Marginal Cost notes for 2016-17 ERA Inquiry* received 21 February 2017.

[200] R. Turvey, 'Marginal Cost', *The Economic Journal* , vol. 79, No. 314, 1969, pp. 282-299

can be constructed in two years. In addition the model does not model the explicitly account for the impact of where new sources are located.

Key inputs into the Water Corporations long run marginal cost model include the water demand profile, the alternative demand scenarios, water inflows and system losses and water source options. The assumptions surrounding each of these inputs are discussed below.

Supply Options

Water supply options in the model are a subset of a portfolio of sources that include a mix of groundwater schemes (including the expansion of some existing schemes), surface water schemes, and desalination plants. The sources in the portfolio may be at various stages of development (greenfields/brownfields etc). Generic options are also included which are hypothetical supply options which have hypothetical capacity, capital and operating expenditure. The generic options are typically considered over the longer run when specific options are exhausted or are associated with a high level of uncertainty. A subset of the options in the portfolio are selected and ranked according to detailed risk and cost considerations as well as technical constraints. Examples of risks considered include ground water capacity and technical risks related to production facilities. This process incorporates the input of several areas within the Water Corporation.

Existing supply options are incorporated into the model, as are dam levels. Dams are a source of storage in the model with existing levels indicating remaining storage capacity. The model uses simulation that randomly generates many inflow outcomes from an assumed distribution. This in turn produces many LRMC estimates which are used to produce a probability distribution function for LRMC**.**

The model itself determines the timing of the ranked water supply options and integration options, subject to the specific rainfall scenario being modelled. The key decision incorporated into the model is that a new water source option is triggered when metropolitan dam levels are below a certain volume, or useable levels, subject to the constraint that a new source is not triggered if one has already been triggered in the preceding two years. The timing of a specific new water sources is based on the dynamics of the water supply network. Within this framework, the timing of new sources is not set for each scenario, but rather is dependent on the specific factors surrounding each scenario. Network constraints and other decisional triggers have been incorporated into the model based on the advice of the (former) Water Corporation infrastructure planning branch. Water supply options must be considered in the context of integration constraints. A water supply option cannot be developed if there is insufficient infrastructure to allow the additional water to be integrated into the water supply network.

Demand Forecasts

The baseline demand profile used in the Water Corporation's long run marginal cost model projects that per capita water consumption in Perth will fall from the existing level of around 129 kilolitres per person to 125 kilolitres per person in 2030 and 115 kilolitres per person by 2030. Beyond 2030, per capita demand is held constant. Because the demand profile is estimated on a per capita basis, it is also sensitive to assumptions about future population growth. The Water Corporation's forecasts of population growth are based on population projections provided by the *.id the population experts* and the Western Australian Department of Planning.

The alternative perturbation water demand scenario is modelled off the base case scenario with the only difference being that water demand in each year of the alternative scenario

increase by 1 gigalitre per year up to 2023 and is constantly higher by 7 gigalitres per year thereafter.

The figure of 7 gigalitres was informed by Water Corporation's analysis of a range of different comparator scenarios.

Specifically, the Water Corporation has found that extreme estimates of the long run marginal cost are derived when the difference in demand between the base and the alternative scenario is too small. Very low estimates of long run marginal cost are produced when the additional demand in the alternative scenario is inconsequential to the scenario. That is, the marginal increase in demand does not generate any difference in the timing of capital projects and simply results in the generation of additional marginal operating costs.

Very high estimates of long run marginal cost are produced when a small marginal increase in demand causes a bring-forward in the timing of supply options (relative to the timing of supply options in the base case). In such a situation, large costs are incurred as a result of a small increment in demand. When the incremental difference in demand between the base and the alternative scenario is too high, the model delivers unrealistically high estimates of the long run marginal cost as evidenced by a marked step change in the derived estimates. This step change is the result of a significant bring-forward in the timing of water supply options and a marked increase in the number of supply options that are required to be implemented to meet the additional demand.

As a result of this analysis, the Water Corporation concluded that a difference of 7 gigalitres per year minimises the volatility of the range of long run marginal cost estimates while maintaining a realistic mean that is representative of a reasonable level of long-term investment.

Obtaining estimates

The difference between the per kilolitre cost of supplying water under the base case scenario and the per kilolitre cost of supplying water under the alternative perturbation scenario (where demand increased by a margin) is the long run marginal cost. On completion of the simulation, a mean and 95 per cent confidence interval band in terms per kilolitre cost of water supply is derived in present value terms.

The ERA long run marginal cost model

Because the Water Corporation LRMC model has not been developed for the explicit purpose of informing tariffs, the ERA has developed a separate model for this purpose. The model is based on the Turvey approach described above. It was developed with the intention of assessing the effect of numerous randomly generated demand, rather than inflow, scenarios. The distribution of LRMC estimates resulting from demand are of interest to the ERA because it allows different levels of demand, along with their associated probability of occurring, to be mapped onto different levels of LRMC estimates and their probability of occurring. For example, extreme levels of consumption can be matched with extreme long run marginal cost estimates. This information can assist in associating various bands of water usage with various levels of LRMC and hence aid in the structuring of tariffs. The trend in LRMC over time is also useful information when formulating tariff structure. There is evidence that suggests a single volumetric price better meets equity and revenue criteria if long run marginal cost is increasing. If long run marginal cost is higher than average cost, marginal cost pricing can recover revenue in addition to that required to cover

the cost of service. The additional revenue recovered in provision of the service can be used to meet social or equity objectives in the provision of the same service.[201]

Accordingly the LRMC model seeks to address the following questions:

- what is the distribution of LRMC outcomes under a conservative, optimistic and mid scenario;
- how does long run marginal cost compare to average cost; and
- does long run marginal cost trend upward, decrease or remain flat over time?

In addition to the assumptions in the Water Corporation model outlined above, the ERA model makes the following simplifying assumptions:

- no storage;
- full utilisation of nominal capacity on all existing and new (non-variable) supply options;
- a three year delay between recognising the requirement for a new source and commissioning with capex occurring at the end of the year; and
- shortages occurring under extreme scenarios are not addressed by any means other than scheduling new capacity for construction and the associated social costs are not included.

The inputs are discussed below.

Demand

The demand scenarios input into the model are both discrete and simulated. The population forecasts and consumption trends used in calculating total future demand are classified into the three discrete scenarios high, mid and low. The characterisation of these scenarios as high, mid and low only relates to the relatively between each of the scenarios. The high scenario, for example, may be considered as low by those who expect stronger growth in consumption and population. One of three discrete settings is selected for analysis. The simulation under the chosen discrete scenario is based on observed deviations from a time series model that has been fitted to historic actual consumption per capita data (or 'shocks').[202] A distribution shape was fitted to the errors and simulations were carried out by simulating 1000 randomly drawn shocks from this distribution. The process for developing these forecasts is outlined and compared to those used in the Water Corporation's model below.

The Water Corporation produces demand forecasts on a gigalitre per year basis (inclusive of system losses) separately for Perth, Mandurah and the Goldfields and Agricultural Water Supply (**GAWS**) Scheme. The forecast horizon is the coming 100 years. These forecasts are then aggregated into total projected demand deemed to apply to the Integrated Water Supply Scheme (**IWSS**). The IWSS incorporates the majority of Water Corporation's water

[201] J. Freebairn, 'Some emerging issues in urban water supply and pricing', *Economic Papers*, vol. 27, No. 2, June, 2008, pp. 184-193.
The single volumetric price tariff structure typically involves multiple fixed cost or service charge bands instead of multiple per unit price bands.

[202] This is done after the effects of water restriction based shocks have been removed in order to limit shocks to only those cause by random deviation from the fitted model.

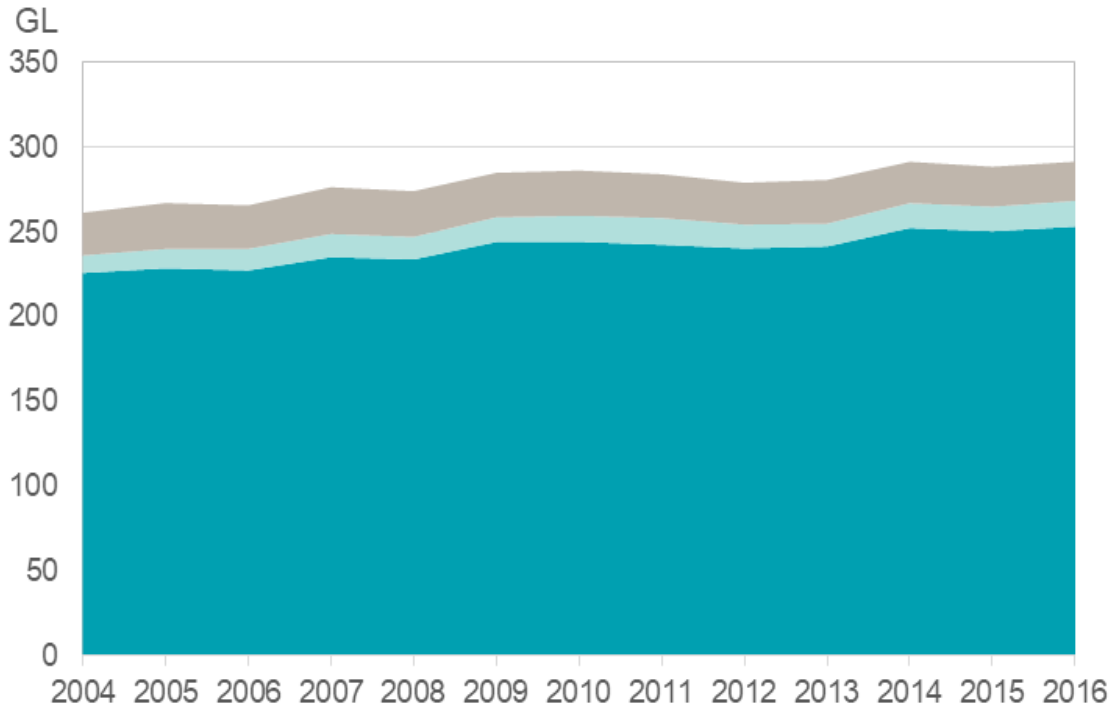
supply assets including dams, desalinisation plants, ground water and conveyance infrastructure.

The gigalitre per year demand forecasts for Perth are broken down further into two drivers; the forecast consumption per capita (excluding system losses) and the forecast Perth population. Perth demand is the product of these two drivers. This figure is then grossed up for conveyance losses which Water Corporation calculates to be 12.1 per cent.

Perth consumption per capita forecasts

Perth metropolitan consumption makes up around 86 per cent of the Integrated Water Supply System's (**IWSS**) annual total demand (see Figure 14).

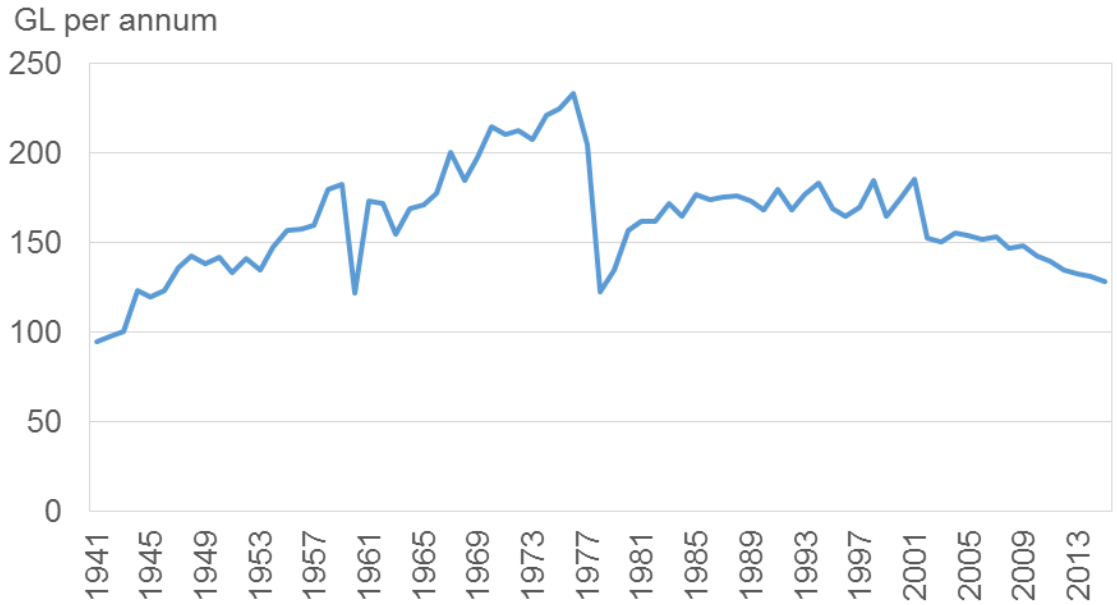
Figure 14 Perth, Mandurah/Southwest and Goldfields Agricultural Water Supply total demand



Source: Water Corporation 2017

Perth consumption therefore has a considerable impact on annual total demand. The Water Corporation has provided Perth consumption data dating back to 1941. The consumption data is plotted in Figure 15.

Figure 15 Perth consumption



Source: Water Corporation, 2017

Demand exhibits considerable variation around an increasing trend prior to 1976, and lower variation around a declining trend thereafter. This suggests that the mean and variance are not constant over time. If consumption is nonstationary, the best forecast using the level (raw) data is likely to be the latest year of consumption. This is because nonstationary properties imply that the distribution parameters – such as the mean and variance of the level data – change over time, and so are of limited or no use for informing future expectations. This can be on account of issues such as trends in the data, which means that the mean increases or decreases over time, or structural change, which implies a significant change in the circumstances driving the data. It is likely that structural changes are present in the data on account of severe water restrictions in 1959, 1960 and 1978 which appear to have resulted in large decreases in consumption. Augmented-Dickey Fuller (**ADF**) tests for stationarity in the level data are shown in Table 43.

Table 43 Perth consumption per capita - stationarity tests

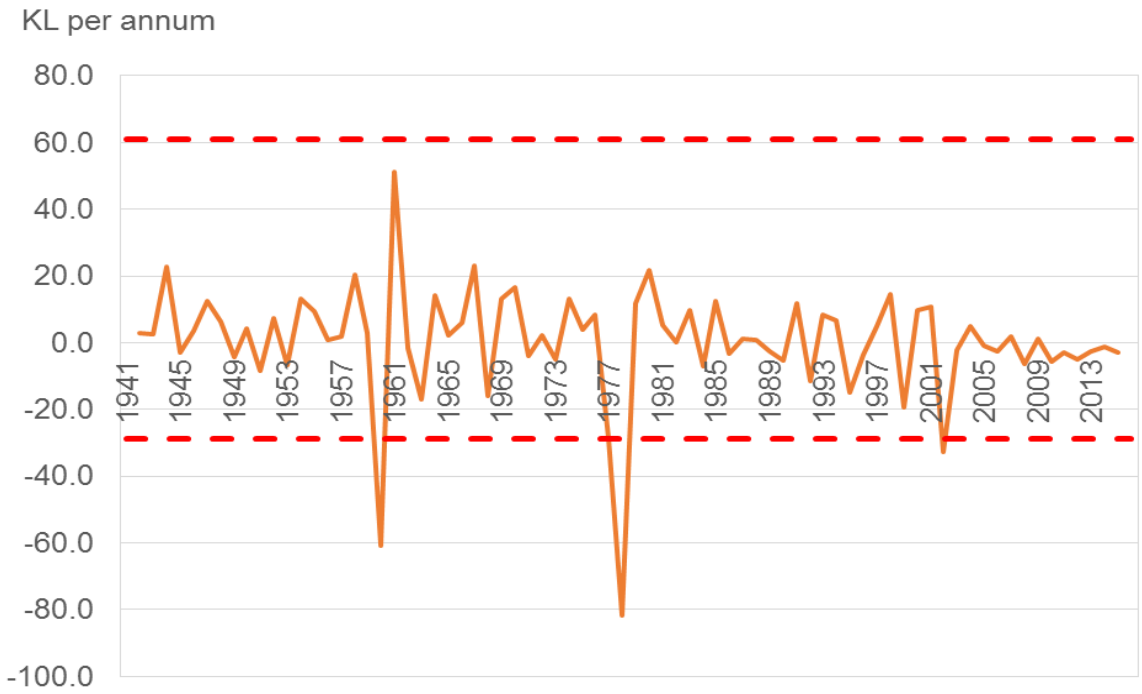
Region	Test Specification	test-statistic	critical-value (5 per cent significance)	outcome
Total	*None*	-0.20	-1.95	*Do not reject hypothesis of unit root - nonstationary*
	Trend	-2.62	-3.45	*Do not reject hypothesis of unit root - nonstationary*
	Drift	-2.86	-2.89	*Do not reject hypothesis of unit root - nonstationary*

Source: ERA Analysis

The absolute value of the test statistic being lower than the absolute value of the critical value confirms that the level data are non-stationary for all specifications of the ADF test. The level data therefore have a non-constant distribution and cannot be used for forecasting without further treatment.

'Differencing' is the subtraction of the prior observation from each observation. This removes any trend in the data (if present) and leaves only the year to year changes. The year-to-year changes in consumption are shown in Figure 16.

Figure 16 Year to year change in Perth consumption per capita



Source: Water Corporation, 2017

An ADF test on the year-to-year changes shown in Table 44 indicates that they are stationary even at the 1 per cent level of significance. This is evident in the absolute value of the test statistic being greater than the absolute value of the 1 per cent critical value. As a result, statistical distributions fitted to this data set are likely to be meaningful for extrapolating future changes.

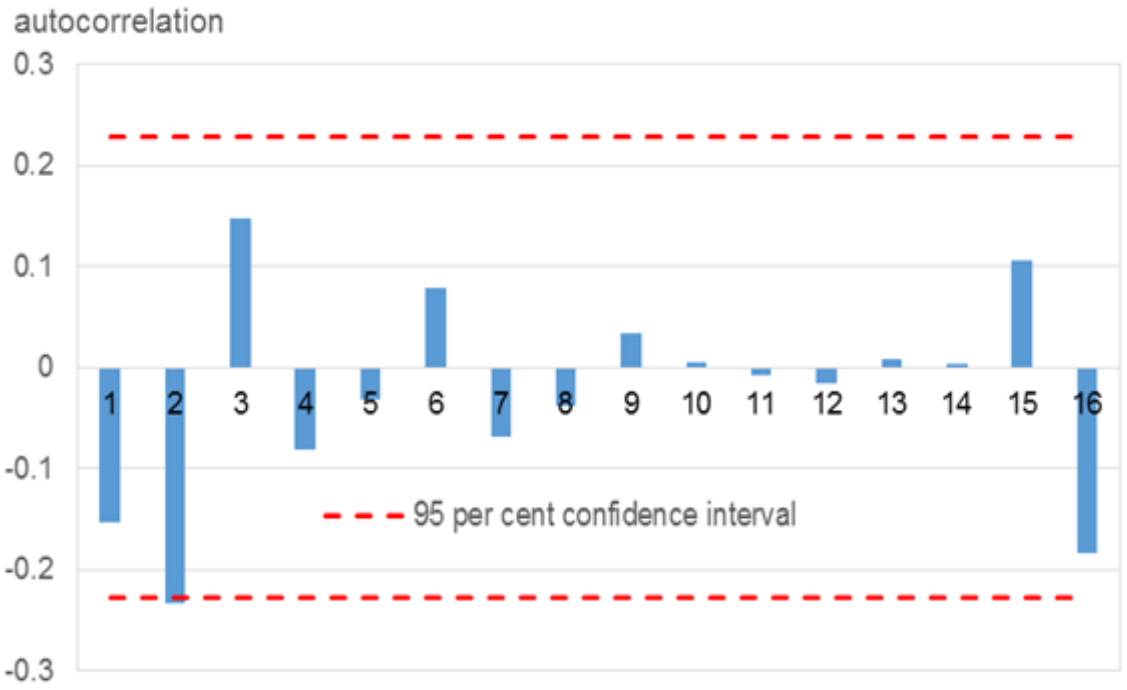
Table 44 Year to year changes in Perth consumption per capita - stationarity tests

Region	Test Specification	test-statistic	critical-value (1 per cent significance)	outcome
Total	*None*	-8.31	-3.51	***Reject hypothesis of unit root - stationary***

Source: ERA Analysis

The oscillation in the year-to-year changes exhibited in Figure 16 suggests negative autocorrelation is present in the data. This means each observation is negatively correlated to prior observations. The autocorrelation function shown in Figure 17 plots the correlation between each observation and the 16 values that precede it.

Figure 17 Autocorrelation function for year to year changes in demand



Source: ERA Analysis

Each observation is significantly negatively correlated with the second value that precedes it (second lag). This is evident in the second blue bar breaching the 95 per cent confidence interval illustrated by the dashed red lines.[203]

The stationarity and autocorrelation in year-on-year changes suggests that they can be modelled over the short term using an Autoregressive Integrated Moving Average (**ARIMA**) process. Autoregressive refers to the model being a function of lagged observations or prediction errors. That is, an observation at time t can be modelled as a function of an observation/s prior to time t because they are correlated. Moving average refers to a similar process except an observation at time t can be modelled as a function of past prediction error/s. A prediction error is the difference between the ARIMA modelled outcome and actual outcome. Integrated refers to differencing the level data.

Figure 16 exhibits large negative shocks in the year-on-year changes in consumption. The year-to-year changes follow a Laplace (as opposed to normal) distribution and so a 95 per cent confidence interval based on this distribution was calculated and plotted in Figure 16. The shocks that are significantly different from the rest of the data set based on this confidence interval occur in 1960, 1978 and 2002. Each of these major negative shocks fall in the year after water restrictions were imposed in late 1959, 1978 and 2001.[204] The use of a binary variable indicating the introduction of these water restrictions in the year prior should help improve the explanatory power of the model by controlling for the negative demand shocks in response to the restrictions. It is important to control out policy driven shocks. This is because they are difficult to forecast and so the base line assumption is

[203] Although large, the 16th lag is not statistically significant, as it falls within the red bands, and so is ignored.

[204] Water Corporation, *Perth Water Statistics*, 2017.

that forecasts are being made in the absence of any such policy or policy shocks. The data used for forecasting should therefore be free of policy driven variation.

The ERA notes that there have been periods of mild and moderate restrictions over the period observed in Figure 15. However, as shown in Figure 16 with the exception of 2002 only severe restrictions have been associated with significant shocks and so are the only restrictions that need to be controlled for. The restriction in 2002 is a special case on account of its significance and should also be controlled for.

Creating an ARIMA model involves specifying the number of lagged prior observations (AR component) with *p* denoting the number of lags, order of integration denoted by *d* and number of lagged prediction errors (MA component) denoted by *q*. This gives an ARIMA model specified as (*p*, *d*, *q*). The stationarity of the year to year data established in Table 44 indicates integration of order 1 is sufficient. The AR or MA component can be omitted if need be (*p* or *q* set to 0). To assess which specification is most appropriate the Akaike Information Criterion (**AIC**) is used. The explanatory power of an econometric model can be improved by adding irrelevant variables, termed 'overfitting' of a model. The AIC penalises the addition of irrelevant variables (in this context lags) while favouring the specification with the greatest explanatory power.

The model specification with the lowest AIC is preferred. Statistically insignificant variables should also be omitted. After trialling a number of specifications, an ARIMA (0,1,0) model with no intercept and binary variables indicating the introduction of water restrictions in the year prior was found to report the lowest AIC. The coefficient on the binary variable for water restrictions introduced in the prior year is -39.35 reporting a t-statistic of -7.54, meaning is significant even at the 1 per cent level. This model simply tells us that next year's consumption is equal to last year's consumption less 39.35 kilolitres if a water restriction was introduced in the year prior plus some random shock.

Initial impressions subject this model to two criticisms. Firstly, in the absence of water restrictions, next year's forecast is simply last year's consumption per capita. The justification for this is that in the absence of water restrictions, consumption per capita does not exhibit any clear trend up or downward over the long run. Extrapolating trends using smaller subsets of the data is not likely to be robust due to selection of the subset of data being overly subjective. In addition, the data has a mean and variance that tends to shift around rather than revert to some constant level, or, put another way, it follows a 'random walk'. This means that using last year's consumption as next year's forecast minimises error by avoiding wrongly forecasting an increase or decrease when the opposite occurs as a result of random shifts in the mean and variance.

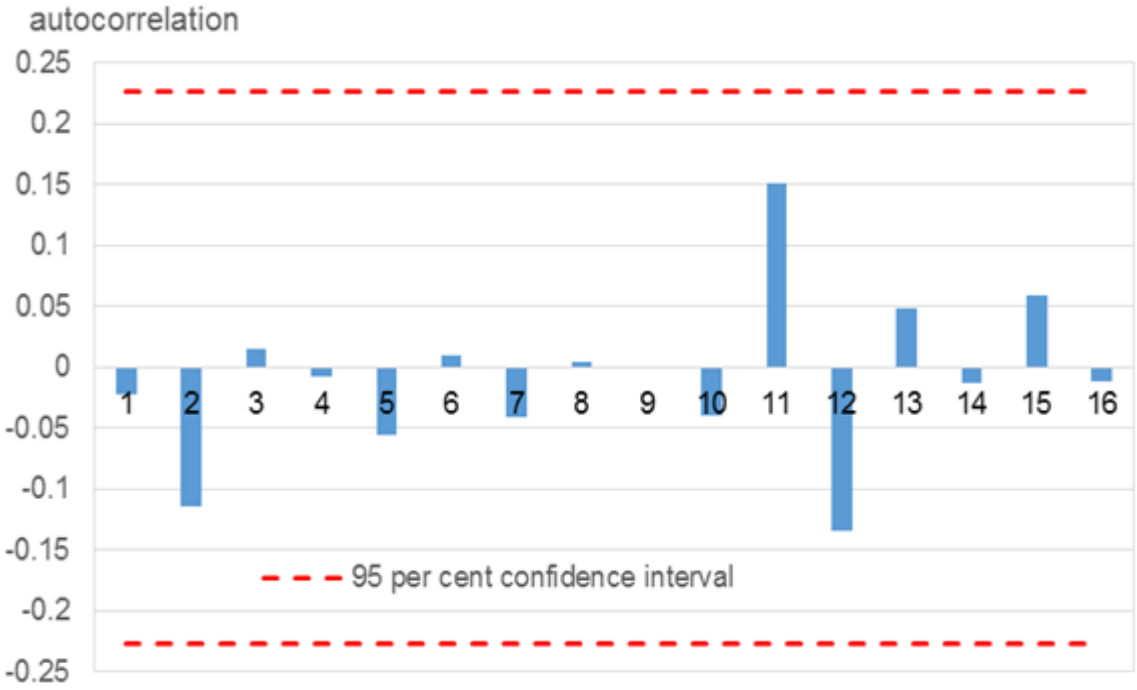
The second criticism is that the prediction of a 39.35 kilolitre per person reduction given a move from no water restrictions to a water restriction in the previous year may be overly optimistic at lower levels of consumption and pessimistic at higher levels of consumption. The main reason for inclusion of this variable is to 'control out' the average effects of the three prior 'high impact' restrictions. It is not intended to be used as forecasting variable. The main objective of controlling out the average effects of the three prior restrictions is to produce a sample of random shocks (shown in Figure 19) that is free from the impact of a significant non-random events (water restrictions). The random shocks can then be used to create more meaningful distributions in simulation analysis that separate random from non-random events.

Only the random variation in consumption is of interest. This is because the randomness in consumption behaviour drives the risk of higher or lower than expected demand. Also, as a driver of demand, consumption is also more likely to be influenced by LRMC pricing than demand drivers such as population growth and so higher consumption should attract

a higher LRMC based price and correspondingly lower consumption should attract a lower price. Shocks can be randomly drawn from the distribution and applied to the demand forecast model from a distribution of demand outcomes.

The random shocks (or residuals) produced by this model are shown in Figure 19. It is important that the shocks and squared values of the shocks are not serially correlated with each other. If this is the case, it means the model has been mis-specified. The model is then not capturing persistence in shocks (that die out over time) or absolute size of shocks that are dependent on the size of the shocks in the preceding year/s. Figure 18 shows that there is no significant auto (or serial) correlation in the shocks.

Figure 18 Autocorrelation function for shocks to changes in demand



Source: ERA Analysis

This is evident by the blue bars not breaching the 95 per cent confidence interval indicated by the dashed red lines. An ARCH LM test was used to test for serial correlation in the squared values of shocks. The results are shown in Table 45.

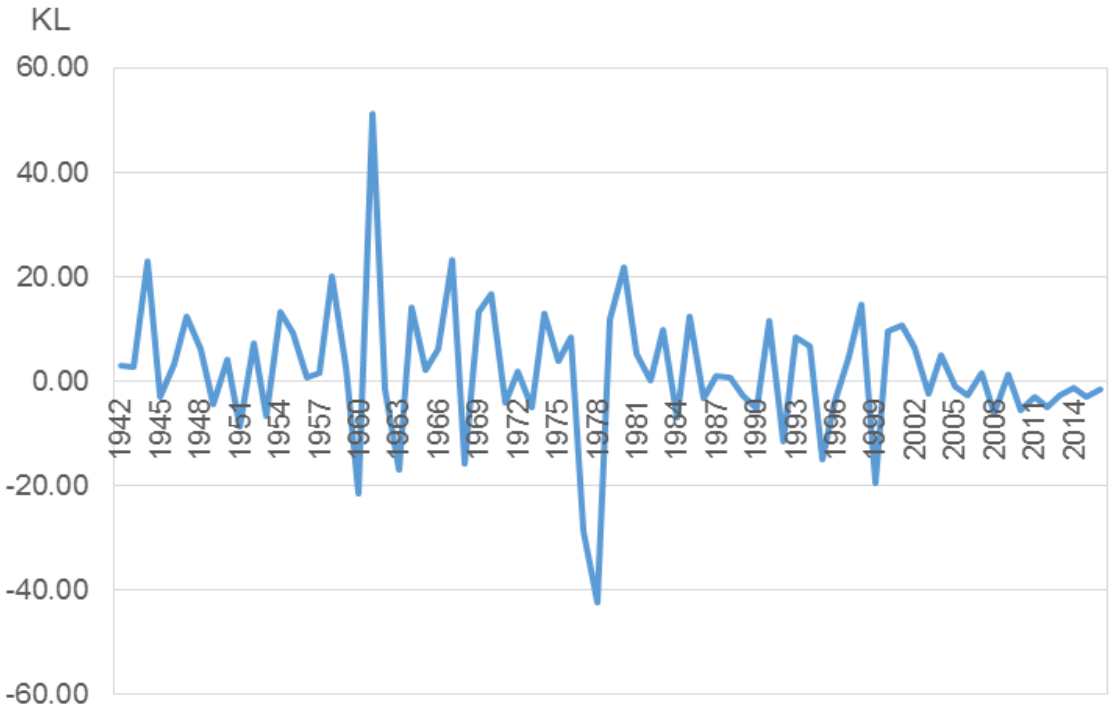
Table 45 Test for serial correlation in squared Perth consumption per capita shocks

Test	test-statistic (Chi-Squared)	p-value	outcome
ARCH LM Test	7.478	0.8245	***Do not reject hypothesis of no ARCH effects***

Source: ERA Analysis

The null hypothesis of the test is effectively no serial correlation in squared residuals (ARCH effects).[205] The p-value indicates no rejection of the null hypothesis which indicates that serial correlation in the squared shocks is not present. Accordingly, this indicates that the ARIMA(0,1,0) model sufficient.

Figure 19 Shocks to annual change in Perth consumption



Source: ERA Analysis

Although the policy driven shocks have been controlled for, it appears that some degree of these types of shocks still exist within the data. For example, given the current lower levels of recent consumption it is very unlikely that consumption would increase or decrease by 40 kilolitres per capita per year. As a result it may be best to remove these observations when simulating demand forecasts based on this distribution of consumption in order to avoid such large increases or decreases in the simulated data. These shocks to consumption are used in simulations further below in the forecast of total demand for Perth. The issue relating to the large shocks is also addressed in that section.

The discussion above has developed a statistical consumption model which is simply last year's forecast and shocks or variations that can be used in simulation analysis to randomly vary the forecast. This is the best forecast based on only on the historically available consumption data. It is naïve in the sense that it does not factor in any conditions that make the future different from the past. Instead of attempting prediction the basis of other qualitative measures, the ERA has included the Water Corporation's consumption per capita forecasts as an additional discrete scenario.[206] The Water Corporation's *Water*

[205] ARCH stand for Autoregressive Conditional Heteroskedasticity and refers to the variance in a time series exhibiting a pattern that can be modelled.

[206] This is discrete in the sense that it is not simulated scenario, but a 'setting' in the model to which the simulated shocks are applied.

Forever consumption per capita views take a range of qualitative factors into account that would reduce per capita water consumption. This includes factors such as:

- programs to encourage households to take measures that save water;
- rebates and legislation on water efficient appliances;
- increased urban density;
- a requirement for certain non-residential users to implement water efficiency management plans;
- leakage and pressure management;
- programs to promote efficient water management in schools and councils; and
- alternative water supplies;
- pricing and billing.

Consistent with this scenario, the most optimistic projections provided by the Water Corporation include an accelerated 2030 target of 115 kilolitres per capita per annum a 2060 target of 105 kilolitres per person.[207] In 2015-16 Sydney's average annual consumption per person was around 107 kilolitres while Melbourne's consumption over the same period was around 95 kilolitres.[208] The smaller outdoor areas associated with higher urban density in these larger cities play a role in reducing water consumption per capita.[209] Considerable growth in Perth's urban density is required to be comparable to that of Sydney and Melbourne. However, assuming urban density is a direct function of population and that increased urban density results in reduced water consumption per capita (either directly or indirectly), the population projections for Perth out to 2030 and 2060 shown in Figure 21 indicate that Water Corporation's most optimistic projections are achievable. The two scenarios are plotted in Figure 20.

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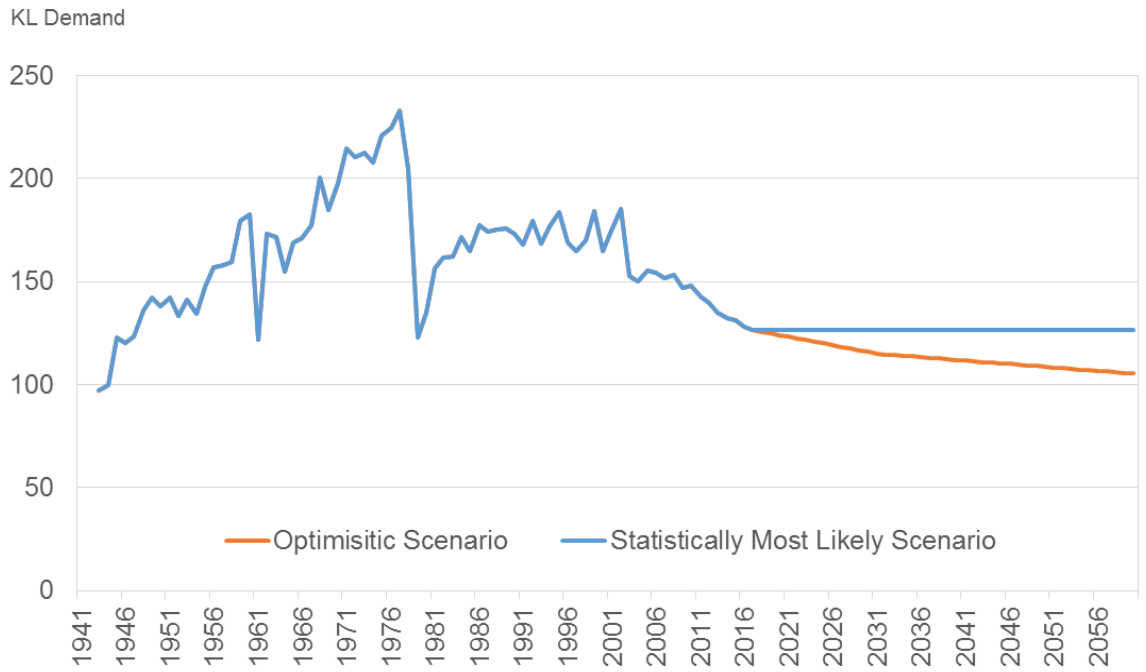
[207] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 12. The ERA notes that the Water Corporation's, revised long-run marginal cost model demand forecasts no longer include the 105 kilolitre by 2060 target. The 105 kilolitre target is still adopted in the ERA modelling as an optimistic, but possible scenario.

[208] Sydney consumption based on 293 litres per person day. See page 1 of http://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq3/~edisp/dd_047419.pdf. Melbourne consumption based on 4,489,190 persons implied from total residential consumption of 272 gigalitres per annum and 166 litres of residential consumption per person per day, 106 gigalitres of non-residential consumption per annum and 48 gigalitres of non-residential consumption. See *Water data use,* [website], 2017, https://www.melbournewater.com.au/waterdata/wateruse/Pages/default.aspx (accessed 18 August 2017).

[209] Productivity Commission, *Australia's Urban Water Sector: Productivity Commission Inquiry Report, Volume. 2*: *No.55*, 31 August 2011, p. 260.

Figure 20 Perth consumption per capita scenarios



Source: ERA Analysis, Water Corporation 2017

A 'mid' scenario assumes half the rate of decline per annum used in the optimistic scenario. A comparison of the three scenarios are shown in Table 46.

Table 46 Consumption reduction scenarios

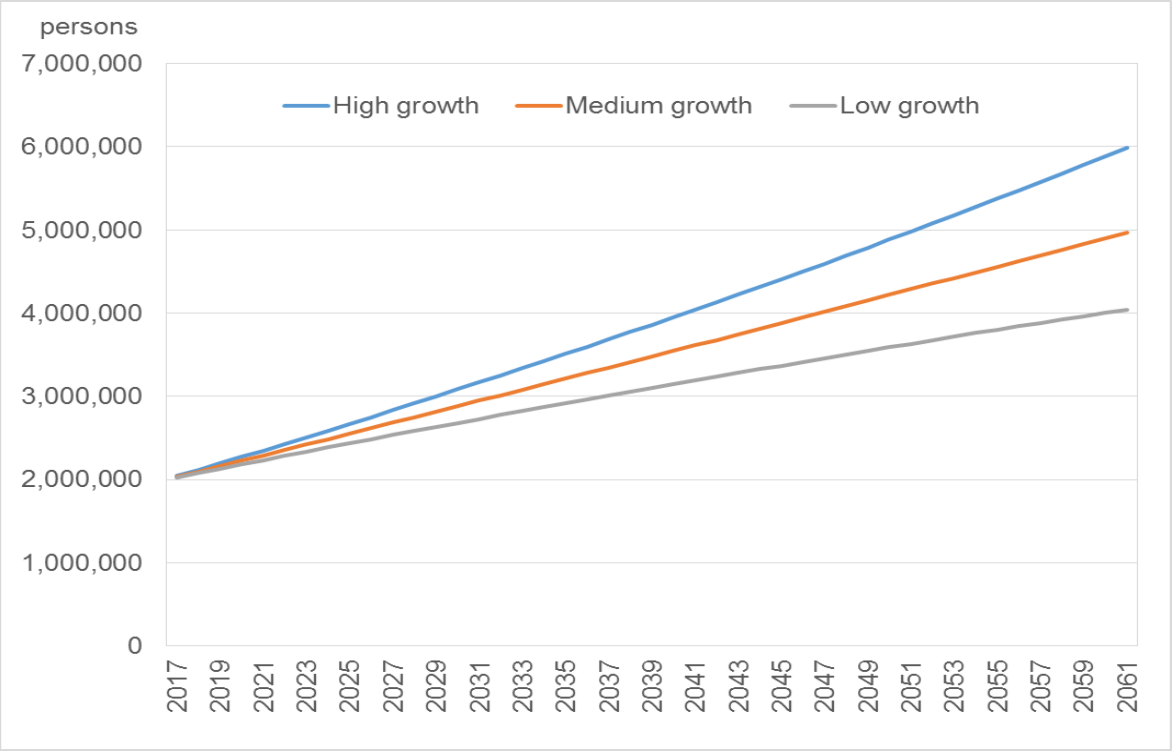
kL per capita per annum reduction	To 2030	To 2060
Optimistic	0.82	0.33
Mid	0.41	0.17
Conservative	0.00	0.00

Source: ERA Analysis, Water Corporation 2017

Perth population forecasts

The ERA sourced population projections for Greater Perth from 2012 to 2061 from the Australian Bureau of Statistics (**ABS**). A high, mid and low scenario is produced and project annual forecasts as at the end of each financial year. The forecasts were made in 2012. However, estimated actual Greater Perth and Mandurah populations were available for 2015. In light of this, the 2012 forecasts were rescaled to start at the estimated Greater Perth less Mandurah population at 2015 and apply the growth implicit in each of the high, medium and low series from then on. The resulting forecasts for each of the scenarios is shown in Figure 21.

Figure 21 Greater Perth (ex. Mandurah) projected population at financial year end



Source: Australian Bureau of Statistics, 2013

Each of the scenarios demonstrates significant divergence out to 2061. These projection differences are a major driver of water demand forecasting errors over the long run. The forecasting period adopted by Water Corporation for its LRMC model is 100 years. This results in the need to extend forecasts out to 2116 which results in the demand forecasts becoming considerably more divergent. However, the value of extending the demand forecasts beyond 2061 is questionable. The forecast error driven by population forecast error becomes so large that the uncertainty around the final result is likely to render it of little significance. In LRMC modelling, forecasts beyond 2061 are heavily discounted by present value formulas so the effect of such divergent forecasts on the final LRMC calculation is not likely to be significant. However, a schedule of projects where cost is increasing rapidly counteracts the discounting effect.[210] The period should also be long enough to ensure that idiosyncratic events such as base case capex falling outside the period analysed while corresponding perturbation capex falling within is heavily discounted.[211] This may call for demand forecasts being linearly extrapolated in order to extend the period being analysed. This issue is revisited further below.

The ABS forecasts are only current as of 2013.[212] Economic and social conditions are likely to have changed substantially since 2013. Up to date forecast would therefore be more

[210] An example of this in the current context is the addition of more expensive and distant production plants in later years as fewer alternative options become available.

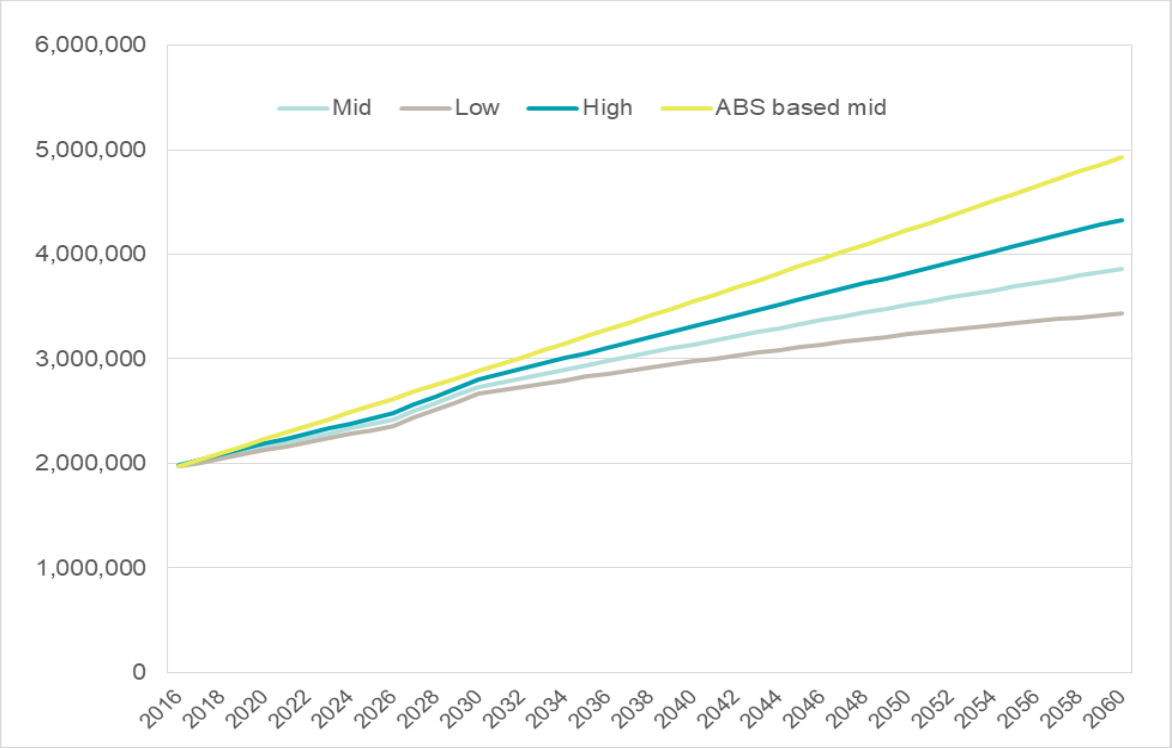
[211] This situation can result in large positive capex values in the perturbation not being offset by the same capex in the base case in subsequent years (LRMC is based on perturbation cash flows less base case cash flows). As a result the LRMC estimate becomes too high due to an excessively large marginal capex value existing in the final years of the period under analysis.

[212] As at 13 July 2017 the ABS six month release schedule does not indicate the release of new updated population projections.

preferable as they are more likely to factor in such changes in economic and social conditions. The ERA notes that the Western Australian State Government Department of Planning, Lands and Heritage (**DPLH**) produces population forecasts out to 2026 which were revised in August 2015. DPLH also produce longer term forecasts from 2031 to 2060 which were published in 2014-15.[213] The shorter term forecasts are available as five sets ranging from relatively high to low.[214]

For LRMC modelling purposes, the average of the DPLH forecasts are used to form the mid forecast, the highest forms the high and lowest forms the low forecast. The longer term forecasts are produced as a set of three, relatively high and low forecasts. The missing years between 2026 and 2031 were linearly interpolated. Since the DPLH forecasts are for Western Australia the year to year growth in each set of forecast was used to index the 2015 ABS Greater Perth (excluding Mandurah) actual population estimate. The results are compared to the 2013 ABS based estimates in Figure 22.

Figure 22 Department of Planning, Lands and Heritage versus ABS growth based Perth population forecast



Source: ERA Analysis, ABS 2013, Department of Planning, Lands and Heritage

All forecasts based on the DPLH based growth rates are substantially lower. This possibly reflects a moderated outlook on the basis of easing economic conditions. For example, *.id the population experts*, a private company that produces population forecasts, state:

[213] See version 1.2 https://www.planning.wa.gov.au/publications/6194.aspx. The revision date for the long term forecast was advised through correspondence with the Department of Planning, Lands and Heritage on 13 July 2017.

[214] The ERA also notes that the Department of Planning, Lands and Heritage historically have produces reports assessing its forecasts against realized values. See Western Australian Planning Commission, *Are our population projections on target?*, March 2004. On this basis of the mean percentage errors, the ERA considers these forecasts to be a reasonable alternative to the ABS forecasts.

> Western Australia is another State where the interstate migration trend has changed considerably, but this State's demographic trends have a strong link to the resource economy. It's only three years ago that WA was recording very high rates of population growth, driven by large increases not only in interstate migration, but also overseas migration. Of course this was at the peak of the mining boom, when demand for labour was very high. You could barely move around at Perth airport for all the mine workers heading north. In 2012, WA recorded a net interstate migration gain of more than 11,400 persons, but this has declined since and in 2015 the State recorded a loss of almost 2,000 persons – the first loss since 2003.[215]

On this basis the lower results appear in line with what would be currently expected and therefore reasonable. This forecast could change in future with new information such as indicators of sustained strengthening in the Western Australian economy.

Perth demand forecasts

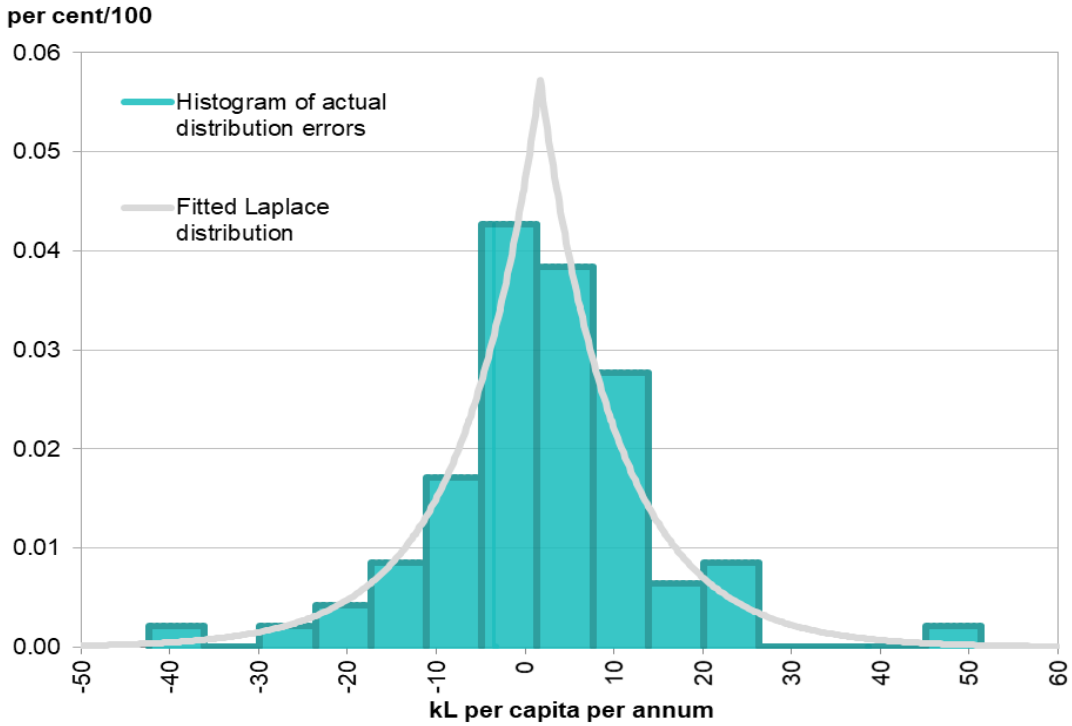
Demand forecasts are a product of annual consumption per capita and population forecasts. These forecasts are subject to considerable variability stemming from the reoccurring variation in annual consumption per capita outcomes and uncertainty stemming from population growth. As discussed above, only the random variation in consumption is of interest. This is due to the randomness in consumption behaviour driving the risk of higher or lower than expected demand and also the fact that consumption is more likely to be influenced by LRMC pricing than demand drivers such as population growth. Simulating consumption outcomes is a key difference between the ERA and Water Corporation LRMC model.

When input into the long-run marginal cost model, the variation in these demand forecasts driven by random consumption shocks is expected to induce a distribution of long run marginal cost estimates. This can be used to inform tariffs set for different levels of consumption. For example low levels of consumption producing lower long run marginal cost should be priced accordingly. High levels of consumption resulting in higher levels of long run marginal cost should also be priced accordingly. This creates an incentive to reduce consumption if the marginal cost is higher than the marginal benefit of high water use or increase consumption if it is lower.

The consumption shocks shown in Figure 19 were fitted with a distribution chosen according to the AIC. This is shown in Figure 23.

[215] See *.id the population experts* [website], 2017, http://blog.id.com.au-2016/population/demographic-trends/who-are-the-winners-and-losers-in-the-interstate-migration-game/ (accessed 16 August 2017).

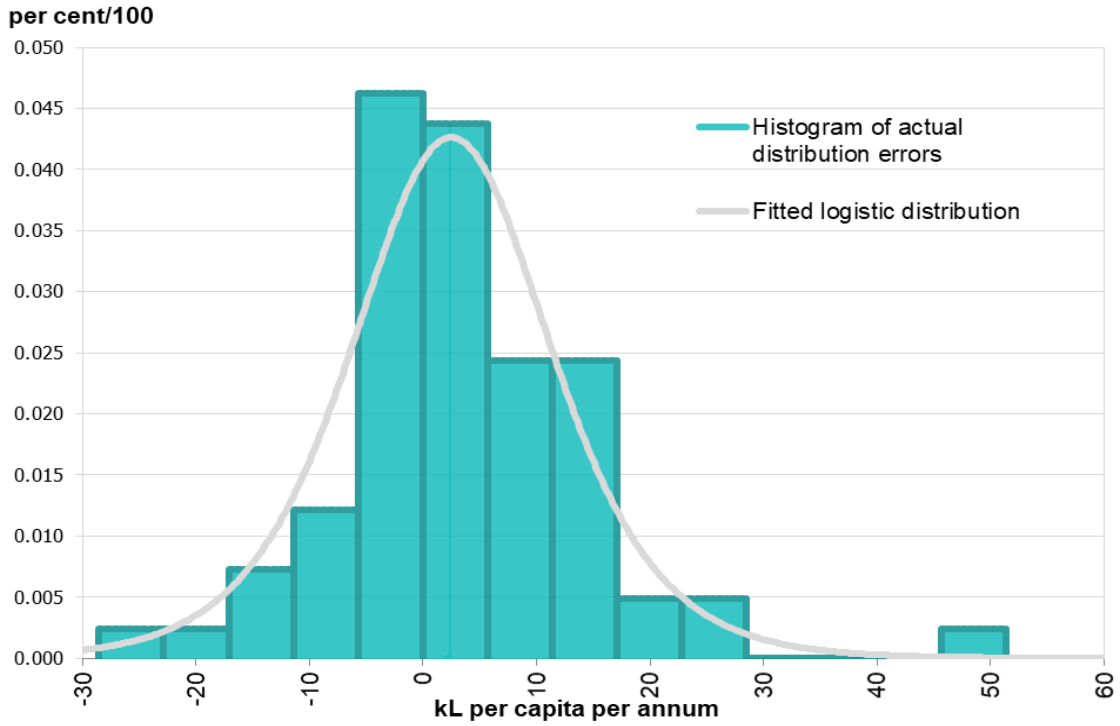
Figure 23 Actual and fitted distribution of random shocks in annual consumption changes



Source: ERA Analysis

It appears that some proportion of the water restriction driven shocks still remain with the consumption shock data. This results in the long tails in the distribution of consumption shocks shown in Figure 23. Such extreme changes in the context of current levels of consumption are not likely. For example it is unlikely that demand would drop from 126 kilolitres per capita in one year to 86 kilolitres in the next year represented by the -40 kilolitres in the left tail in Figure 23, particularly given that Melbourne, a city with higher urban density than Perth, had consumption over 2015-2016 that was up around 94 kilolitres. For this reason the distribution was refitted to a dataset removing the extreme observations in 1960, 1978 and 2002 which are associated with water restrictions. The refitted distribution of consumption shocks is shown in Figure 24.

Figure 24 Actual and fitted distribution of random shocks in annual consumption changes – water restriction driven outliers removed



Source: ERA Analysis

The best fit of distribution was a logistic fit. This distribution exhibits a less extreme downside which would imply a minimum consumption per capita in the near term of around 96 kilolitres per annum (126 kilolitres minus 30 in the left tail). This minimum, although unlikely is more realistic than the previous 86 kilolitre per year figure. The distribution appears reasonable as a basis for simulation analysis.

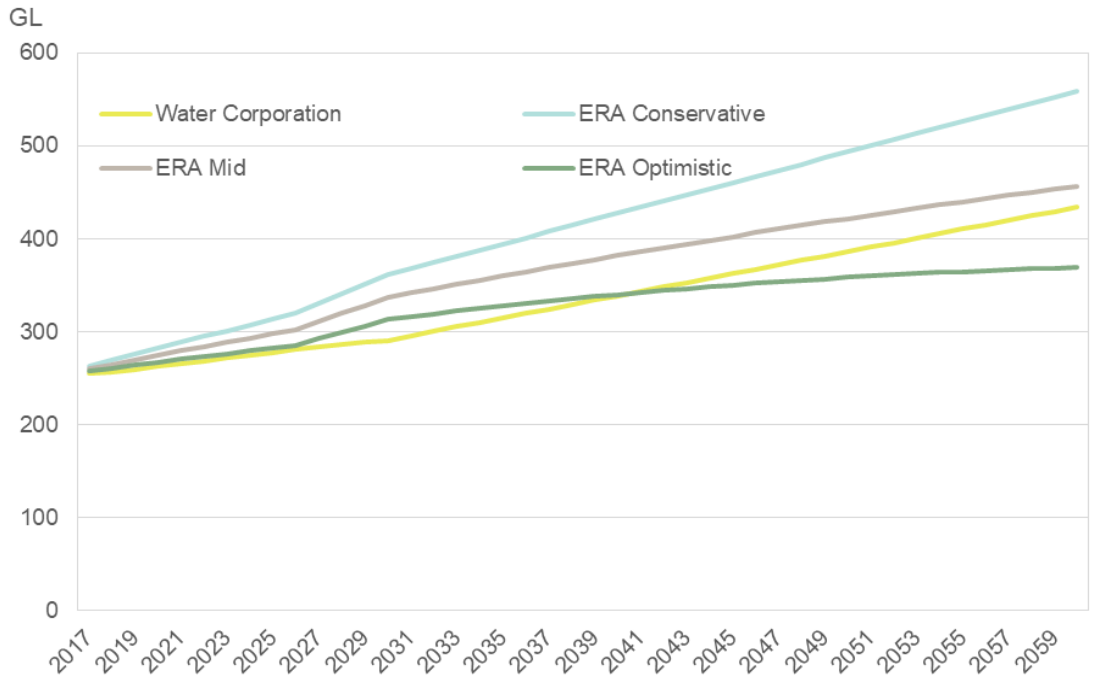
Demand for Perth (excluding Mandurah) is the product of consumption per capita and population. The three discrete demand scenarios discussed above form the basis for demand forecasts; conservative, mid and optimistic. Within the LRMC model a discrete scenario is manually chosen. Simulation can then be applied to the scenario by randomly drawing consumption shocks from the distribution shown in Figure 24 and applying them to the consumption forecast which is then multiplied by population. The three scenarios are formed as follows:

- the conservative scenario combines the highest discrete annual consumption per capita scenario, which is zero reduction, (shown in Table 46) and the highest population forecasts shown in Figure 22;
- the optimistic scenario combines the lowest discrete annual consumption per capita scenario which is that based on Water Corporations policy assumptions and the lowest population forecasts shown in Figure 22; and
- the mid scenario relates to a mid-point between high and low demand. It combines the mid annual consumption per capita scenario shown in Table 46 with the mid population growth assumption

A simulation was run 1000 times to produce a set of annual Perth demand forecasts out to 2060. Each scenario has its own distribution as a result of the simulation. Figure 25 shows the mean of each of these distributions and compares them with the Water Corporation's

demand forecasts for Perth which were submitted in its revised LRMC model.

Figure 25 Perth demand forecasts ERA vs Water Corporation



Source: ERA Analysis, Water Corporation 2017

The Water Corporation's Perth demand forecasts are similar to the ERA optimistic forecast until 2026. This is a result of the optimistic scenario using the same consumption forecasts as the Water Corporation for the optimistic scenario and similarity between the small area forecast information population forecasts used by Water Corporation and the low population growth forecasts produced by DPLH.[216] All ERA forecasts differ between 2026 and 2030 due to the linear interpolation of population forecasts (discussed above) applied by the ERA and the difference in consumption per capita which is higher in the mid and conservative scenarios. The Water Corporation's demand forecasts submitted in its revised LRMC model differ from that in its initially submitted model. The consumption per capita forecasts underlying the demand forecast in the initially submitted model are those used as the basis for the ERA optimistic scenario. After 2030 the Water Corporation's revised consumption per capita forecasts stay constant at 115 kilolitres per capita instead of declining to 105 kilolitres in 2060. The removal of this decline results in the steeper slope observed in the Water Corporation forecasts compared to the ERA forecasts. Again the difference in consumption per capita, which is higher in the mid and conservative scenarios, explains the remaining divergence.

Mandurah and Goldfields and Agricultural Water Supply Scheme

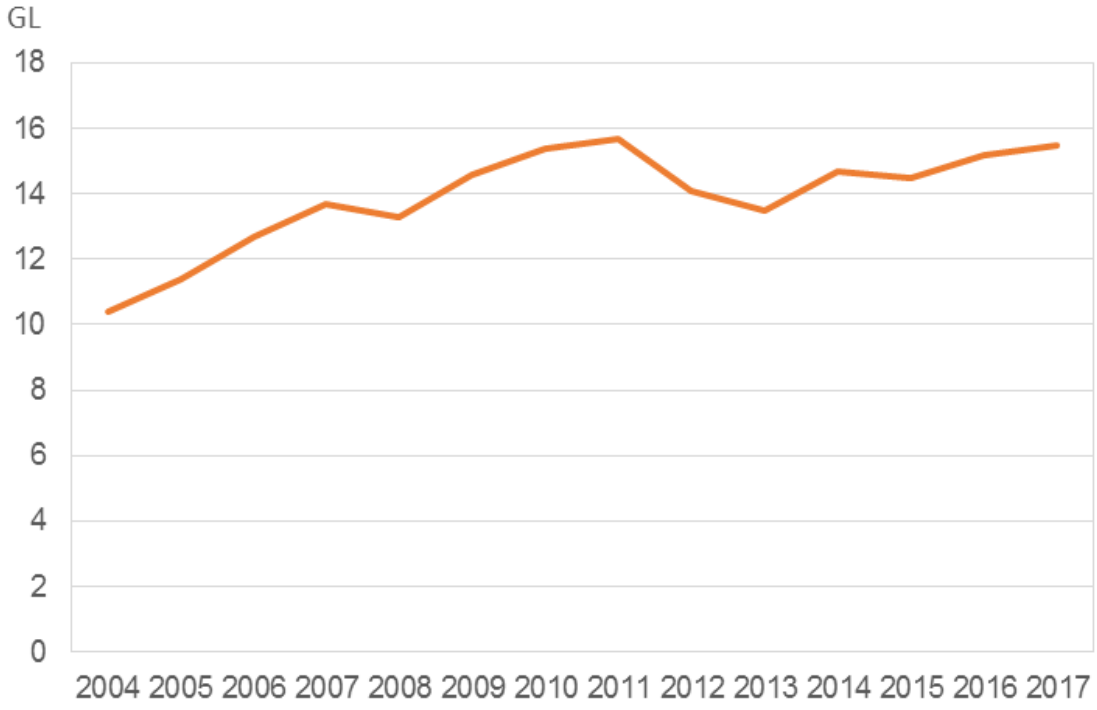
Due to the relatively small influence of Mandurah and GAWS, forecasts for these schemes are made at the total consumption level and then added to the Perth metropolitan forecasts to form the total IWSS forecast. No simulations or scenarios have been used for these

[216] The SAFI forecasts are produced by '.id the population experts'. Water Corporation use Department of Planning recent forecasts of 3.5 million persons by 2050.

forecasts. This is because variation in these forecasts has virtually no noticeable effect on the LRMC estimates when combined with variations in Perth total demand.

Historical data for Mandurah are shown in Figure 26 below.

Figure 26 Historic demand Mandurah/Southwest



Source: ERA Analysis

A small number of observations was supplied, however a linear regression appears to produce reasonable results in terms of explanatory power and statistical significance (see Table 47).

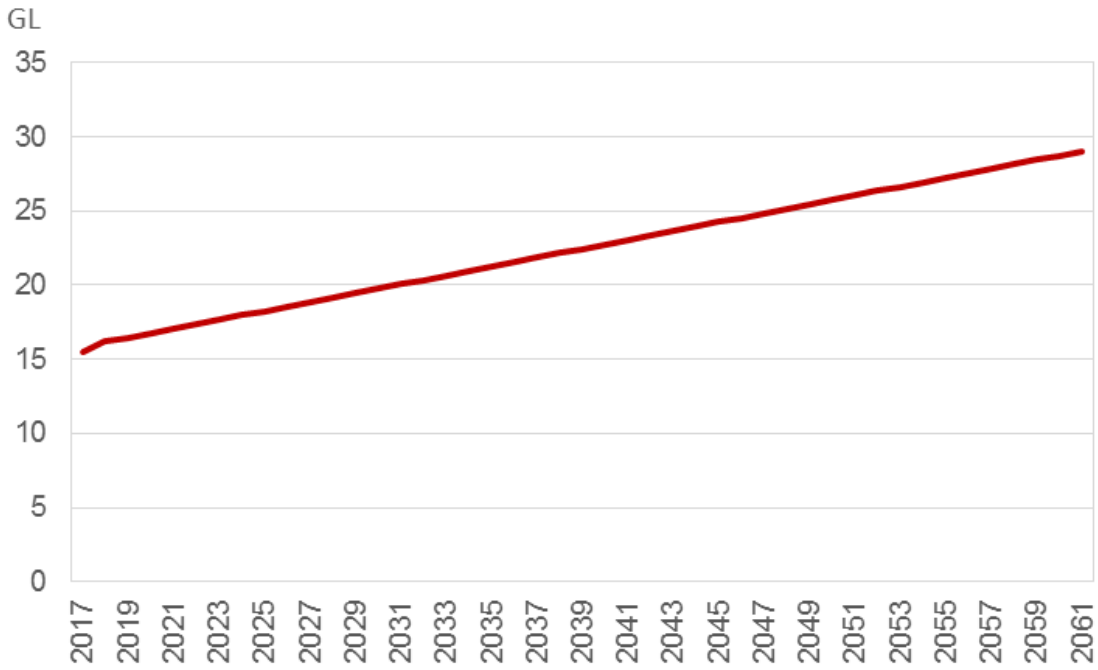
Table 47 Regression of Mandurah/Southwest demand on time

Parameter	Coefficient	p-value
Intercept	-587.007	0.00
Year	0.299	0.00
Observations	13	
R Square	0.56	

Source: ERA Analysis

The coefficients are statistically significant at the 1 per cent level while the R-Square indicates the regression explains 56 per cent of the variation. The forecasts based on this regression are shown in Figure 27.

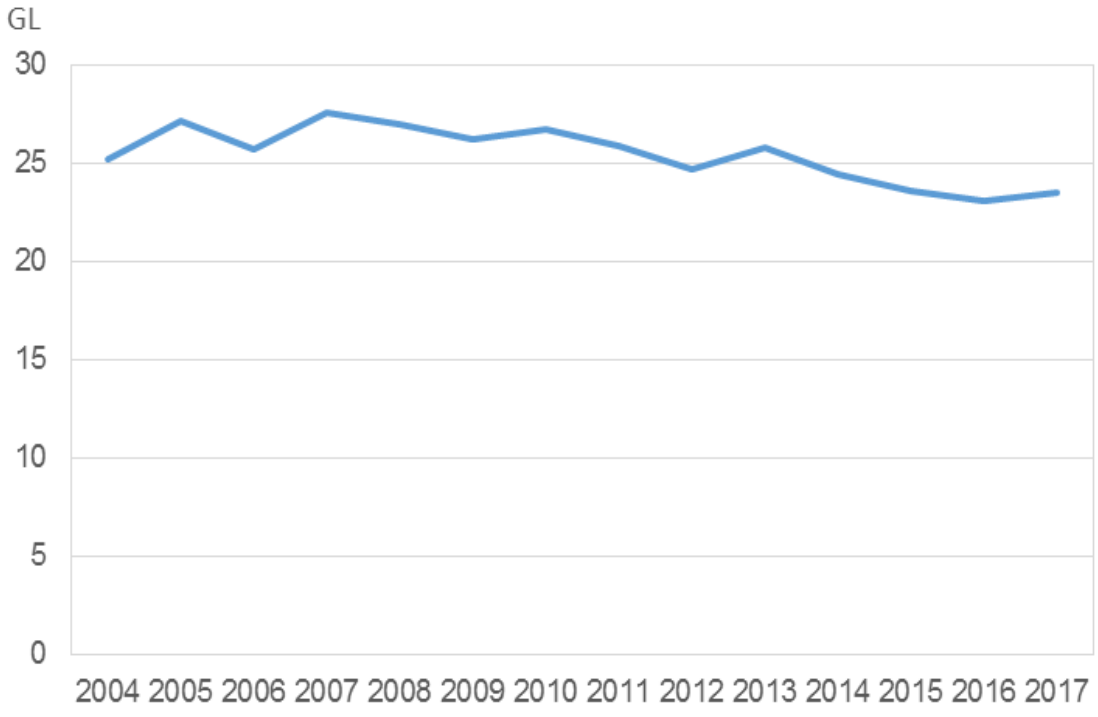
Figure 27 Mandurah/Southwest demand forecasts



Source: ERA Analysis

Historical GAWS demand is shown in Figure 28.

Figure 28 Historic demand Goldfields Agricultural Water Scheme

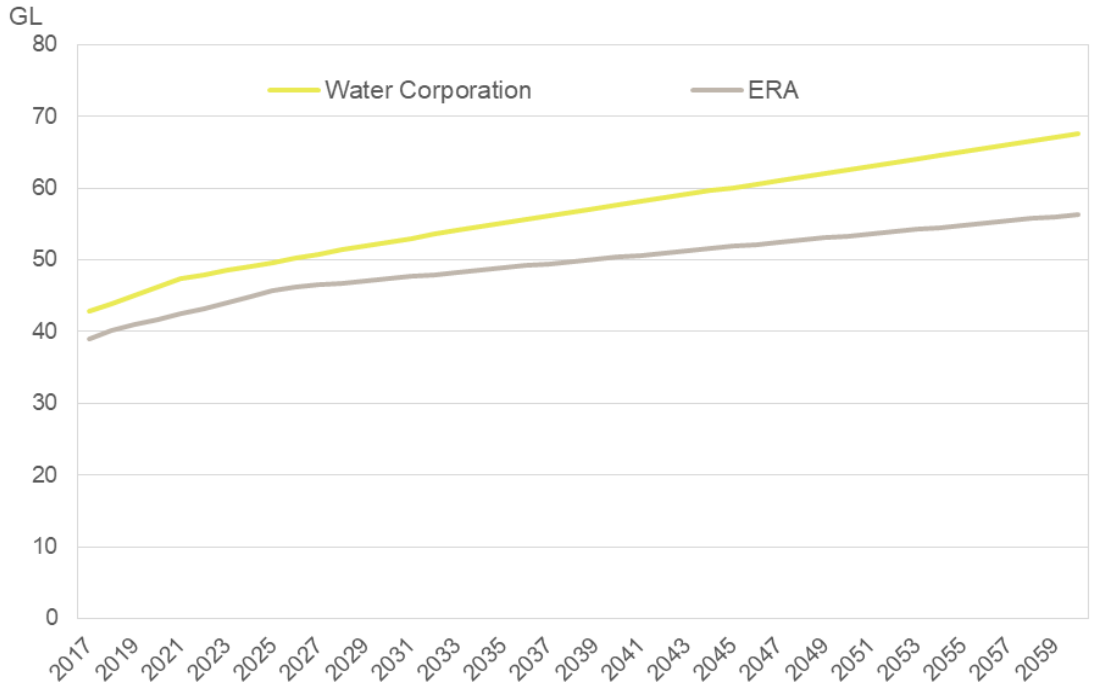


Source: Water Corporation, 2017

The GAWS demand appears to follow a downward trend across the limited number of data

points supplied. However, the data may be cyclical given the relatively high concentration on the mining and agricultural sector. Forecasting cycles in these sectors, their interactions and relationship with final demand would be a very complex undertaking and likely prone to a high degree of error. For this reason, minimum annual growth observed over the sample (1.91 per cent) was used to index the 2016 realised demand figure of 23.1 gigalitres until the maximum demand observed over this period (27.6 gigalitres) was reached. Demand is kept constant at 27.6 gigalitres per annum thereafter to minimise the forecast error if unexpected growth or contraction occurs. The Mandurah and GAWS forecasts are combined and compared to the Water Corporation forecasts in Figure 29 below.

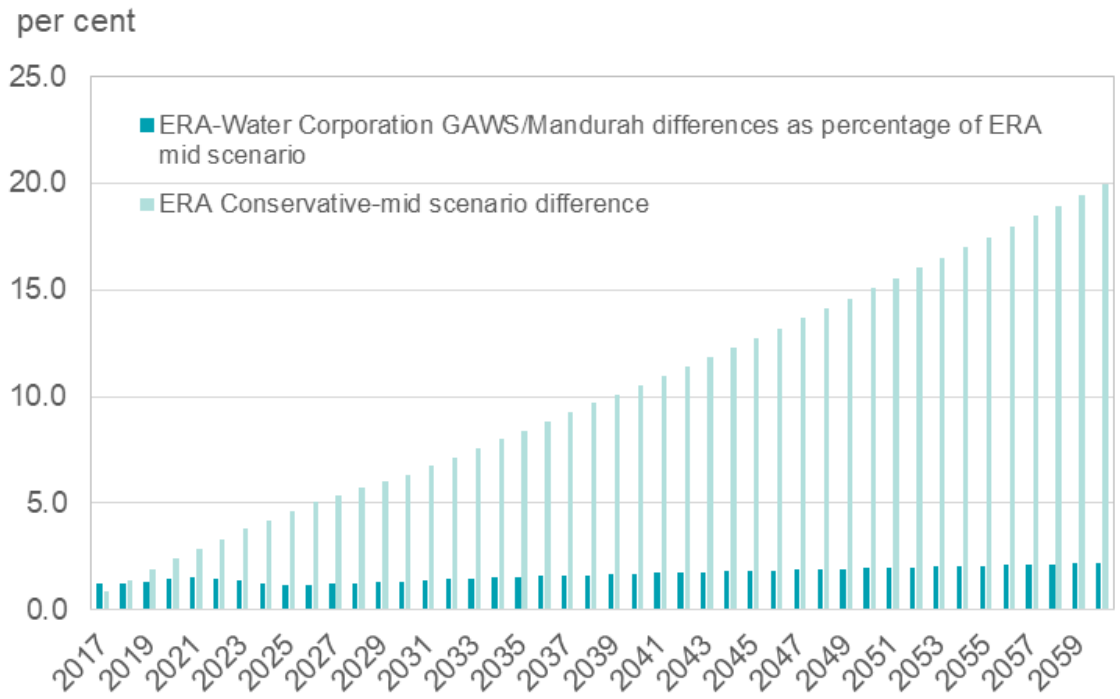
Figure 29 Mandurah/GAWS forecasts – ERA vs Water Corporation



Source: ERA Analysis, Water Corporation 2017

Although the differences appear substantial, in the context of the total IWSS mid scenario forecast the difference is between 1 and 2.5 per cent. This is shown in Figure 30.

Figure 30 ERA vs Water Corporation Mandurah/GAWS difference as a per cent of ERA mid scenario IWSS total demand



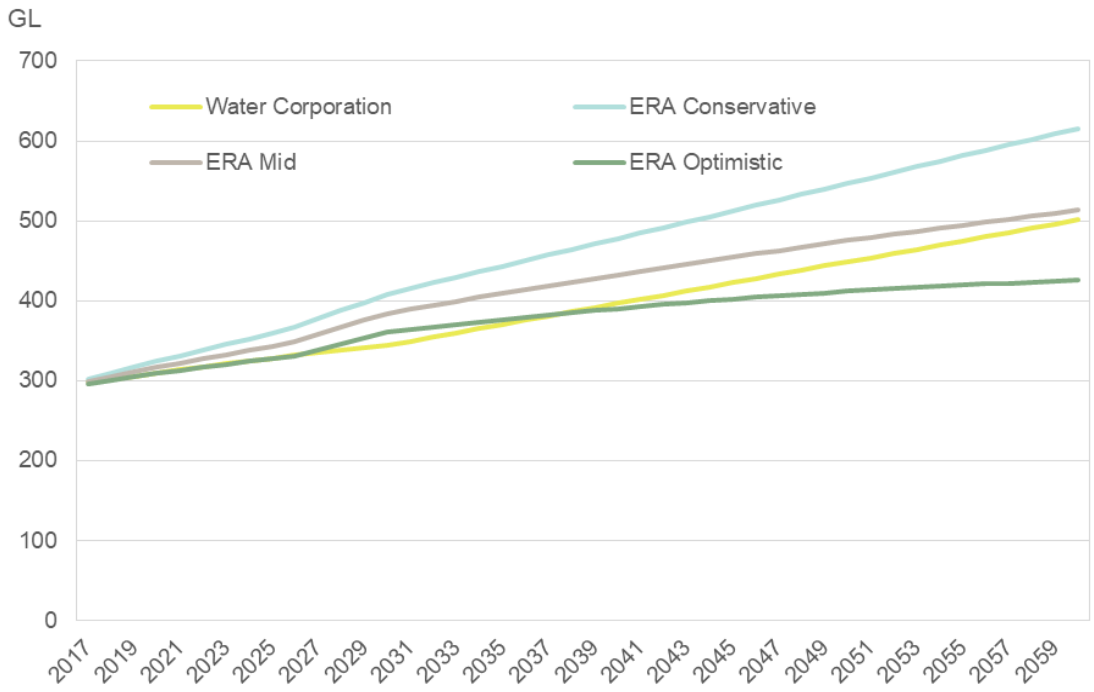
Source: ERA Analysis

The increase in the years after 2026 is mainly driven by the Water Corporation's assumption of continued growth in GAWS demand while the ERA assumes constant GAWS demand after 2026 in order to account for cyclical uncertainty (note demand even appears to decline in Figure 28). In the overall scheme of the analysis the differences are minor compared to the differences between the conservative, mid and optimistic scenarios being used in sensitivity analysis in the LRMC estimations. For example, the difference between the ERA mid and conservative scenario is around 10 per cent on average and as high as 20 per cent. It is therefore more useful to apply scenario than an attempt to reduce the relatively minor differences in the ERA and Water Corporation Mandurah/GAWS demand forecasts.

Integrated Water Supply Scheme total demand forecasts

The Mandurah and GAWS static forecasts are added to the simulated Perth forecasts to arrive at IWSS total demand forecasts. The means of the simulated IWSS demand forecasts are compared to Water Corporation IWSS forecasts shown in Figure 31.

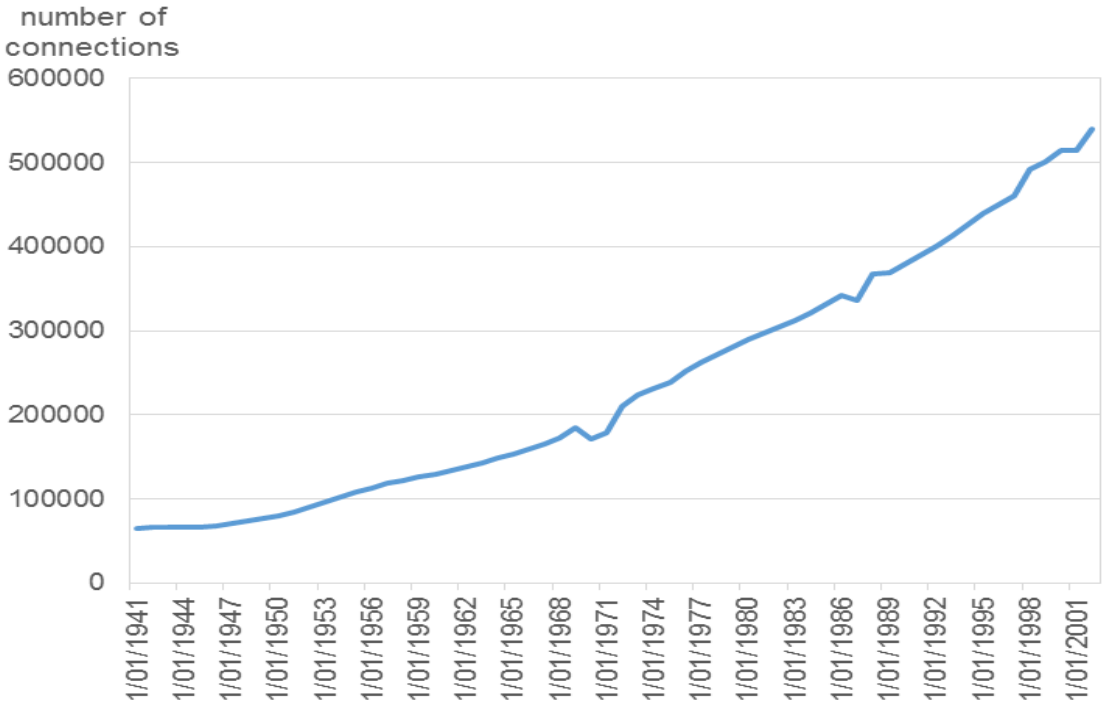
Figure 31 ERA and Water Corporation IWSS demand forecasts



Source: ERA Analysis, Water Corporation 2017

The results are similar to those shown in Figure 25 for Perth, but higher on account of Mandurah and GAWS being added in. The drivers of differences discussed for the Perth demand forecasts above drive the majority of the differences observed for the IWSS here. The mid and conservative forecasts are considerably higher than the Water Corporation forecasts. To check whether the ERA's simulated consumption is too high, demand forecasts for Perth were carried out based on forecast connection growth and 2016 consumption per connection. This is intended to be a neutral crosscheck that does not assume growth in consumption per connection or increased water use efficiency. Water Corporation supplied Perth service connection data spanning 1941 to 2002. The data are shown in Figure 32.

Figure 32 Perth number of connections

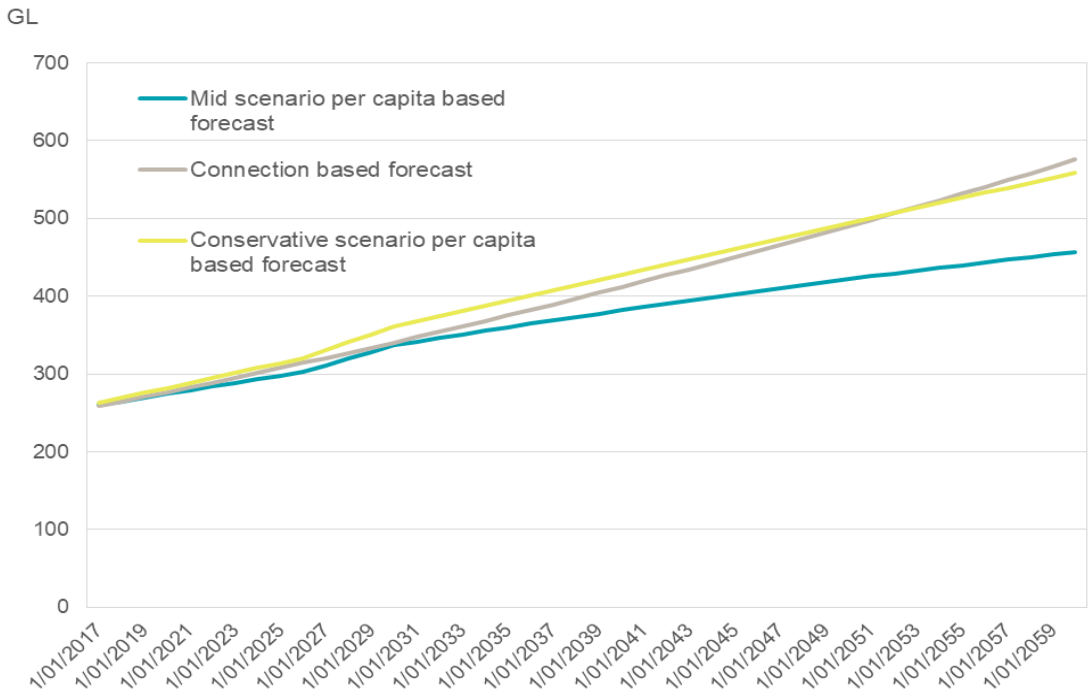


Source: Water Corporation 2017

The year to year differences were linearly extrapolated out to 2060 and used to augment the latest (2002) data point to produce forecasts of connections out to 2060.

The latest total annual Perth consumption figure supplied by Water Corporation was the 2016 consumption of 253 gigalitres. Dividing this total consumption figure by the extrapolated 2016 connection figure of 762,749 gives an annual consumption per connection figure of 332 kilolitres. This consumption per connection figure is then multiplied by the connection forecasts out to 2016 to produce total Perth demand forecasts. The connection growth based demand forecasts are compared to the mean of the simulated high and mid scenario demand forecasts in Figure 33.

Figure 33 Connection growth based versus per capita based Perth demand forecasts



Source: ERA Analysis, Water Corporation 2017

The connection based forecast is fairly close to the conservative per capita based forecast. This suggests that the conservative and mid scenario forecasts are not unrealistically high and as a result are suitable scenarios to consider in the LRMC analysis.

System losses

System losses calculated by Water Corporation have increased from 10.5 per cent since the 2013 inquiry to 12.1 per cent for the current inquiry.[217] Losses have a significant impact on the marginal cost calculation because the increment in demand in the denominator of the marginal cost is calculated net of losses while the additional cost in the denominator is calculated based on water production including losses. Dividing by a smaller marginal demand number in the denominator increases the marginal cost estimate. The higher the losses greater the increase. The effect on the Water Corporation LRMC model is shown in Table 48.

Table 48 Impact of losses on Water Corporation LRMC output (2016 dollars per kilolitre)

Water Corporation LRMC output	5th per cent of distribution	Mean	95th per cent of distribution
Losses at 12.1 per cent	2.13	2.82	3.34
Losses as 10 per cent	2.04	2.32	2.59

Source: ERA Analysis, Water Corporation 2017

[217] Based on figures submitted in the Water Corporation long run marginal cost model.

The historic water losses are shown in Figure 34.

Figure 34 Losses (non-revenue water)

Source: Water Corporation 2017

The Water Corporation states that there are many reasons for the increase between the last inquiry and now. In particular it believes a more robust measurement process for both supply and customer metering has added to the accuracy and increased the overall figure. The Bureau of Meteorology reported over the last 5 years 'non-revenue' water averaged approximately 10 per cent of utilities' system input.[218] This suggests that Water Corporation's losses are above the national average. Assuming that on average water utilities achieve an economic level of leakage where the cost of reducing a unit of leakage is equal to the value of that unit of water, a 10 per cent loss may be considered the current economic level of leakage. However, as the cost of water increases and more cost effective technologies become available it is reasonable to assume that over the longer run the economic level of leakage will become lower than 10 per cent. The ERA notes that Aqwest and Busselton estimate system losses close to 10 per cent. For these reasons the Secretariat considers an assumption of a 10 per cent loss rate on average over the longer run is reasonable.

Supply (inflow)

Inflow is an important input into the LRMC model. High inflows can delay the need for new source projects for many years and hence reduce LRMC estimates significantly. Inflow is also very difficult to predict and so is a key source of estimate risk. If forecasts are too optimistic (high) LRMC estimates may be too low. If this is reflected in water pricing it may result in excessive water consumption increasing the likelihood of severe water restrictions.

[218] See http://www.awa.asn.au/AWA_MBRR/Publications/Latest_News/More_investment_needed_to_curtail_non-revenue_water_losses_in_Australia.aspx

If forecasts are too conservative, unnecessary investment in expensive plant like desalinisation may be brought forward in the LRMC modelling and increase the LRMC estimate.

Supply (inflow) scenarios are not simulated but instead are only considered as three different discrete scenarios – optimistic (high), mid and conservative (low). Again, the characterisation of these scenarios as high, mid and low only describes the relatively between each of the scenarios. The details of the inflow forecasting are outlined below and compared with those of the Water Corporation.

Existing sources can be viewed as inflow dependent (rainfall related) sources or other sources. Water supplied from inflow dependent sources such as dams is subject to a higher degree of uncertainty stemming from unpredictable climate events. The high variability in inflows is a key driver of changes in the timing of addition of new sources in future. Other sources such as desalinisation and ground water are subject to relatively low variability in their supply capacity, although groundwater allocations are subject to variation at the discretion of the Department of Water. For this reason modelling multiple inflow scenarios is necessary in order to form a view on the most likely future supply requirements and the variability or risk of deviation in the modelled outcomes.

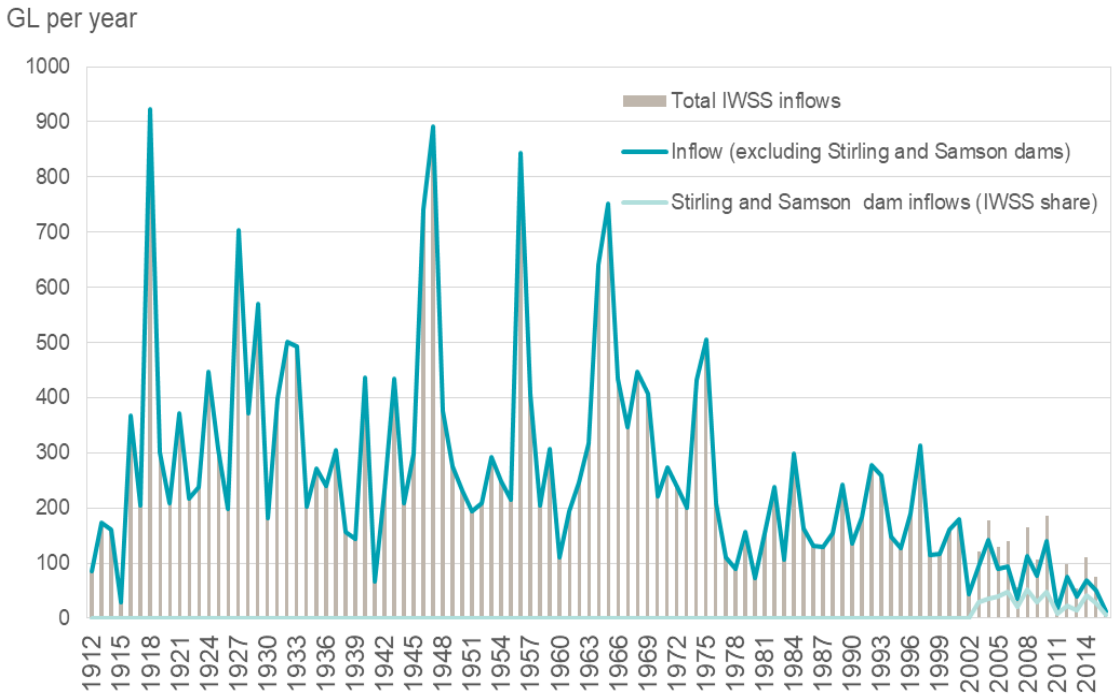
One approach to understanding and forecasting this variation would involve attempting to understand and predict the factors driving inflow such as climate. The downside to this approach is that forecasting drivers such as climate is likely to be far more complex than forecasting inflow using more basic methods such as observing the behaviour of the associated inflows over time (time series). The drawback of time series modelling is that it may not be useful for forecasting over a long time horizon, particularly if the patterns observed in the data are not pronounced and/or are mainly a function of recent historical observations. For this reason, both methods are used in the ERA forecasts.

Time Series

Time series modelling identifies recurring patterns and variation in those patterns in an historic time series. The method has long been an accepted approach in modelling rainfall and streamflow.[219] This process only attempts to identify statistically significant patterns without any regard to the drivers of those patterns. The time series in question, historical inflow data, is tested for suitability in time series modelling of inflows. For the sake of testing the longest series possible inflow, excluding Stirling and Samson dams, was used. This is because inflow from both dams became available in 2002 and so inflow after that data is not comparable to inflow prior. The composition of inflows is shown in Figure 35.

[219] For an example of an early study see N. Matalas, Autocorrelation of rainfall and streamflow minimums, *Statistical studies in Hydrology*, Professional paper 434-B,1963.

Figure 35 Total IWSS surface water inflows



Source: Water Corporation 2017

The total inflows excluding Samson Brook and Stirling dams are tested for stationarity (reversion in mean and variance to some long run level) to determine whether the series are amenable to time series modelling. The total inflow *appears* to be highly erratic or *nonstationary*. The *variation* in inflows also *appears* to have increased substantially after 1979 and then decreased again after 2001. If the inflows are nonstationary, the best forecast using the level (raw) data is likely to be the latest year of inflows (for the same reasons as outlined above for consumption). Augmented-Dickey Fuller (**ADF**) tests for stationarity in the level data are shown in Table 49.

Table 49 Total IWSS inflow (excluding Samson Brook and Stirling dams) - stationarity tests

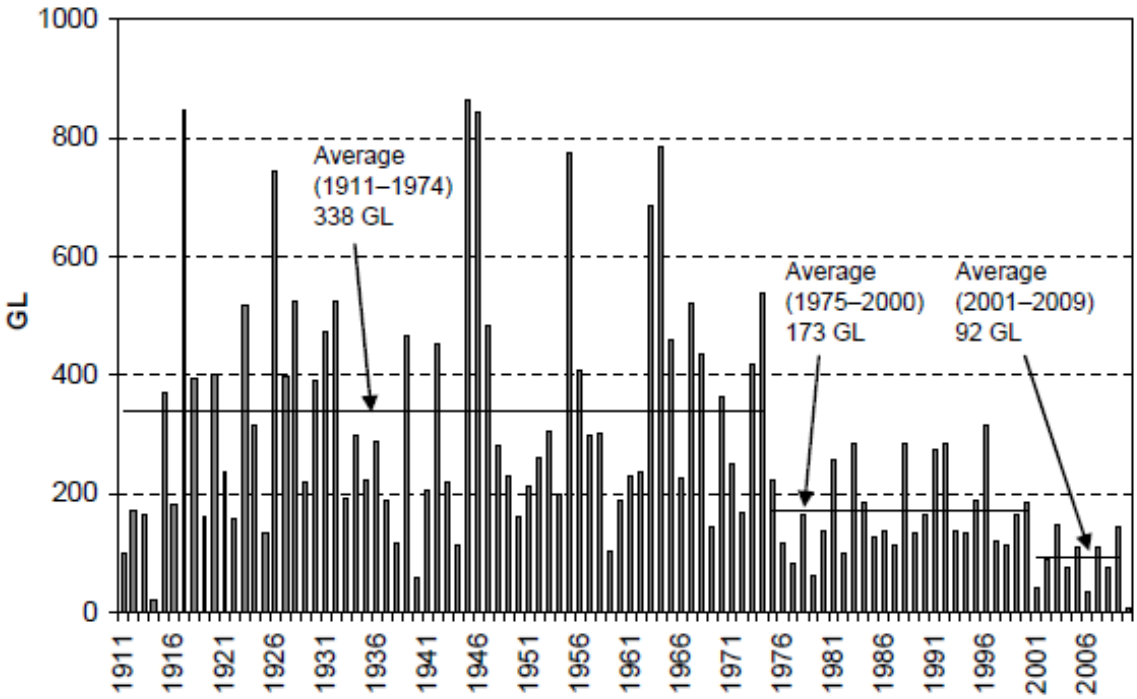
	Test Specification	test-statistic	critical-value (5 per cent significance)	critical-value (1 per cent significance)	outcome
Total	*None*	-2.31	-1.95	-2.58	***Reject hypothesis of unit root - stationary***
	Trend	-5.98	-3.43	-3.99	***Reject hypothesis of unit root - stationary***
	Drift	-4.67	-2.88	-3.46	***Reject hypothesis of unit root - stationary***

Source: ERA Analysis

Despite appearances, the results show that inflows are stationary at the 5 per cent level of significance under all specifications of the test. This indicates that from a statistical point of view, over the very long run inflow will tend to revert to the long run average. However, at the 1 per cent level of significance only the trend and drift models indicate stationarity. This suggests that inflow only mean reverts around a declining trend. While the series in Figure 30 appears to trend downward, using trend analysis would produce counterintuitive results

because it would quickly predict negative inflows. The drift specification therefore appears to be the most intuitive model. A time series model with drift incorporates a tendency to move in a particularly direction, although not as inexorably as a linear trend. The concept is reflected in Water Corporation's characterisation of streamflow data containing structural breaks shown in Figure 36.

Figure 36 Annual inflows for Perth



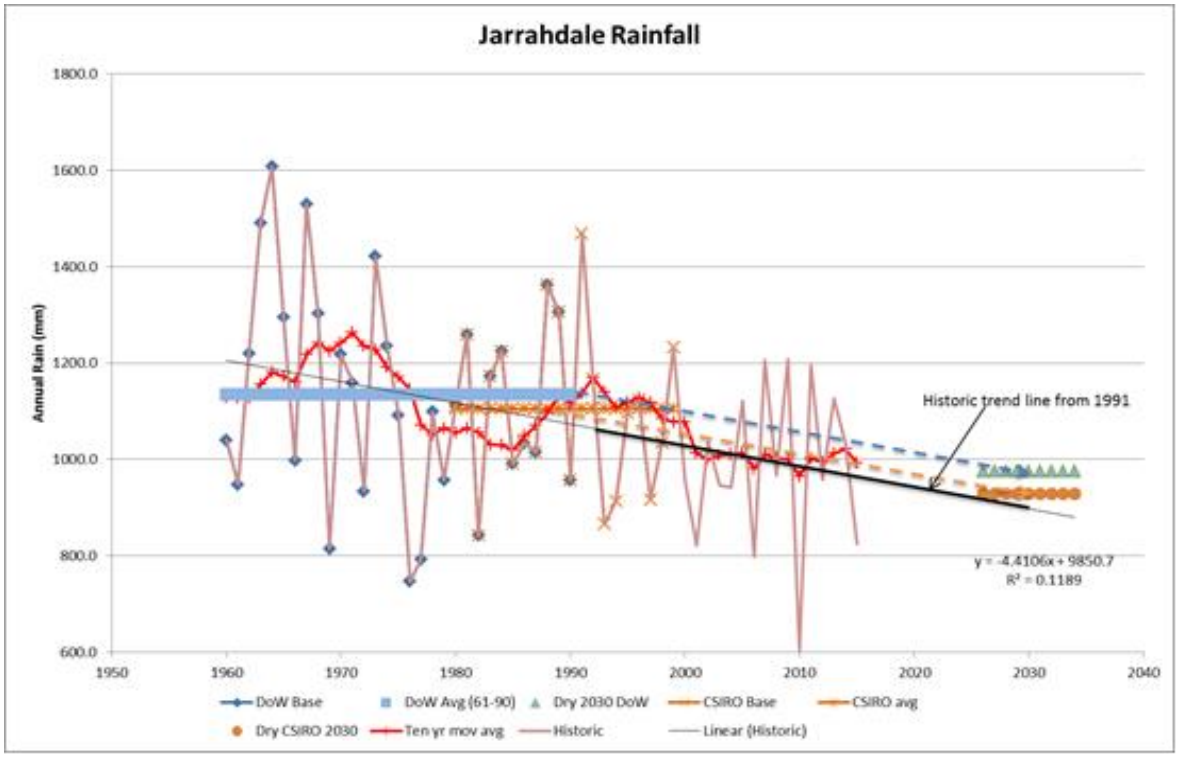
Source: Water Corporation 2011[220]

Years in this figure represent the May to April period. Inflows for 2010 are not for the full year.

The ERA initially undertook time series analysis using a variety of specifications including an ARIMA model and autoregressive specifications including structural breaks. The ARIMA model produced unsatisfactory forecasts on account of identifying strong negative autocorrelation in inflow data which meant very low years of inflow would be followed by a large reversal of low inflow. The low inflow years of 2015 and 2016 produced inflow forecasts in the short term in excess of 100 gigalitres which were considered implausible in light of climate change and the lower forecasts produced by Water Corporation. Figure 37 shows the historic and projected rainfall for Jarrahdale which is used by Water Corporation as representative rainfall for IWSS dams. The projection based on historical data is below both the Department of Water and CSIRO's driest 2030 projections.

[220] Image published in Productivity Commission, Australia's Urban Water Sector: Productivity Commission Inquiry Report, Volume 2, No. 55, 31 August 2011, p.149

Figure 37 Jarrahdale rainfall forecasts and trends



Source: Water Corporation 2017

Additionally, the negative autocorrelation found in the inflow data has been identified by McMahon et al as likely a result of sample sized and sample variability. McMahon also stated that:

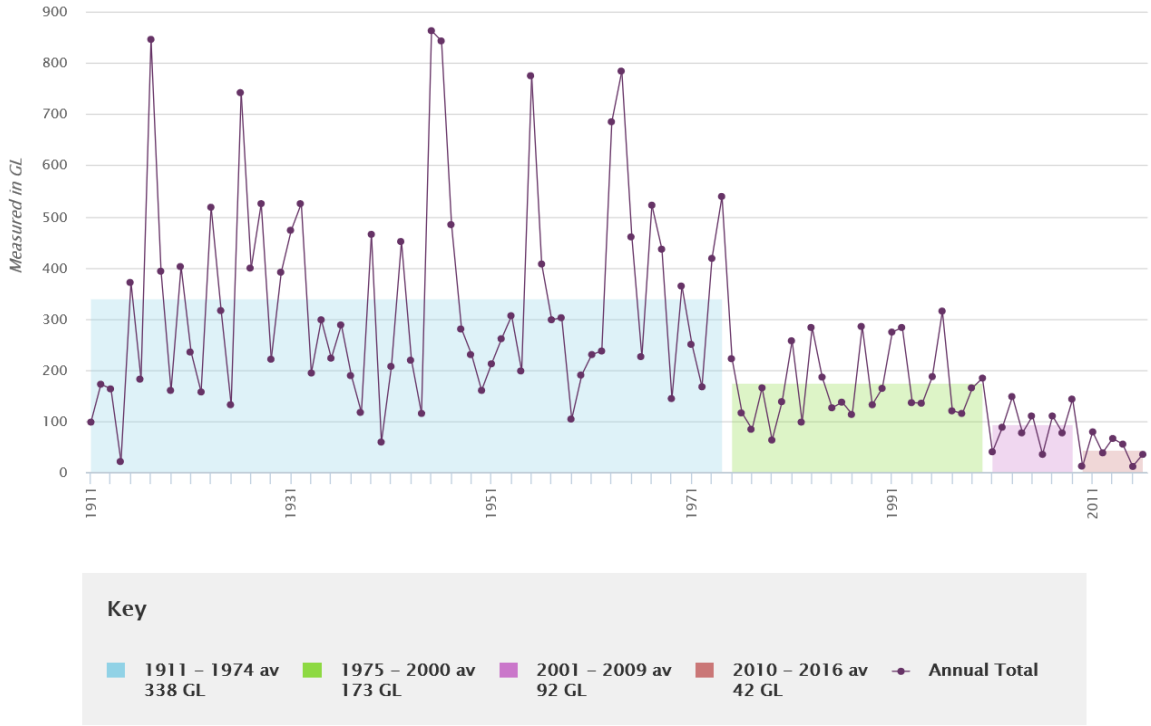
> This explanation is plausible given that, unlike positive correlations, there is no physical explanation why large negative correlations should occur at the annual level.[221]

Water Corporation characterises both historic stream flows and inflows using particular time periods. This is shown in Figure 36 and Figure 38. These time periods are:

- 1911 to 1974;
- 1975 to 2000;
- 2001 to 2009; and
- 2010 to 2016.

[221] T. McMahon, R. Vogel, M. Peel and G. Pegram, 'Global streamflows – Part 1: Characteristics of annual streamflows', *Journal of Hydrology*, 2007, vol. 347, pp.243-259.

Figure 38 Historic streamflow



Source: Water Corporation 2017

Assuming that these periods accurately represent structural breaks in the data, time series forecasts should be based on the period 2010 to 2016.[222] This leaves only seven observations to work with and so precludes any statistical analysis. For this reason the mean of the seven observations from 2010 to 2016 for the total inflows including Samson Brook and Stirling dams is used as the time series forecast.

Table 50 Total IWSS inflows including Samson Brook and Stirling dams

Financial Year	GL
2010	186
2011	25
2012	99
2013	53
2014	111
2015	76
2016	19
Average	**81**

Source: Water Corporation 2017

In summary, the stationarity tests in Table 49 suggest a trend or drift model is appropriate for the inflow data. Trend models do not produce intuitively appealing results due to producing negative forecasts in the short run and so a drift model is considered to be more appropriate. The concept of drift is reflected (although not explicitly) in Water Corporation's characterisation of stream flows and inflows as having structural breaks that step down over

[222] The statistical significance of these structural breaks is tested further below.

time. The best fitting autoregressive models have significant negative autoregressive coefficients. There is no physical explanation why these negative autocorrelations should occur in annual inflows. As a result, the simple average of the inflow observations in the period after the last structural break specified by the Water Corporation is used to produce a constant forecast of 81 gigalitres per annum.

Climate driven forecasts

Climate is a key driver of inflow. Climate change is not explicitly considered in the model above. Climate change suggests that a trend that should be present in the forecasts. The Commonwealth Scientific and Industrial Research Organisation (**CSIRO**) Indian Ocean Climate Initiative stage 3 (**IOCI 3**) produce long run climate projections. These compare a baseline period (1962-1999) to mid-century (2047-2064) and end of century (2082-2099) localised projections for Western Australia. Projections for Jarrahdale were used for what follows.

Rainfall appears to be a reasonable predictor of total inflow. Historical monthly rainfall was collected for Jarrahdale dam weather station from the Bureau of Meteorology dating back to 1912.[223] The rainfall was aggregated into financial years and then totalled across the dams for each year. The total inflow series excluding Stirling and Samson Brook dams dating back to 1912 was regressed on the rainfall data values to produce the regression model shown in Table 51.

Table 51 Regression of rainfall on total inflow

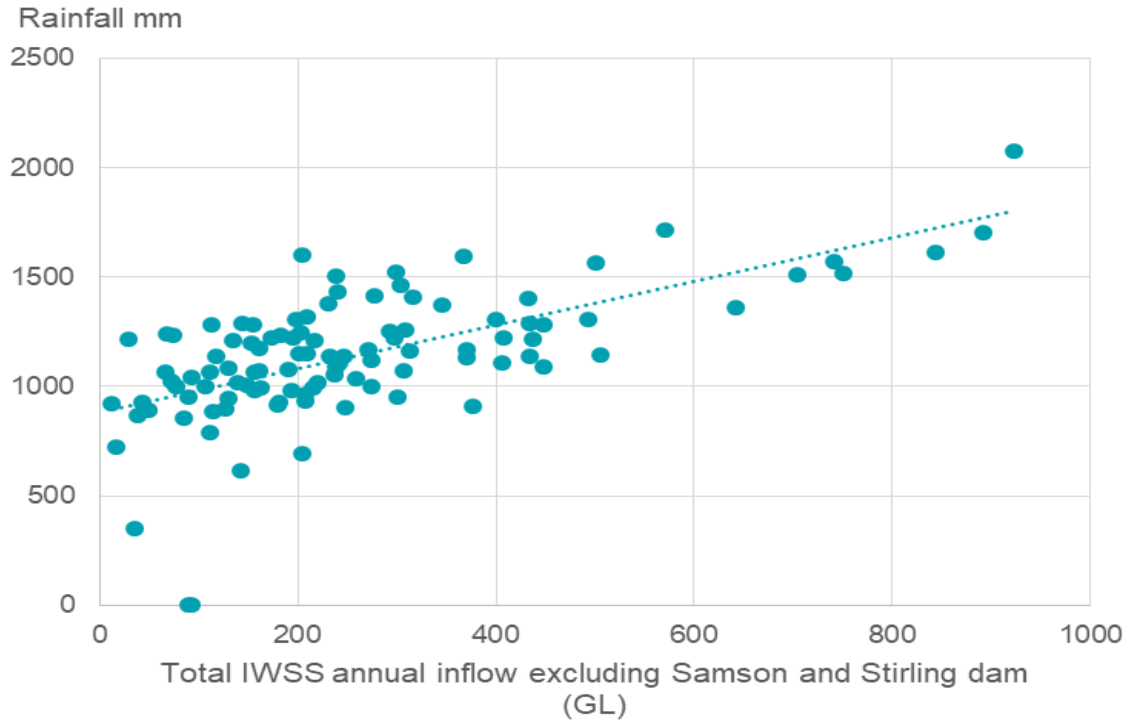
coefficients	value	p-value
Intercept	-203.239	0.0005
Rainfall	0.41	<0.0001
R-Square	0.41	
Observations	105	

Source: ERA Analysis

The R-Square indicates that rainfall explains 41 per cent of the variation in total inflow. All coefficients are highly significant (even at the 1 per cent level) as indicated by the p-values being 0.0005 or less. The relationship is shown diagrammatically in Figure 39.

[223] Accessed via http://www.bom.gov.au/climate/data/. Some years of observation were missing including 2005 and 2006.

Figure 39 Rainfall vs total IWSS inflow excluding Samson and Stirling dam

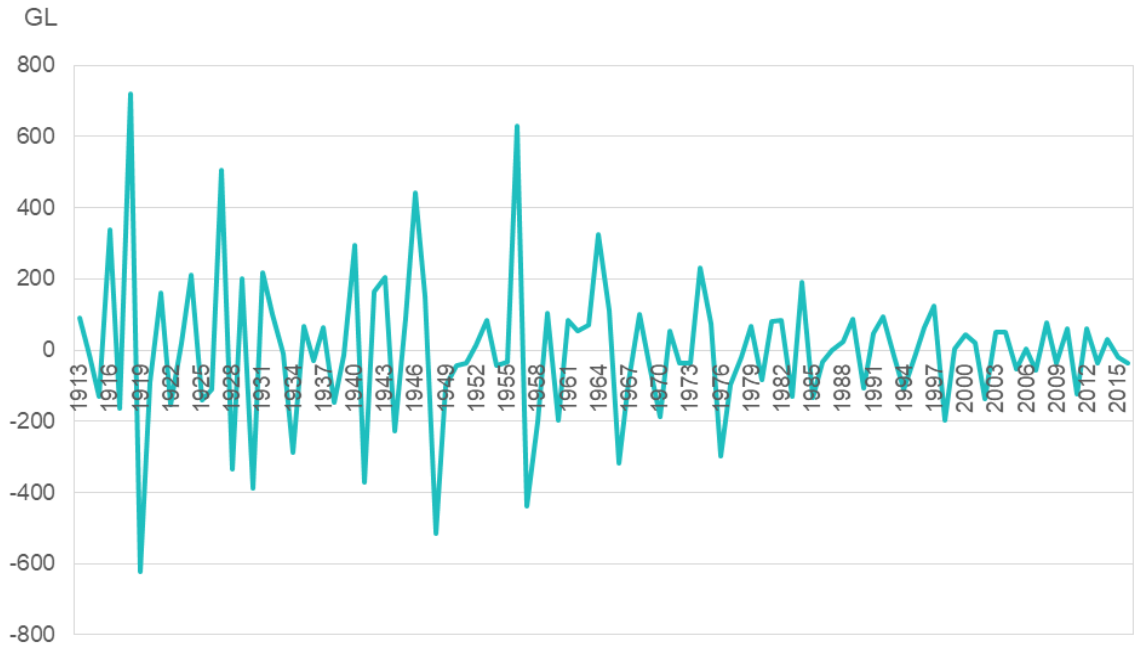


Source: Water Corporation, Bureau of Meteorology and ERA analysis

Note: The data points lying on the horizontal axis represent missing years of Jarrahdale rainfall data.

Such relationships can be spurious – any two downwardly trending series will can show a statistically significant relationship even if there is no possible way that they are related. For this reason the changes in each of these series were checked for a relationship with each other. The changes in annual inflow are plotted in Figure 40.

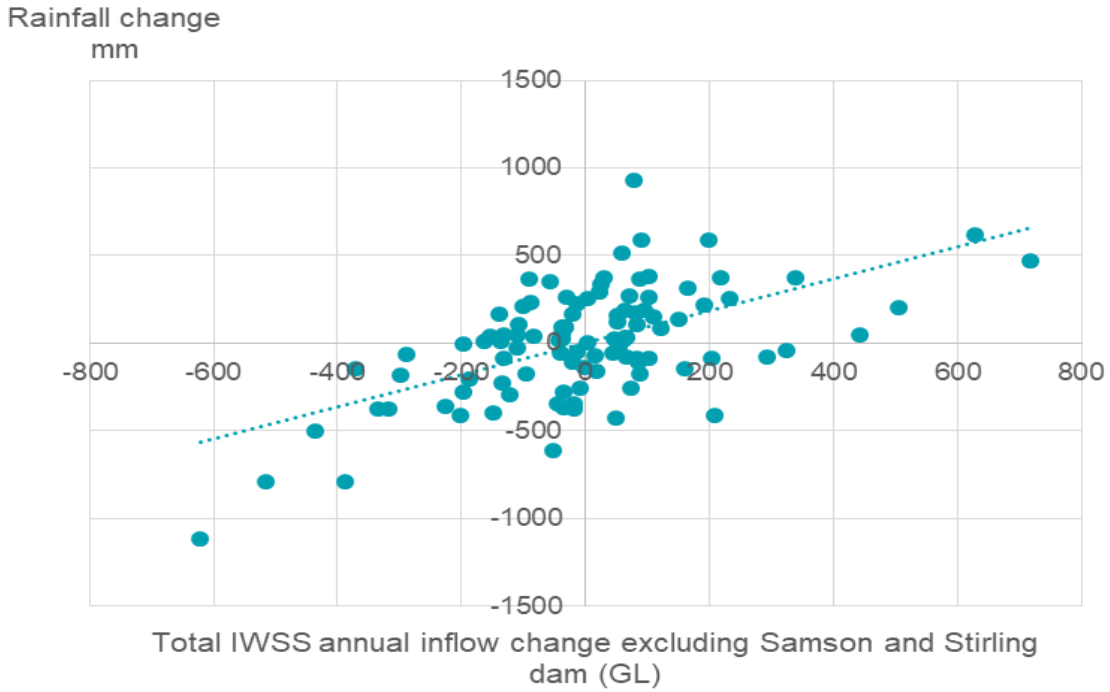
Figure 40 Changes in total IWSS inflow excluding Samson and Stirling dam



Source: Water Corporation 2017

The relationship between the changes in rainfall and changes in inflow are plotted in Figure 41. The positive relationship between changes and the spread of data between the top right and bottom left quadrant tend to indicate that the relationship observed between rainfall and inflow in Figure 39 is not spurious.

Figure 41 Changes in rainfall vs total IWSS inflow excluding Samson and Stirling dam



Source: Water Corporation, Bureau of Meteorology and ERA analysis

Given the explanatory power of the rainfall data, the IOCI 3 downscaled rainfall projections in combination with historical rainfall were used to project future rainfall which in turn could be used to project total inflow.[224] The worst case scenarios were used in light of the projections based on the historical data being worse than the dry 2030 CSIRO projections in Figure 37. The IOCI 3 projection shown in Table 52 was applied to the 1962 -1999 rainfall averages for Jarrahdale.

Table 52 CSIRO IOCI 3 downscaled rainfall projections

Station	Base Case (1962-1999)	Worst Case (2047-2064)
Jarrahdale	1	0.66

Source: CSIRO

This produced averages for Jarrahdale across 2047-2064. This is shown in Table 53.

[224] Downscaled refers to localized impact of broader climate change projections.

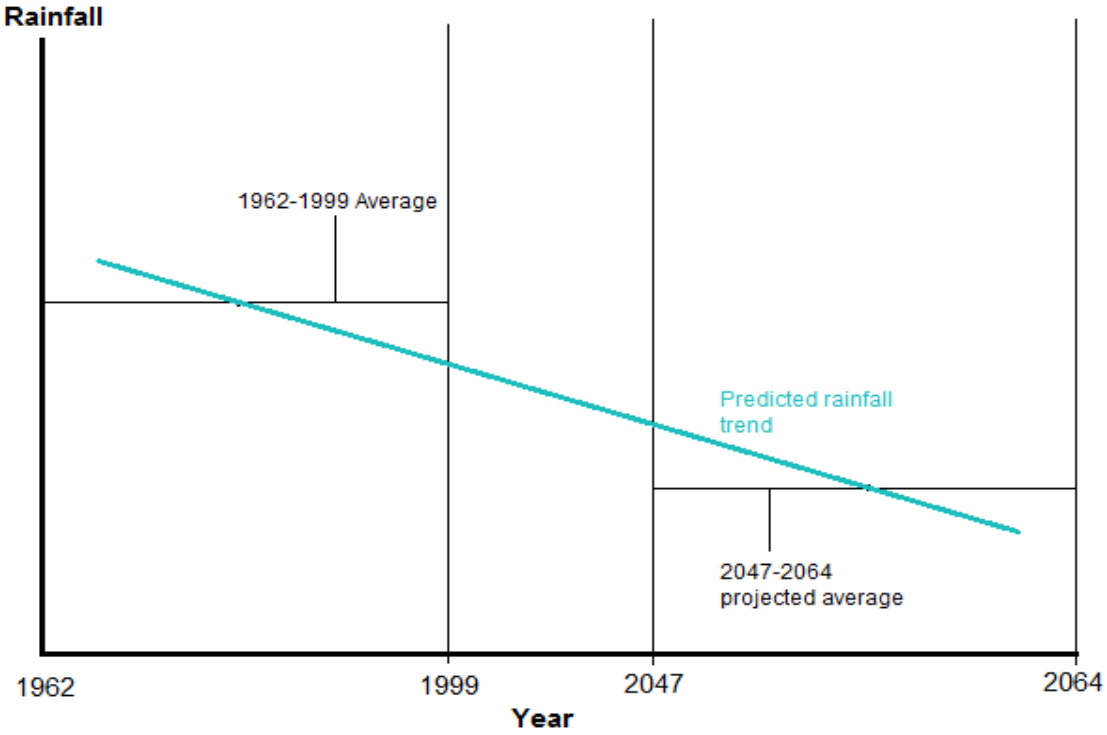
Table 53 Rainfall projection 2047-2064

	Jarrahdale
Rainfall reduction factor (2047-2064)	0.67
Average annual mm (1962-1999)	1129
Average annual mm (2047-2064)	**756**

Source: CSIRO, Bureau of Meteorology 2017 and ERA Analysis

A predicted rainfall trend was fitted across the mid points of the 1962-1999 and 2047-2064 periods. This is demonstrated diagrammatically in Figure 42.

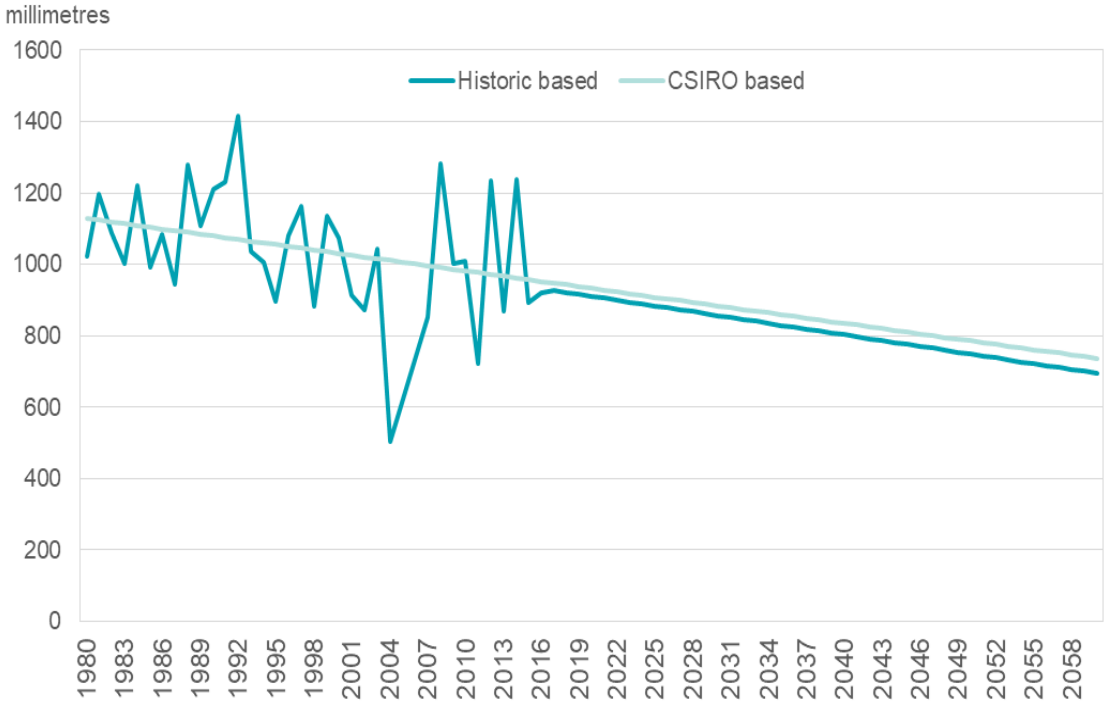
Figure 42 Linear rainfall projection process



Source: ERA

The resulting linear annual projection for Jarrahdale rainfall is shown in Figure 43 and compared against the historic linear trend based on the same data.

Figure 43 Jarrahdale rainfall projections



Source: CSIRO, Bureau of Meteorology 2017 and ERA Analysis

The projections appear reasonably similar which suggests that the CSIRO IOCI 3 based forecasts are reasonable. Once a regression model is fitted to the existing inflow and rainfall data dating back to 1912, the Jarrahdale rainfall projections can be used as the main input into the regression model to project inflow. A regression model similar to the one shown in Table 51 is used. The model must be altered to take the structural breaks into account shown in Figure 37 because these suggest that the relationship between inflow and rainfall changes with time. Each of the periods is assigned a binary variable (0 or 1) to indicate which period they fall within. The new model is shown in Table 54.[225]

[225] The period 1912 to 1974 is considered the base case and so is not included in the regression. Including it in the regression results in the dummy variable trap where the regression will not solve.

Table 54 Regression of rainfall on total inflow with four structural breaks

coefficients	value	p-value
Intercept	-98.34	0.1709
Rainfall	0.35	0.0000
1975-2000	-90.57	0.0081
2001-2009	-42.21	0.4702
2010-2016	-186.78	0.0014
Adjusted R-Square	0.46	
Observations	105	

Source: ERA Analysis

The results of the regression indicate that all variables are significant with the structural break period from 2001 to 2009. The period from 2010 to 2016 is highly significant as indicated by the p-value less than 0.01. The value of the coefficient on the 2001 to 2009 period (-42.21) is much closer to that of the 1975 to 2000 (-90.57) than that of the 2010 to 2016 period. This suggests that the period 2001 to 2009 should be merged with the 1975 to 2000 period. This resulted in the regression model shown in Table 55.

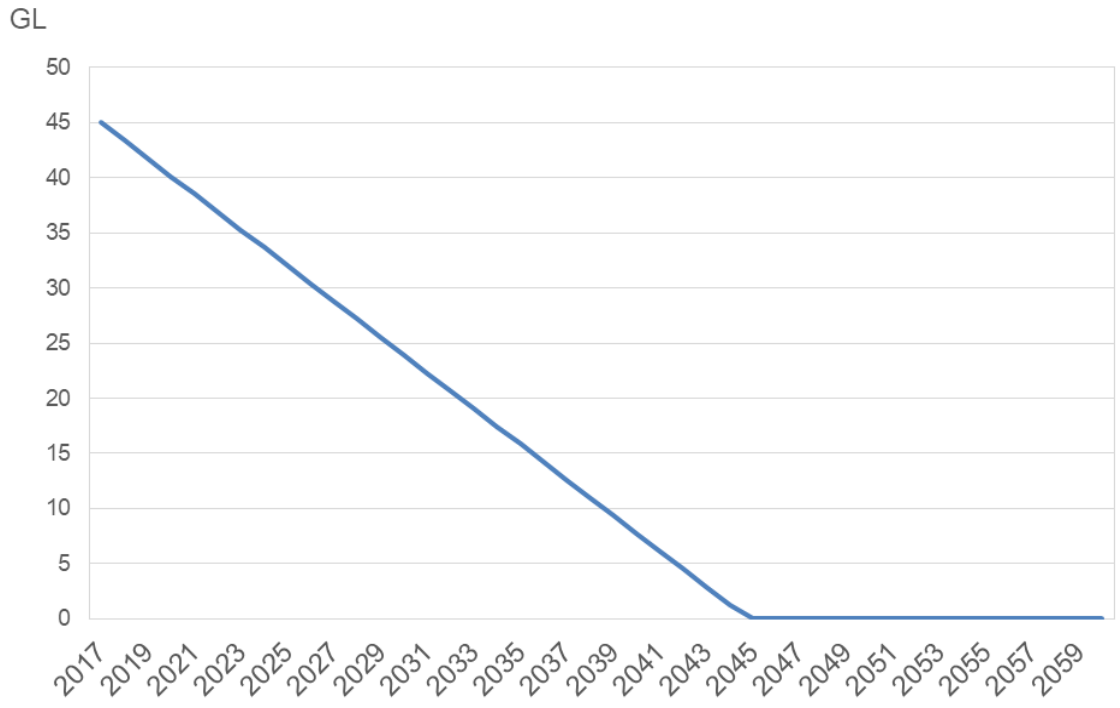
Table 55 Regression of rainfall on total inflow with three structural breaks

coefficients	value	p-value
Intercept	-76.39	0.2517
Rainfall	0.33	<0.0000
1975-2000	-82.98	0.0115
2010-2016	-191.42	0.0010
Adjusted R-Square	0.47	
Observations	105	

Source: ERA Analysis

With the exception of the intercept, all of the coefficients in this model are statistically significant at the 5 per cent level as indicated by all of the p-values less than 0.05. The adjusted R-Square or explanatory power also increases by 1 per cent. This model appears adequate for forecasting inflows using the Jarrahdale rainfall forecasts and binary variable indicating that we are in the latter (2010 to 2016) period structure as inputs. The resulting forecasts are shown in Figure 44. Before comparing this forecast to that of Water Corporation and the previous time series based forecast an adjustment must be made to include a forecast for the Samson Brook and Stirling dam share.

Figure 44 Total IWSS inflow forecasts excluding Samson Brook and Stirling dams



Source: ERA Analysis

Only 15 observations were available to ERA for the IWSS share of Samson Brook and Stirling dams. A basic regression of these observations on the historical IWSS inflow excluding Samson Brook and Stirling dams gave the results shown in Table 56.

Table 56 Regression of IWSS share of Samson Brook and Stirling dams on total IWSS inflow excluding Samson Brook and Stirling dam

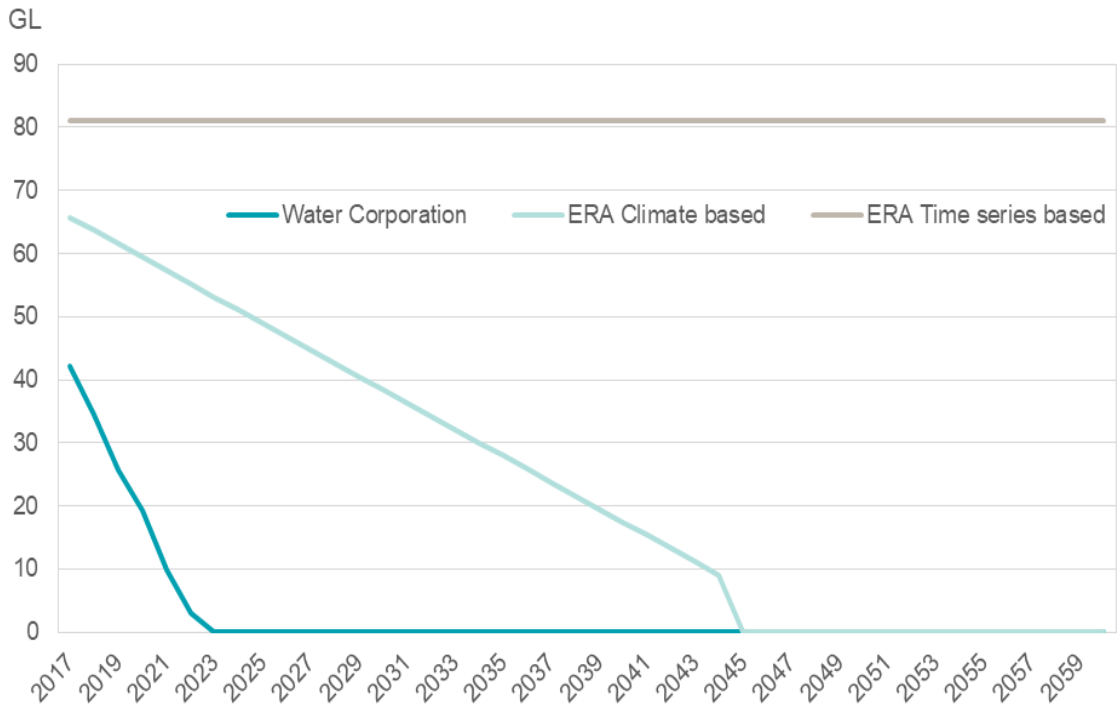
coefficients	value	p-value
Intercept	7.39	0.1281
Total IWSS inflow excluding Samson Brook and Stirling dam	0.30	0.0001
R-Square	0.69	
Observations	15	

Source: ERA Analysis

The number of observations is not likely to provide robust estimates, however the R-Square is fairly high explaining 69 per cent of the variation and the slope coefficient is significant at the 1 per cent significance level as shown by the p-value less than 0.01. Using the forecasts in Figure 44 as the main input in this regression produced forecasts for the IWSS share of Samson Brook and Stirling dams which were then added to the forecasts in Figure 44. The

results are shown in Figure 45 and are compared with the time series and Water Corporation mean total IWSS forecasts.[226]

Figure 45 Mean inflow predictions



Source: ERA Analysis

The sudden drop-off between 2044 and 2045 is a result of the Samson Brook and Stirling dams being forced to zero. If they are not forced to zero they will be maintained at the constant of 7.39 shown in Table 56 above. This is not logical because if the other dams have zero inflow, Samson Brook and Stirling dams should also have zero inflow on account of the explicit modelled positive relationship.

Water Corporation's regional forecasts assume that inflow data for 'all other' (previously metro) and Southern follows a gamma distribution while Dandalup follows an inverse Gaussian distribution. While this in itself does not result in the forecasts being lower than the Authority's, the parameters selected to define the shape of these distributions results in mean inflow of 23.4, 8.5 and 10.2 gigalitres per annum for all other, Southern and Dandalup respectively in 2017. The parameters for each successive year result in successively lower means until the final mean for all distributions is 0.4 gigalitres per annum in 2023. The Water Corporation notes that the real forecast for each region is zero in 2023. The value of 0.4 gigalitres has been used to overcome instability in its LRMC model. Given that the Water Corporation mean forecast is much lower than both of those of the ERA a conservative inflow scenario will be added to the LRMC sensitivity analysis. Accordingly the optimistic scenario will be based on the time series based forecasts, the mid scenario

[226] The sudden drop-off between 2044 and 2045 is a result of the Samson Brook and Stirling dams being forces to zero. If they are not forced to zero they will be maintained at the constant of 7.39 shown in Table 56 above. This is not logical because if the other dams have zero inflow, Samson Brook and Stirling dams should also have zero inflow on account of the positive relationship.

based on the ERA Climate based forecasts and conservative scenario a zero inflow forecast.

Scenarios and remaining inputs

The discrete demand and supply scenarios are used to create three general scenarios – conservative, optimistic and middle scenario. The conservative scenario reflects outcomes that pose the highest risk to future water security, the optimistic scenario reflects outcomes that pose the least risk, and the middle scenario a mid-point in terms of risks:

- The conservative scenario assumes the highest Department of Planning WA population growth estimates, no inflow and no change in current consumption per capita.
- The optimistic scenario assumes the lowest Department of Planning WA population growth estimates, the highest inflow forecast in the supply section above and the unrevised Water Corporation LRMC model consumption per capita projections outlined in the demand section above.[227]
- The middle scenario assumes the average Department of Planning WA population growth estimates, the ERA climate based inflow estimates outlined in the supply section above and the average of the unrevised Water Corporation LRMC model consumption per capita projections and constant consumption at current level projections.

The simulations only apply to the consumption forecasts used as part of demand forecasting as discussed in the demand section above.

Marginal demand (perturbation)

As outlined above the results of the Turvey LRMC approach are sensitive to the choice of perturbation, or margin by which demand is increased in the second of the two financial models being compared. Turvey's seminal paper postulates that the perturbation to demand should be chosen to be large enough to be noticeable, but small enough to be marginal.[228] Sapere Research Group outline a pragmatic approach where a perturbation is chosen that matches the growth rate in demand such that it brings investment forward or backward by one year.[229] In light of this the perturbation was initially chosen as the average of annual demand growth in the base case. This cannot be expressed as a set percentage because demand growth and demand changes depending on which scenario is selected and also changes with simulations.

New Sources

As discussed above, the new source options used by Water Corporation are ranked according to detailed risk and cost considerations as well as technical constraints - a process that incorporates the input of several areas within the Water Corporation. While an inquiry into the technical specifics of each project is beyond the scope of this section some high level analytics follow.

A naïve application of an LRMC model would simply consider the least cost schedule which would rank projects with a lower cost per kilolitre first and those with a higher cost per

[227] In its revised LRMC model, the Water Corporation increased the consumption per capita projections.

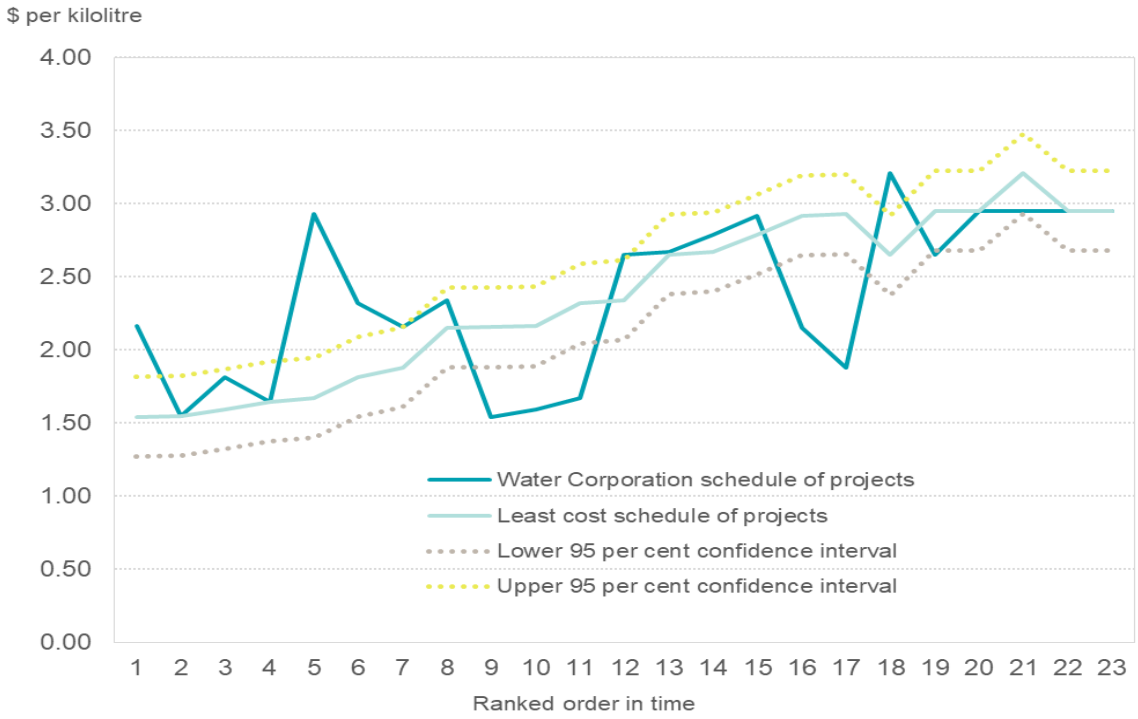
[228] R. Turvey, 'Marginal Cost', *The Economic Journal* , vol. 79, No. 314, 1969, p.288

[229] R. Tooth, 'Measuring long run marginal cost for pricing', *Sapere research group*, 2014, p.6

kilolitre last in order to minimise LRMC. This is naïve in the sense that important risks and technical constraints are not considered. For example, later stages of ground water recycling plants cannot be built before earlier stages and these earlier stages themselves cannot be built before sufficient wastewater inflows for recycling are available from other plants. Despite this, ranking the projects by cost per kilolitre is still a useful exercise to examine the extent to which the project schedule follows a least cost path.

To calculate the naïve least cost schedule, the annualised cost per kilolitre was calculated for each project assuming a 25 year life (excluding the integration infrastructure).[230] The schedule contains two integration infrastructure projects that split the schedule into three parts. The new source projects within each of the three parts are ranked in ascending order according to annualised cost per kilolitre. The results were then compared to the original Water Corporation schedule of projects so that significant deviations could be identified. This is presented graphically in Figure 46.

Figure 46 Deviations from the naïve least cost schedule



Source: ERA Analysis, Water Corporation 2017

The Water Corporation's schedule of projects broadly follows the least cost schedule with 12 exceptions. These are partially explained by technical and other constraints discussed above. The effect of using the naïve least cost schedule in the Water Corporation's LRMC model is shown in Table 57.

[230] The Water Corporations LRMC model repeats capex for new sources every 25 years which implies a 25 year life. This assumption is consistent with the life for similar assets assumed in the financial model and has also been adopted in the ERA LRMC model.

Table 57 Impact of naïve least cost schedule on Water Corporation LRMC output (2016 dollars per kilolitre)

Water Corporation LRMC output	5th per cent of distribution	Mean	95th per cent of distribution
Technically constrained project schedule	2.13	2.82	3.34
Unconstrained project schedule	1.72	2.26	2.83

Source: ERA Analysis, Water Corporation 2017

The LRMC estimates under the naïve or unconstrained project schedule are not feasible because they do not take the realities of scheduling the projects into account. The analysis simply demonstrates the sensitivity of LRMC estimates to changes in the pattern of costs shown in Figure 46. The mean and range between the 5 and 95 per cent of the distribution of estimates are reduced by 56 and 10 cents respectively. Although this effect suggests that the ranking of projects is important, a more detailed engineering based analysis that examines technical cost drivers and other practical constraints is required if the ERA is to propose an alternative project schedule. Such analysis is beyond the scope of this inquiry. The ERA cannot justify a departure from the current schedule of projects supplied by Water Corporation in its LRMC model.

Conveyance costs

The Water Corporation LRMC model includes separate assumptions for conveyance costs (costs of transporting water). The assumptions are shown in Table 58.

Table 58 Water Corporation conveyance cost assumptions

Integration	Conveyance Cost ($/kL)	Base year dollars	June 2016 dollars
Stirling Trunk Main	0.14	2014	0.144
Dandalup Trunk Main	0.10	2014	0.103

Source: Water Corporation 2017

The ERA LRMC model uses pumping costs of 10 cents per kilolitre in June 2005 dollars from the ERA Inquiry on the cost of supplying bulk potable water to Kalgoorlie-Boulder.[231] These costs are indexed from June 2005 to June 2016 dollars giving 13 cents per kilolitre. This cost is then applied to the annual capacity of each new source and then added to operating expenditure. While this may appear to be an imprecise approximation, sensitivity analysis applied to the Water Corporation LRMC model indicates that conveyance cost assumptions have minimal impact on LRMC estimates. This is demonstrated in Table 59 below.

[231] Economic Regulation Authority, *Final Report: Inquiry on the cost of supplying bulk potable water to Kalgoorlie-Boulder*, 14 October 2005, p.18.

Table 59 Impact of conveyance costs on Water Corporation LRMC output (2016 dollars per kilolitre)

Water Corporation LRMC output	5th per cent of distribution	Mean	95th per cent of distribution
Including conveyance costs	2.13	2.82	3.34
Excluding conveyance costs	2.12	2.82	3.36

Source: ERA Analysis, Water Corporation 2017

The exclusion of conveyance costs changes costs by 1 cent per kilolitre at the extremes, but in differing directions. There is no effect on the mean at two decimal places.

Horizon of analysis

As discussed above, the value of extending the demand forecasts beyond 2060 is questionable because of the strong increase in forecast error. However, the period should also be long enough to ensure that idiosyncratic events such as base case capex falling outside the period analysed while corresponding perturbation capex falling within is heavily discounted. In initial modelling it was found that the effect of such idiosyncrasies on the model was quite strong. As a result all population, consumption, and inflow forecasts were linearly extrapolated out to 2117 to ensure these idiosyncrasies are heavily discounted by present value formulas. Where the inflow forecasts reach zero a value of zero was extrapolated thereafter.

Results

Long run marginal cost distribution results

The distribution results for each of the scenarios classed by percentile are shown in Table 60.

Table 60 Long run marginal cost estimate distribution under each scenario (July 2018 dollar forecast)

Scenario	5%	10%	20%	30%	40%	Mean	60%	70%	80%	90%	95%
Conservative	1.19	1.52	1.89	2.10	2.24	2.31	2.48	2.57	2.73	2.97	3.12
Middle	0.41	0.85	1.22	1.56	1.87	2.00	2.35	2.53	2.73	3.18	3.31
Optimistic	0.21	0.42	0.67	0.83	1.08	1.20	1.34	1.43	1.67	2.07	2.22

Source: ERA Analysis

The higher values in the conservative water demand growth scenario compared to the middle and optimistic demand growth scenarios mainly reflect the zero inflow assumption. When the middle and optimistic demand scenarios are altered to include a zero inflow assumption, the distribution of LRMC becomes wider and the values are generally higher. This is shown in Table 61, which compares the average of the original scenarios with the average of the same scenarios, but all altered to include a zero inflow assumption.

Applying higher demand to all scenarios decreases the span of the distribution, predominantly by increasing the lower end of the distribution (Table 61). It also increases the mean price. However, this mean price increase is less than that under the zero inflow assumption.

Table 61 Long run marginal cost estimate distribution average of altered scenarios (July 2018 dollar forecast)

Scenario	5%	10%	20%	30%	40%	Mean	60%	70%	80%	90%	95%	Range between 95th and 5th percent of distribution
Original Scenarios	0.61	0.93	1.26	1.50	1.73	1.84	2.06	2.18	2.38	2.74	2.89	2.28
Inflow held constant at zero	0.97	1.32	1.62	1.92	2.10	2.32	2.54	2.70	2.94	3.36	3.60	2.63
Demand held constant at high	1.18	1.38	1.67	1.86	2.03	2.13	2.33	2.43	2.55	2.82	2.94	1.76

Source: ERA Analysis

The conclusion to be drawn here is that under the current modelling assumptions, inflow is not only the most uncertain forecast variable in estimating LRMC, but also has the greatest effect on the size of the LRMC estimate. Consequently the level of risk tolerance should be a key consideration in selecting inflow scenarios for determining estimates of LRMC. If the consequences of adverse inflow outcomes are not offset by the benefits of favourable inflow outcomes then a more conservative set of scenarios is preferable.[232]

In some respects the payoff from inflow outcomes are asymmetric given uncertainty. An overly optimistic demand (low) and supply (high inflow) forecast may result in excessively low LRMC estimates. In turn, this may encourage excessive consumption which increases the likelihood of expensive supply projects being bought forward, but subsequent later more severe water restrictions and more rapid increases in tariffs. An overly conservative demand (high) and supply (low inflow) forecast may result in excessively high LRMC estimates. This produces lower risks in terms of higher than expected expenditure, tariffs and severity of water restrictions, but has social costs in terms of forgone economically efficient consumption. This rationale together with the current context of a drying climate suggests the zero inflow scenario may be the most appropriate. Zero inflow leads to investment in expensive new sources (such as desalinisation plants) being brought forward.

The zero inflow assumption means close to all of the existing capacity needs to be utilised in 2017. In the perturbation case the shortage/surplus is between -1 and 8 gigalitres between the discrete high and low demand scenarios. The effect of running existing sources at full capacity appears to increase LRMC estimates considerably as shown in Table 62.

[232] For example over-forecasting inflow by 50 gigalitres per annum is likely to have a consequence that is not offset by the benefit of under-forecasting 50 gigalitres per annum.

Table 62 Impact of operating existing sources at full capacity on Water Corporation LRMC output (2016 dollars per kilolitre)

Water Corporation LRMC output	5th per cent of distribution	Mean	95th per cent of distribution
Existing sources not operating at full capacity	2.13	2.82	3.34
Existing sources operating at full capacity	3.14	3.40	3.62

Source: ERA Analysis, Water Corporation 2017

Modelling at zero inflow and full capacity reduces the likelihood of rapid increases in tariffs in the event that these outcomes occur.

The zero inflow assumption is embedded in the conservative scenario. However, higher population growth forecasts and constant consumption per capita are also embedded in this scenario. The high population growth forecasts are not likely to be appropriate given the moderated outlook for population growth on the basis of easing economic conditions discussed in the demand section above. In addition, consumption per capita appears to have been declining more recently. To temper this aspect of the conservative scenario, each of the three scenarios are reproduced in Table 63 under the zero inflow assumption and averaged.

Table 63 Scenarios modified to reflect zero inflow assumption (July 2018 dollar forecast)

Scenario	5%	10%	20%	30%	40%	Mean	60%	70%	80%	90%	95%
Conservative	1.19	1.52	1.89	2.10	2.24	2.31	2.48	2.57	2.73	2.97	3.12
Middle	0.83	1.30	1.60	2.08	2.18	2.41	2.58	2.76	3.06	3.68	4.02
Optimistic	0.88	1.13	1.37	1.58	1.88	2.26	2.55	2.77	3.03	3.43	3.67
Average	**0.97**	**1.32**	**1.62**	**1.92**	**2.10**	**2.32**	**2.54**	**2.70**	**2.94**	**3.36**	**3.60**

Source: ERA Analysis

At the extremes the estimates are fairly idiosyncratic, but tend to converge to a stable mean. For this reason it is desirable to use the average of each of the scenarios under the zero inflow assumption. On this basis, the ERA's best LRMC estimates at the various points of the probability distribution are those based on the average zero inflow scenario. These are shown in Table 64.[233]

Table 64 ERA LRMC estimates (July 2018 dollar forecast)

5%	Mean	95%
0.97	2.32	3.60

Source: ERA Analysis

LRMC trends

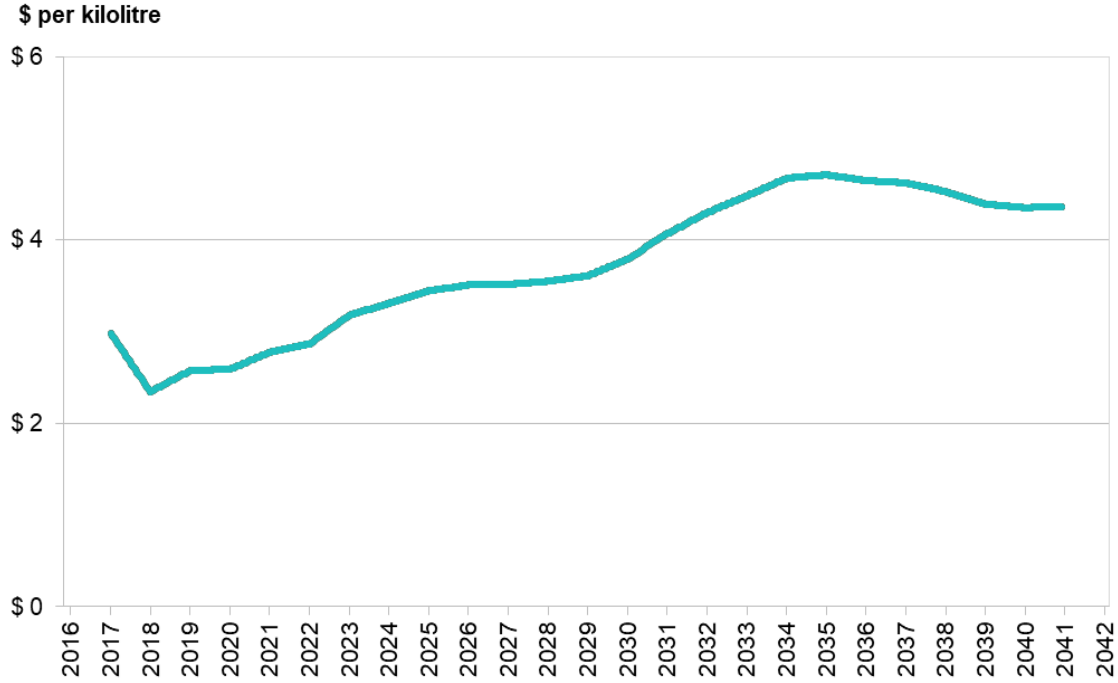
The trend in the LRMC estimates is examined by measuring the present value of the marginal cash flows and demand in each year between 2017 and 2042 over a 25 year horizon from each of those years (forward rolling 25 year window). Although it is possible

[233] The mean is used because it takes account of the simulated probability distribution density when determining the mid-point.

to examine the trend out to 2092, the schedule of new sources becomes exhausted resulting in scenarios where there are few new sources left to trigger and hence the misleading appearance of declining LRMC. The model has also been altered to ensure that new sources triggered in the perturbation just prior to each future window of analysis are netted out against capex of the corresponding new source if it is triggered in the beginning of the base case. This prevents large negative values occurring where base case capex, representing negative marginal capex, is not offset in the present value formula by positive marginal capex from the perturbation case due to perturbation capex falling outside the window of the present value formula.[234] This also occurs at the end of the 25 year window. This effect at the end is less problematic due to heavier discounting of future cash flows in combination with simulation producing many cases where this either does not occur or occurs at a different point in the window. Taking the mean of the simulations tends to smooth out the effect. The trend in the mean LRMC estimate for the conservative, middle, optimistic scenario are shown below.

Figure 47 shows the trend in the LRMC estimate for the conservative scenario.

Figure 47 Long run marginal cost trend in mean – conservative scenario (July 2018 dollar forecast)



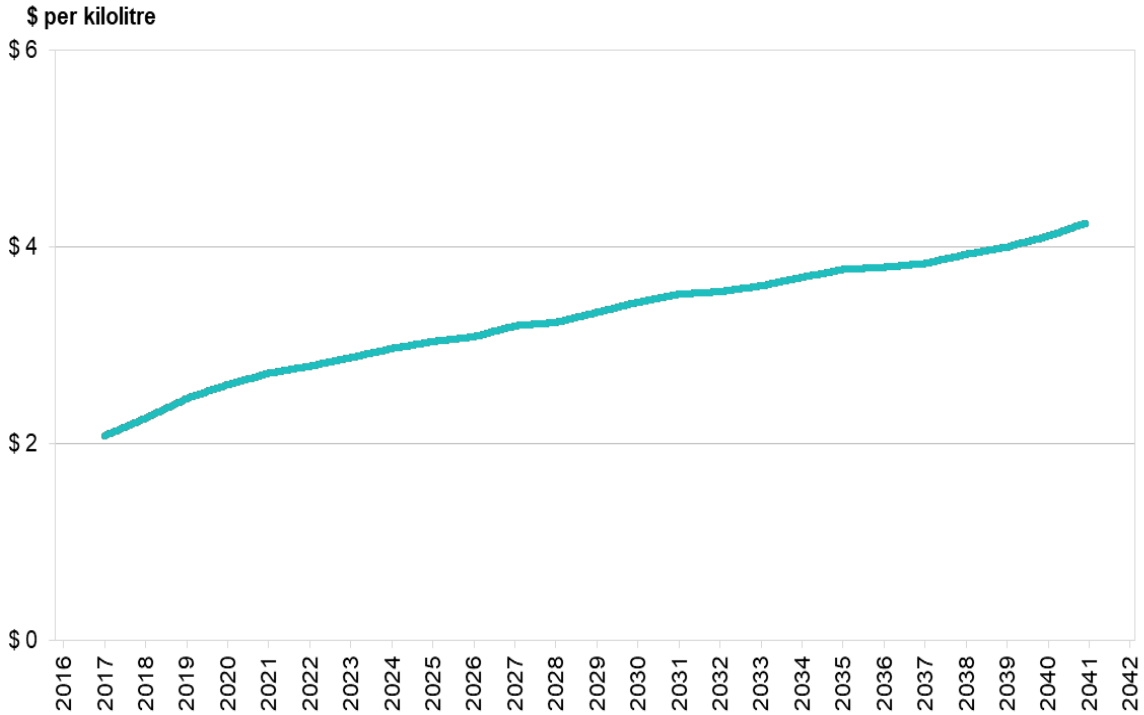
Source: ERA Analysis

The best mean estimate is currently $2.32 per kilolitre in forecasted July 2018 dollars. The LRMC estimates under the conservative scenario start high relative to the other scenarios and incline more rapidly. In July 2018 dollars, the mean estimate rises over $3.00 per kilolitre by 2023 (in six years) and over $4.00 by 2031 (in 14 years). The maximum LRMC in this graph is $4.71 by 2035.

[234] Perturbation capex is positive while base case capex is negative because marginal capex is defined as the present value of capex in the perturbation *minus* the present value of capex in the base case.

Figure 48 shows the trend in the LRMC estimate for the optimistic scenario.

Figure 48 Long run marginal cost trend in mean – middle scenario (July 2018 dollar forecast)

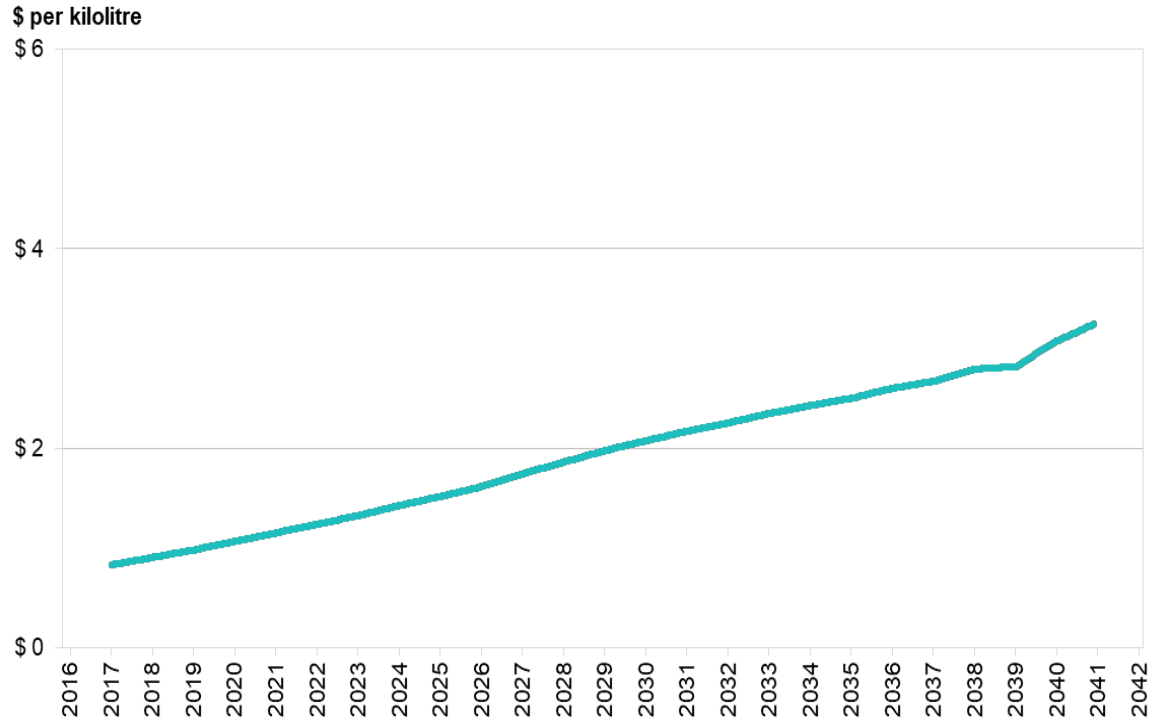


Source: ERA Analysis

The LRMC estimates under the mid scenario start between the conservative and optimistic scenarios. The rate of incline is also in between that of those two scenarios. In July 2018 dollars, the mean estimate rises over $3.00 per kilolitre by 2025 (in eight years) and over $4.00 by 2040 (in 23 years).

The optimistic scenario is shown in Figure 49.

Figure 49 Long run marginal cost trend in mean – optimistic scenario (July 2018 dollar forecast)



Source: ERA Analysis

The LRMC estimates under the mid scenario start between the conservative and optimistic scenarios. The rate of incline is also in between that of those two scenarios. In July 2018 dollars, the mean estimate rises over $3.00 per kilolitre by 2040 (in 23 years). Within the 25 year period LRMC does not rise above $4 per kilolitre. The highest value is $3.26 in 2041. This is lower than the highest of the ERA's best estimates ($3.60) shown in Table 64.

To summarise, under an optimistic scenario where inflow is high and demand is low LRMC does not rise above the top end of the range of the ERA's best estimate range even after 25 years. This scenario does not seem likely in the current context of a drying climate, and fairly high rates of Water Consumption per capita. The conservative scenario suggests that between 6 and 14 years the mean LRMC estimate will be higher than the highest of the ERA's best estimates. This scenario assumes very high population growth and so is also considered unlikely. The mid scenario suggests that between 8 and 23 years the mean LRMC estimate will be higher than the highest of the ERA's best estimates in real terms.

Long run marginal cost versus average cost of service

The analysis above shows that, under a conservative scenario of zero inflows and high demand, mean LRMC could be as high as $4.71 per kilolitre in July 2018 dollars. As discussed above, the trend in LRMC over time is also useful information when formulating tariff structure. If long run marginal cost is higher than average cost, pricing at marginal cost can recover revenue in addition to that required to cover the cost of service. The additional revenue recovered in provision of the service can be used to meet social or equity objectives in the provision of the same service.

The calculation of the average cost of service is shown in Table 65.[235]

Table 65 Average cost of service per kilolitre for the IWSS

	Present value	2017/18	2018/19	2019/20	2020/21	2021/22
Cost of Service ($m 2016)	7,467	1,729	1,727	1,723	1,711	1,698
Forecast GL	989	222	225	229	232	236
Kilolitres	989,267,104					
Average cost of service ($ per kilolitre)	**7.55**					

Source: ERA Analysis

Note: the IWSS has been defined here as Perth (excluding Mandurah Murray), Mandurah Murray, Goldfields and Agricultural regions.

The analysis is in 2016 dollars and does not necessarily capture every scheme and so potentially underestimates the average cost of service. Despite this, the average cost estimate ($7.55) is much higher than the highest July 2018 dollar ERA best estimate of long run marginal cost shown in Table 64 ($3.60) and higher than the July 2018 dollar maximum estimate of $4.71 observed in the trend analysis above. This is likely on account of the large sunk costs and short time frame of demand involved in the average cost of service analysis.

Conclusion on the estimates of long run marginal cost

The Water Corporation LRMC model has not been developed for the explicit purpose of informing tariffs. Its model simulates inflow rather than consumption scenarios. For this reason the ERA has developed an LRMC model with the intention of assessing the effect of simulated consumption, rather than inflow, scenarios.

Inflow assumptions have a major impact on both the level and dispersion of estimates. The use of conservative demand (high) and supply (low inflow) forecasts may result in excessively high LRMC estimates. Starting out with this assumption reduces the risk of future shocks to expenditure, tariffs and severity of water restrictions. However, this assumption can also have social costs in terms of forgone economically efficient consumption if a higher than expected inflow scenario eventuates. An overly optimistic demand (low) and supply (high inflow) forecast may result in excessively low LRMC estimates. In turn, this may encourage excessive consumption which increases the likelihood of expensive supply projects being bought forward, more severe water restrictions and more rapid increases in tariffs.

In the current context of a drying climate the zero inflow scenario appears be the most appropriate to use in order to avoid increases in the likelihood of severe water restrictions and rapid increases in LRMC-based tariffs. The current outlook for population growth appears subdued on the basis of easing economic conditions.[236] Perth's consumption per

[235] Note that the forecasts used here are those from the tariff model and so do not necessarily correspond to the exact scenarios used in the LRMC model.

[236] This may change in future with new economic information. Forecasts change when new information is available, but presumably take all existing information into account.

capita has been declining in recent years, however is still fairly high relative to other Australian cities. For these reasons the middle demand scenario in between conservative and optimistic is considered to be the most likely. To account for the zero inflow assumption and weight demand driven outcomes closer toward the middle, the best estimates are based on an average of the scenarios all modified to use the zero inflow assumption.

In forecast July 2018 dollars per kilolitre the best estimates are:

- $0.97 for the 5th per cent of the simulated distribution;
- $2.32 for the mean of the simulated distribution; and
- $3.60 for the 95th per cent of the simulated distribution.

Based on a 25 year ahead window, LRMC estimates increase over time under conservative, mid and optimistic scenarios. The mid scenario suggests that between 8 and 23 years the mean LRMC estimate will be higher than the highest of the ERA's best estimates ($3.60 per kilolitre) in real terms.

The trend in LRMC over time is also useful information when formulating tariff structure. If long run marginal cost is higher than average cost, pricing at marginal cost pricing can recover revenue in addition to that required to cover the cost of service. The additional revenue recovered in provision of the service can be used to meet social or equity objectives in the provision of the same service. A basic analysis of the average cost of service indicates that it is higher than the highest LRMC estimates and so there is no scope to recover additional revenue through LRMC pricing to directly meet social or equity objectives in water provision.

Appendix 5 Busselton and Aqwest Water demand forecasts

Aqwest

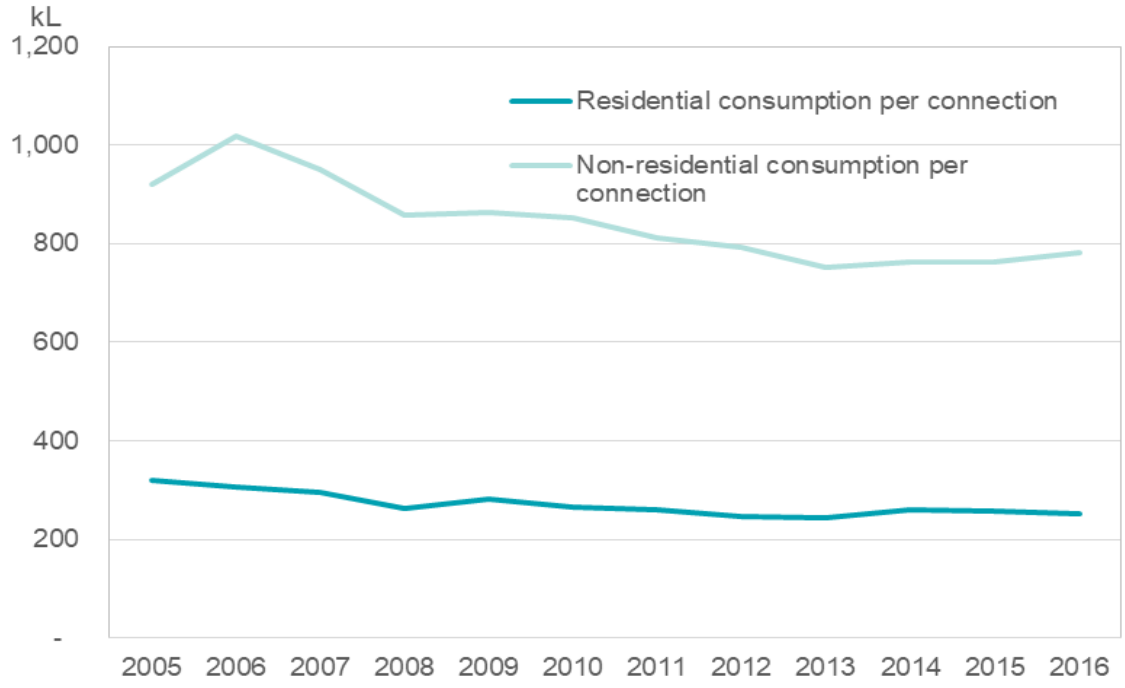
Background

The longest series of demand data provided by Aqwest dates back to 1982. This is the number of services (or connected properties). For the purposes of forecasting the ERA has used this series because it has a greater number of observations than the residential and non-residential connections and volume series. The relationship between the longer number of services data, residential and non-residential connections is established through regression. The modelled relationship is then applied to the forecasted services data to derive forecasted residential and non-residential connections. This connection data is then multiplied by latest year's consumption per connection data for both the residential and non –residential to create residential and non-residential volume forecasts.

Average residential and non-residential consumption

The end of June residential and non-residential connections and volume series supplied by Aqwest were used to derive average consumption per connection. This is shown in Figure 50.

Figure 50 Aqwest consumption per connection



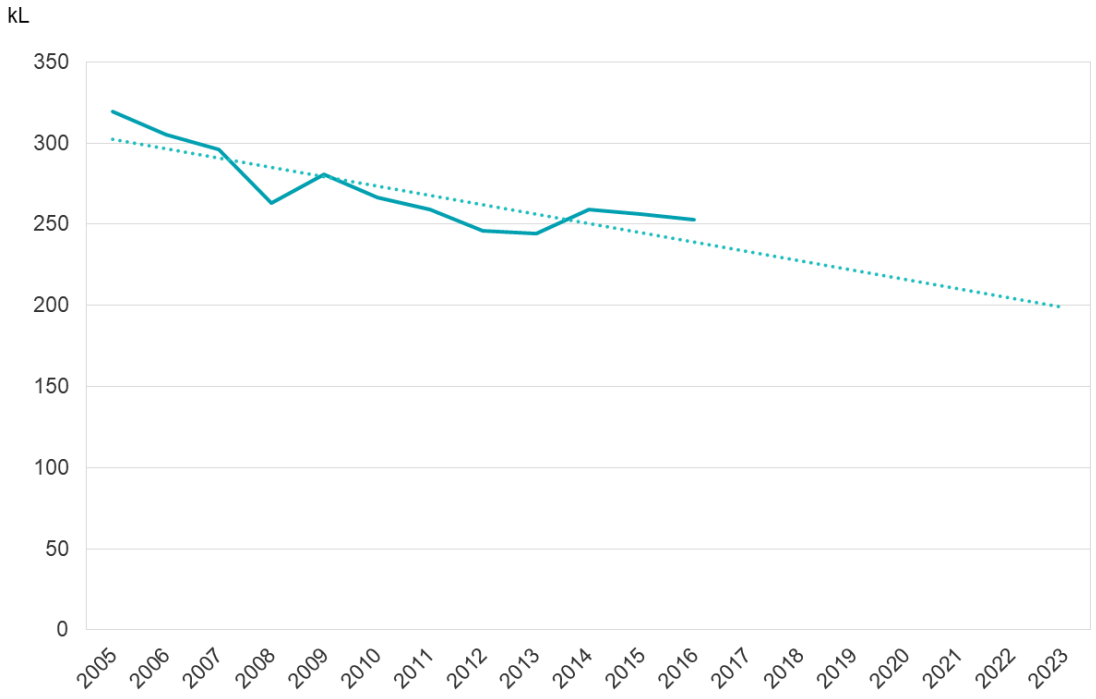
Source: ERA Analysis

Both residential and non-residential consumption per connection has been declining. Recently, it appears to have stabilised. The more recent stability suggests that it is reasonable to use the latest consumption per connection for volume forecasts. These latest

figures are 253 and 782 kilolitres per connection for residential and non-residential connections respectively.

Despite the appearance of stability in more recent consumption it is still possible that per connection consumption could decline further due to factors such as increasing urban density. Extrapolating this trend on the small sample of consumption per connection observations produces extreme results. Figure 51 demonstrates that such extrapolation produces decreases in residential consumption per connection of around 20 per cent over 7 years (253 kilolitres per annum in 2016 down to 200 by 2023).

Figure 51 Linear extrapolation of Aqwest residential consumption per connection



Source: ERA Analysis

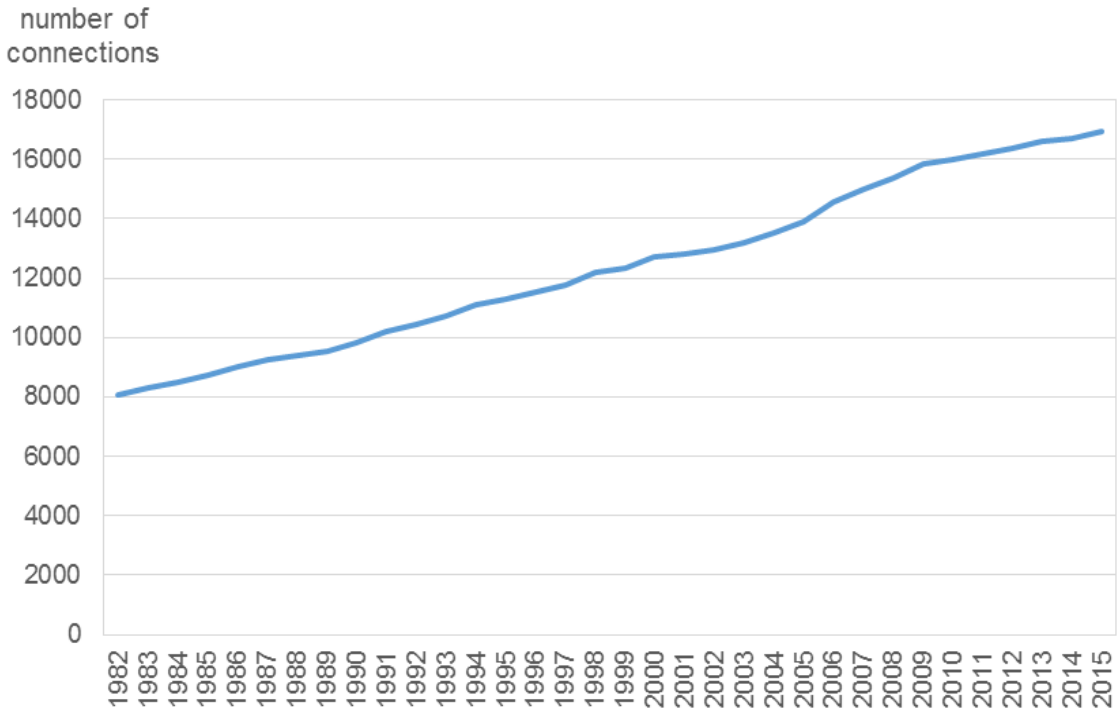
At current connection growth rates consumption per kilolitre would lead to very substantial declines in overall residential volumes. Because of thos difficulty in forecasting consumption per connection, the ERA uses the constant consumption per connection method outlined above as an upper bound for forecast volumes.

The ERA also extrapolates volumes directly for a lower bound. Extrapolating volumes directly takes the past declines in consumption into account. This offsets the reasonably linear connection growth (see next section). It results in lower volume growth.

Connections

Since 1982 growth in connections has been positive and fairly linear (Figure 52).

Figure 52 Aqwest number of services



Source: Aqwest, 30 year statistics 2016

Given that a linear trend appears to be a suitable fit for the data and that the trend is increasing, the ERA has made a linear forecast of connection numbers out to 2061.[237] The linear regression output is shown in Table 66.

Table 66 Regression of Aqwest connections to distribution network on time

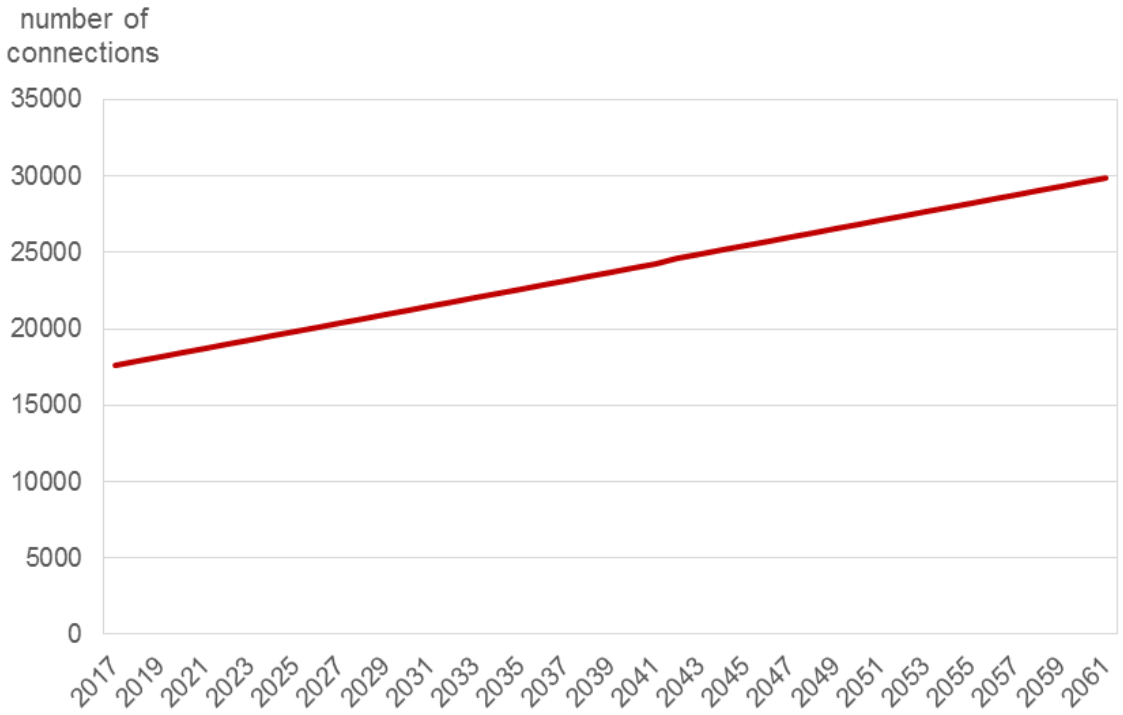
Parameter	Coefficient	p-value
Intercept	-547909	0.00
Year	280.35	0.00
Observations	35	
R Square	0.993	

Source: ERA Analysis

The regression explains over 99 per cent of the annual change in connections as indicated by the R-Square of 99.3 per cent and the coefficients are statistically significant even at the 1 per cent confidence level. A plot of the forecast connections is shown in Figure 53.

[237] 2061 was chosen only for consistency with the forecast horizon used for Water Corporation.

Figure 53 ERA forecast number of Aqwest services



Source: ERA Analysis

The regression relationship between these forecasted number of Aqwest services (connected properties) and the residential and non-residential connections is shown in Table 67.

Table 67 Regression of residential and non-residential connections on Aqwest services

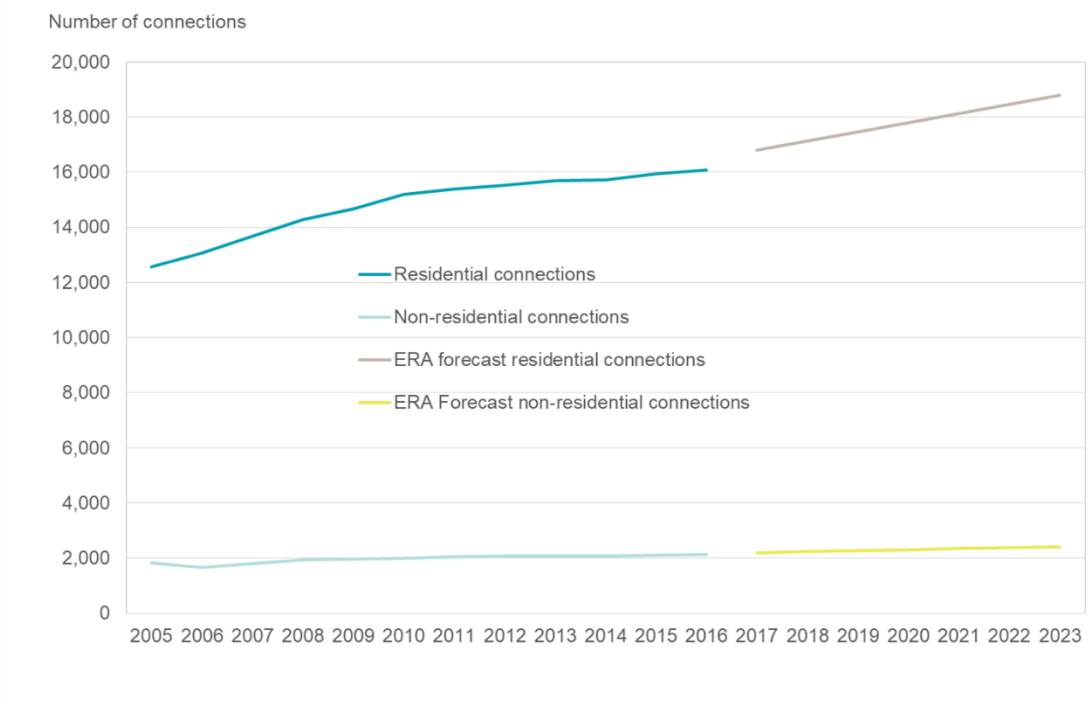
Parameter	Coefficient	p-value
Residential connections		
Intercept	-3964	0.00
Number of services	1.18	0.00
Observations	12	
R Square	0.98	
Non-residential connections		
Intercept	-89	0.80
Number of services	0.13	0.00
Observations	12	
R Square	0.81	

Source: ERA Analysis

The small number of observations available compromises the robustness of the regressions. Additionally, regressing one increasing series on another increasing series can result in the detection of statistical relationship, where in fact there is none. However, in this instance there is good reason to believe the number of services and of residential/non-residential connections are fundamentally related. The slope coefficients are statistically significant, as shown by the p-values that are virtually zero. The R-Square

is high for both series. The forecasts based on data in Figure 53 and the regressions in Table 67 are shown in Table 68 as a continuation of the historical actual data.

Table 68 Actual and forecast residential and non-residential Aqwest connections

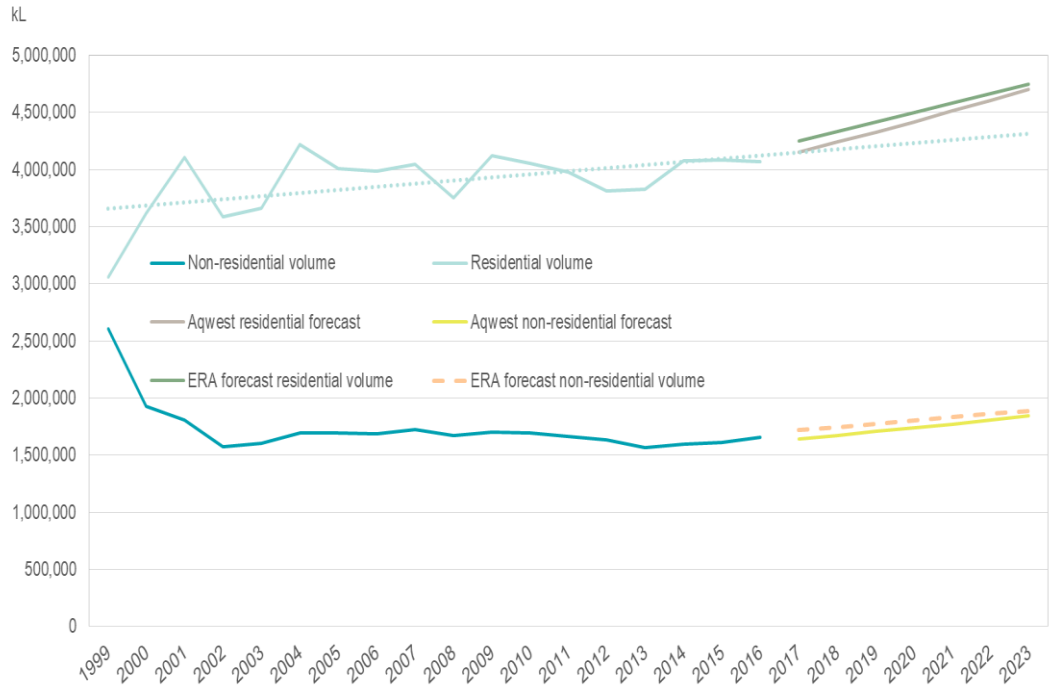


Source: ERA Analysis, Aqwest 2017

Volumes

The residential and non-residential connection forecasts are multiplied by their corresponding consumption per connection figures, which are outlined above. The resulting forecast volumes are compared to those of Aqwest and historical data in Figure 54.

Figure 54 Actual and ERA vs Aqwest forecast residential and non-residential volumes



Source: ERA Analysis

The resulting constant consumption per connection based volume forecasts are very similar to the forecasts made by Aqwest. The trajectory of the forecasts appear quite high compared to the previous volumes. This result is driven by relatively strong residential connection growth, which may be observed in the connection growth trend line in Figure 55.

Figure 55 Aqwest volume and connection trends vs volume forecasts

Source: ERA Analysis

This result implies that Aqwest is not expecting any further material declines in consumption per connection.

Furthermore, the Aqwest connection forecasts shown in Table 79 are lower than the ERA connection forecasts. The result is that the Aqwest forecasts imply increases in consumption per connection. This is because the Aqwest volume/consumption forecasts shown in Figure 55 are not possible with these lower connection forecasts, unless consumption per connection is increasing.

Table 69 Aqwest vs ERA forecast connections

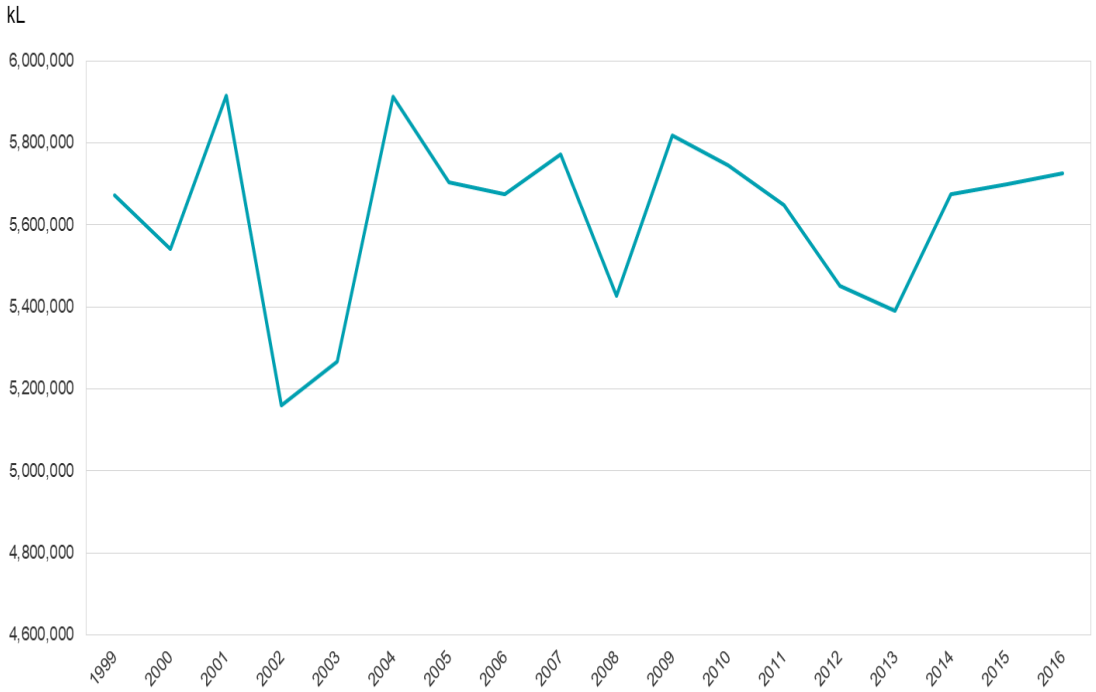
	2017	2018	2019	2020	2021	2022	2023	CAGR
Aqwest								
Aqwest Residential connections	16,274	16,416	16,558	16,702	16,848	16,994	17,142	0.87
Growth (%)	1.13	0.87	0.87	0.87	0.87	0.87	0.87	
Aqwest Non-residential connections	2,151	2,164	2,177	2,190	2,204	2,218	2,232	0.62
Growth (%)	1.37	0.60	0.60	0.60	0.64	0.64	0.63	
ERA								
ERA Residential connections	16,810	17,142	17,474	17,805	18,137	18,468	18,800	1.88
Growth (%)	4.46	1.97	1.93	1.90	1.86	1.83	1.80	
ERA Non-residential connections	2,198	2,235	2,271	2,308	2,344	2,381	2,417	1.60
Growth (%)	3.58	1.66	1.63	1.61	1.58	1.56	1.53	
Total connections	17,562	17,842	18,123	18,403	18,683	18,964	19,244	1.54
Total growth (%)	2.62	1.60	1.57	1.55	1.52	1.50	1.48	

Source: ERA Analysis

As mentioned above, the ERA uses the constant consumption per connection method as an upper bound for forecast volumes and extrapolates volumes directly for a lower bound to take the past declines in consumption into account.

Total volume is shown in Figure 56.[238]

Figure 56 Aqwest historical total volume



A regression of total volume on time gives the regression equation shown in Table 70.

Table 70 Regression of Aqwest total volume on time

Parameter	Coefficient	p-value
Intercept	-146707.1591	0.99
Year	2874	0.77
Observations	18	
R Square	0.01	

Source: ERA Analysis

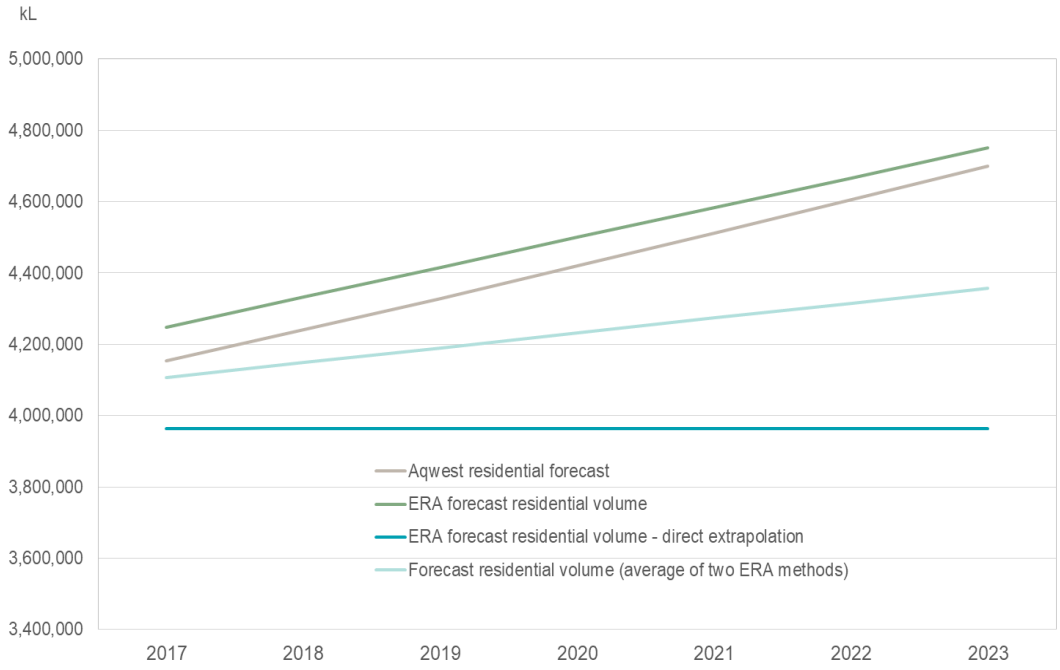
The p-value for the 'year' coefficient of 0.77 indicates that the slope coefficient is not statistically different from zero. A constant trend in growth (constant at 5,726,247 kilolitres per annum) is therefore the best volume forecast, given this data. Based on the average of data between 1999 and 2016, residential customers represent approximately 69 per cent of total volume demanded while non-residential represents approximately 31 per cent. Applying these proportions to the constant total volume forecast gives a constant volume forecast of 3,964,624 and 1,761,623 kilolitres per annum for residential and non-residential volumes respectively.

[238] Aqwest provided additional observations of volume data upon request spanning 1999 to 2004.

In the absence of additional information that can be used to quantify effects on connection growth or consumption, the best forecast is given by the average of the upper bound forecasts, based on constant consumption per connection, and lower bound forecasts, based on extrapolated volumes. This is because it accounts for both the strong, historically observed, connection growth and the offsetting effect of declining consumption, observed in the past volume data.

The residential volume forecasts are shown in Figure 57.

Figure 57 Aqwest vs ERA residential volume forecasts

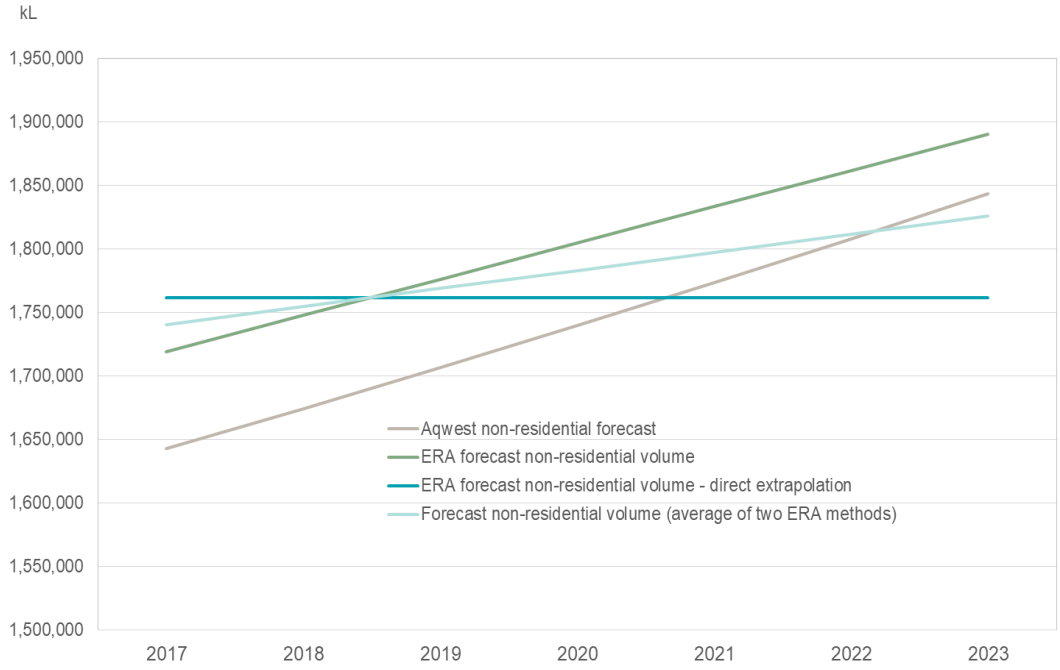


Source: ERA Analysis

The final ERA residential forecasts based on the average of the two ERA methods is significantly below the Aqwest forecasts.

The non-residential forecasts are shown in Figure 58.

Figure 58 Aqwest vs ERA non-residential volume forecasts



Source: ERA Analysis

The final ERA residential forecasts based on the average of the two ERA methods is initially above the Aqwest forecasts, but falls below the Aqwest forecasts after 2018.

The results are summarised in Table 71.

Table 71 ERA forecast compound annual growth rates in volumes for Aqwest

	2017	2018	2019	2020	2021	2022	2023	CAGR (%)
Residential kilolitres	4,106,425	4,148,330	4,190,235	4,232,140	4,274,045	4,315,950	4,357,855	**1.00**
Growth (%)	0.98	1.02	1.01	1.00	0.99	0.98	0.97	
Non-residential kilolitres	1,740,313	1,754,592	1,768,871	1,783,149	1,797,428	1,811,707	1,825,985	**0.80**
Growth (%)	4.87	0.82	0.81	0.81	0.80	0.79	0.79	
Total kilolitres	5,846,738	5,902,922	5,959,106	6,015,289	6,071,473	6,127,656	6,183,840	**0.94**
Total growth (%)	**2.10**	**0.96**	**0.95**	**0.94**	**0.93**	**0.93**	**0.92**	

Source: ERA Analysis

The forecasts show a jump in total consumption in of 2.10 per cent in the initial year, largely caused by an initial jump in non-residential consumption, in that year, of 4.87 per cent. Other than a statistical explanation, there is no immediately obvious reason why this should be so. It occurs as a result of an immediate reversion from the actual data back to the mean regression line, which is represented by the kilolitre forecasts. This regression line runs through the conditional mean of the data (that is, conditioned by year) and so will not

necessarily fall in line with the last actual observed data point. To avoid this initial jump the ERA uses the compound average growth rate (**CAGR**) between the 2017 and 2023 forecast data points produced by the regression. The CAGRs are shown in the last column of Table 81. It is these growth rates which are used to index actual demand from 2016 on to produce load forecasts for the tariff model.

The resulting indexed load figures to be used in the Aqwest tariff model are shown in Table 72.

Table 72 Aqwest residential and non-residential load forecast

	2019	2020	2021	2022	2023
Volume					
Residential kilolitres	4,238,009	4,280,389	4,323,192	4,366,424	4,410,089
Growth (%)	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Non-residential kilolitres	1,673,545	1,689,276	1,705,155	1,721,183	1,737,363
Growth (%)	**0.94**	**0.94**	**0.94**	**0.94**	**0.94**
Connections					
Residential connections	16,724	17,039	17,359	17,685	18,018
Growth (%)	**1.88**	**1.88**	**1.88**	**1.88**	**1.88**
Non-residential connections	2,220	2,256	2,292	2,329	2,366
Growth (%)	**1.60**	**1.60**	**1.60**	**1.60**	**1.60**

Source: ERA Analysis

Busselton Water

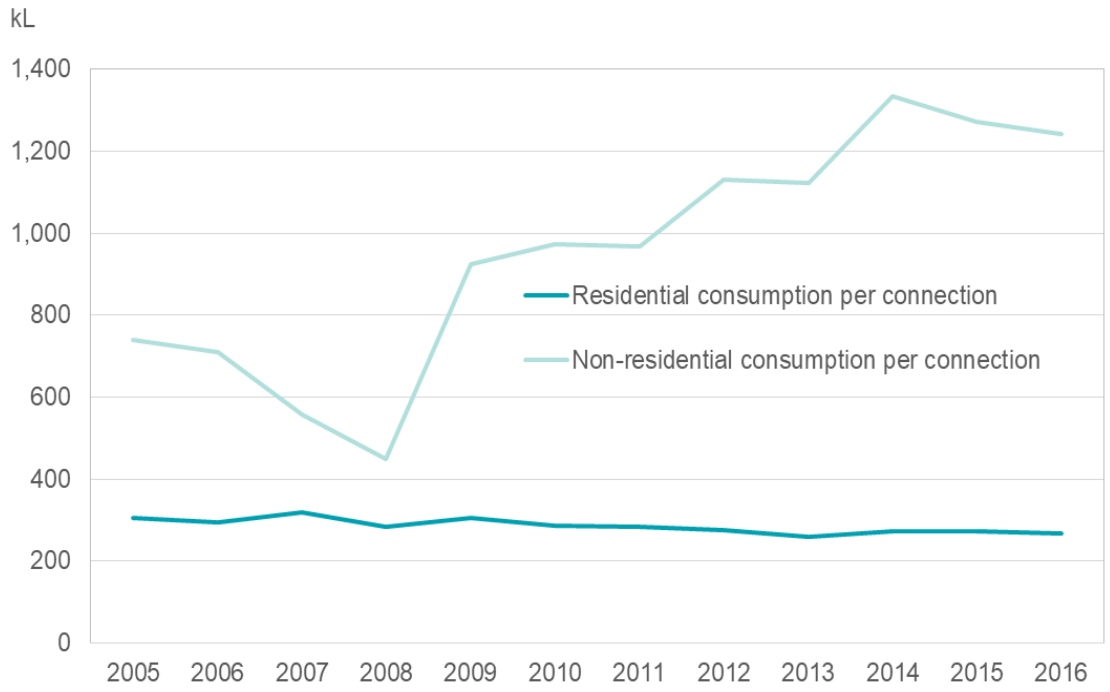
Busselton Water's billed water consumption and total connection data dates back to the 1997 financial year. However, this data for the residential and non-residential segments is only available back to the 2005 financial year. The ERA has adopted the longer term series as the starting point for forecasting, so as to improve the statistical accuracy of the results. The relationship between the shorter series of residential and non-residential load data and the longer aggregated series is then used to derive residential and non-residential forecasts from the projections based on the longer series of aggregated data.

For consistency with the approach applied to the Aqwest forecasts, the ERA uses forecasts based on a constant consumption assumption multiplied by forecast connection growth, as well as forecasts based on directly extrapolated volumes.

Average Consumption

The end of June residential and non-residential connections and volume series supplied by Aqwest were used to derive average consumption per connection. This is shown in Figure 59.

Figure 59 Busselton Water consumption per connection



Source: Busselton Water

Figure 59 shows that residential consumption has been declining, but appears to have stabilised since 2013. The more recent stability indicates that it is reasonable to use the latest consumption per connection for volume forecasts. However, the non-residential data is very unstable. This appears to be a result of strong non-residential consumption growth between 2008 and 2014 and/or changes in measurement process – part of the way through the series – which is discussed further below. The latest consumption per connection figures are 266 and 1242 kilolitres per connection for residential and non-residential connections respectively. Under the constant consumption method (used for Aqwest forecasts above), these values are kept constant and used forecasts for future consumption per connection which are applied to forecast connections to derive volume forecasts. The connection forecasting process is based on a longer series of data and is outlined below.

Connections

A basic linear regression on the connection data spanning 1997 to 2016 produces significant coefficients and some degree of explanatory power.[239] The regression is shown in Table 73.

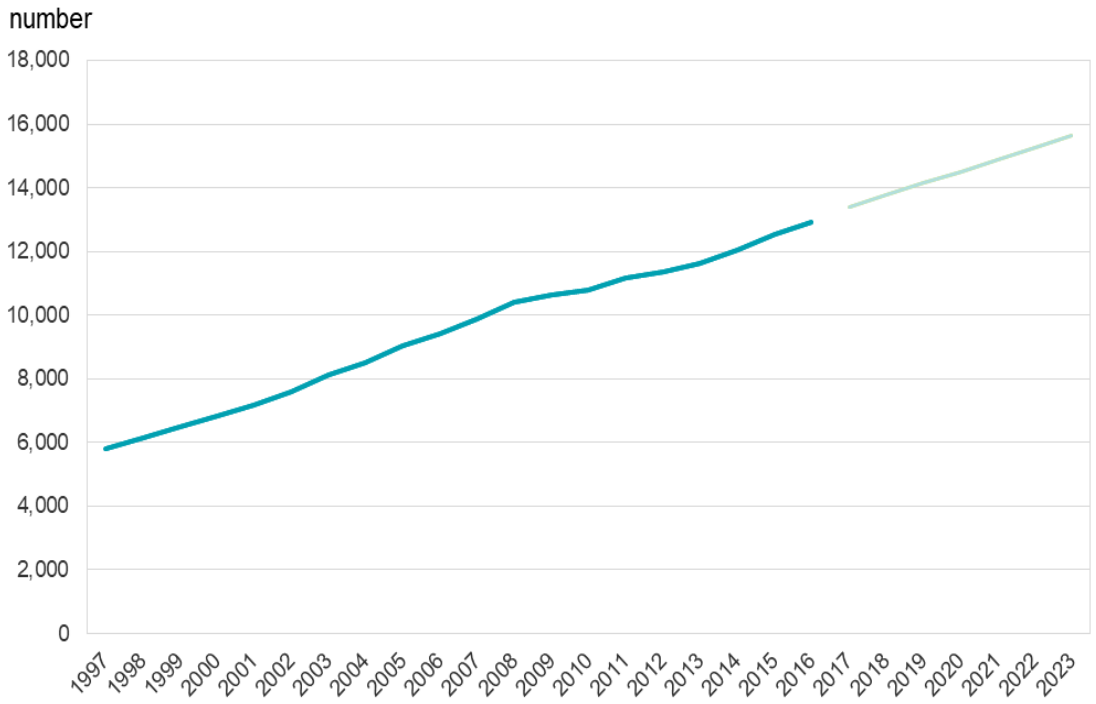
Table 73 Regression of Busselton Water connections on time

Parameter	Coefficient	p-value
Intercept	-747508	0.00
Year	377	0.00
Observations	20	
R Square	0.99	

Source: ERA Analysis

The slope coefficient is significant at the 1 per cent level while the R-square indicates that the regression explains around 99 per cent of the variation in connections over the years. The actual and forecast connections are shown in Figure 60.

Figure 60 Historic and ERA forecast Busselton Water connections

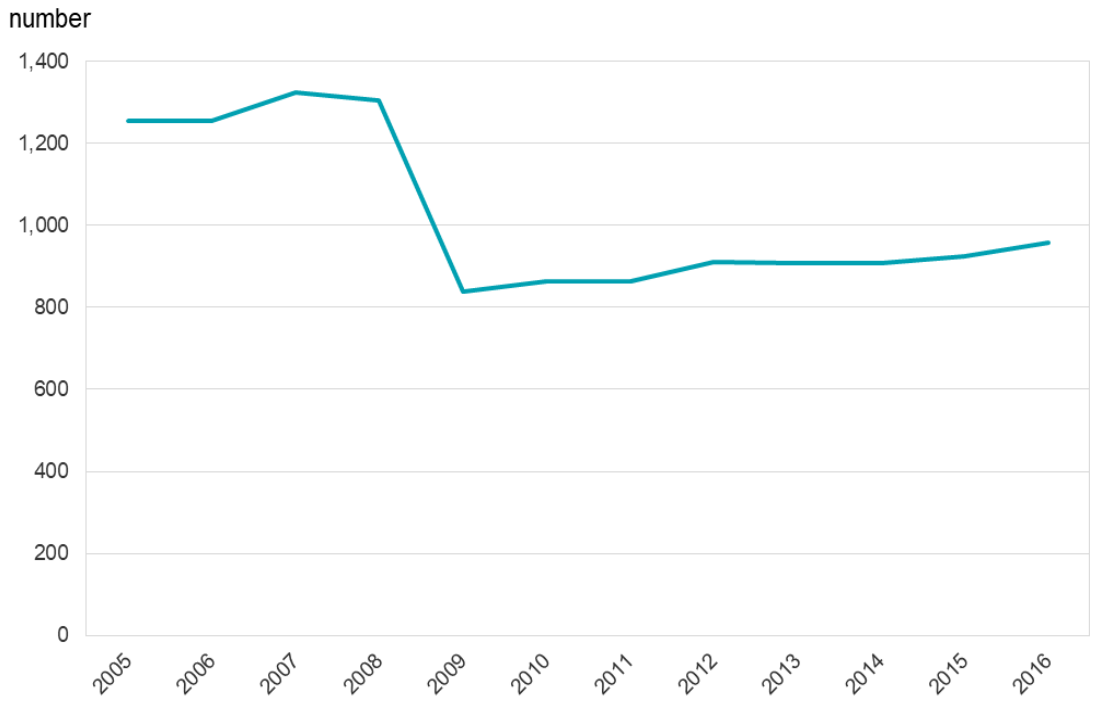


Source: ERA Analysis, Busselton Water

Although 12 observations for non-residential connections were provided by Busselton Water a change in measurement methodology partway through the series results in a structural break in the data. This is shown in Figure 61.

[239] The 2015 and 2016 observations for total connections were based on the sum of the latest residential and non-residential connection data provided by Busselton Water. While summing this data in earlier years around 2005 results in discrepancies due to changes in measurement methodology, sufficient time has passed to consider the latest observations for residential and non-residential reflective of the total.

Figure 61 Busselton Water non-residential connections



Source: Busselton Water

For this reason only the observations after 2008 are used leaving 8 observations. The regression relationship between the forecasted Busselton Water connections in Figure 60 and the residential and non-residential connections is shown in Table 74.

Table 74 Regression of residential and non-residential connections on Busselton Water total connections

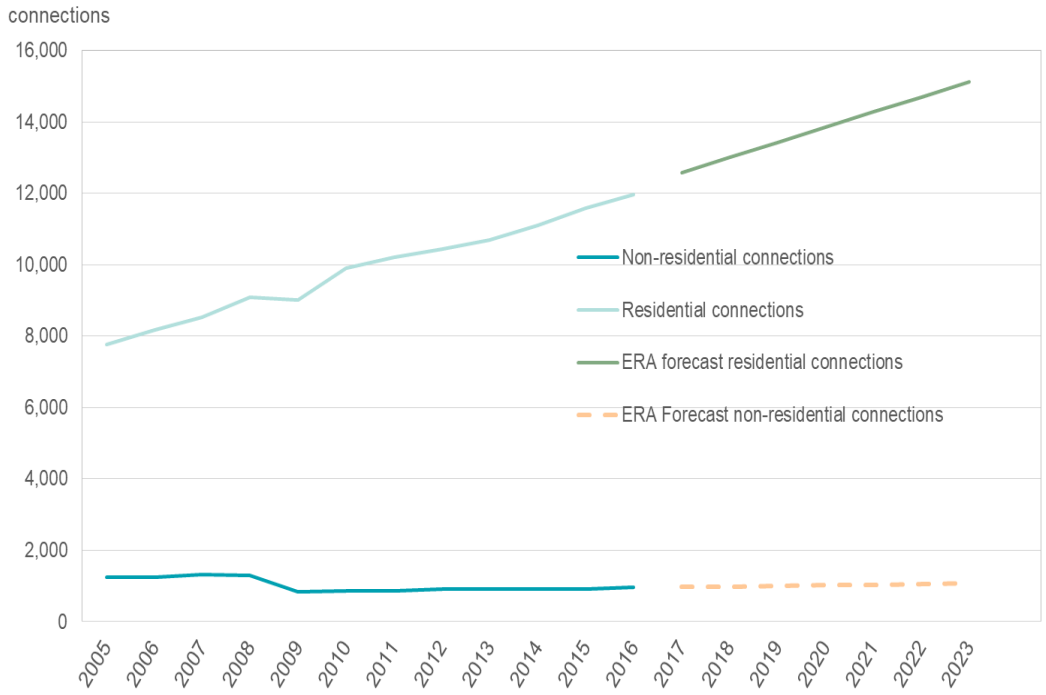
Parameter	Coefficient	p-value
Residential connections		
Intercept	-2479	0.00
Total connections	1.13	0.00
Observations	12	
R Square	0.98	
Non-residential connections		
Intercept	391	0.00
Total connections	0.04	0.00
Observations	8	
R Square	0.86	

Source: ERA Analysis

As for Aqwest, the small number of observations available compromises the robustness of the regressions. Additionally, regressing one increasing series on another increasing series can result in the detection of statistical relationship where in fact there is none. However, in this instance there is good reason to believe the number of connections and residential/non-residential connections are fundamentally related. The slope coefficients

are statistically significant as shown by the p-values that are zero (when rounded to 2 decimal places) and the R-Square is high for both series.

Figure 62 Actual and forecast residential and non-residential Busselton Water connections



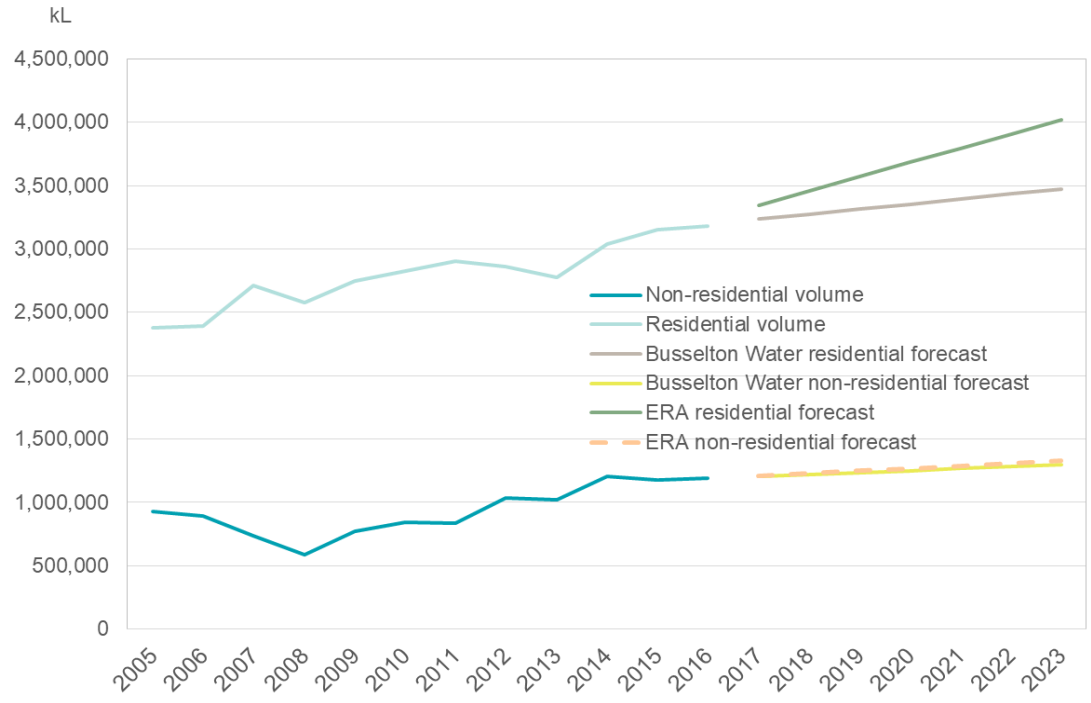
Source: ERA Analysis, Busselton Water

Volumes

Under the constant consumption method the residential and non-residential connection forecasts established above are multiplied by their corresponding consumption per

connection figures which are also outlined above. The resulting forecast volumes are compared to those of Busselton Water and historical data in Figure 63.

Figure 63 Actual and ERA vs Busselton Water forecast residential and non-residential volumes



Source: ERA Analysis, Busselton Water

While the ERA and Busselton Water non-residential volume forecasts are very close there is a significant difference between the ERA and Busselton Water residential forecasts. This appears to result from using the constant residential consumption of 266 kilolitres per connection in combination with strong residential connection growth shown in Figure 62. This may not account for declining consumption per capita resulting from factors such as increased urban density.

For consistency with the forecasting process undertaken for Aqwest, the direct extrapolation of total volumes to forecast residential and non-residential volumes is also applied. A basic linear regression on the consumption data spanning 1997 to 2016 produces significant coefficients and some degree of explanatory power. The regression is shown in Table 75.

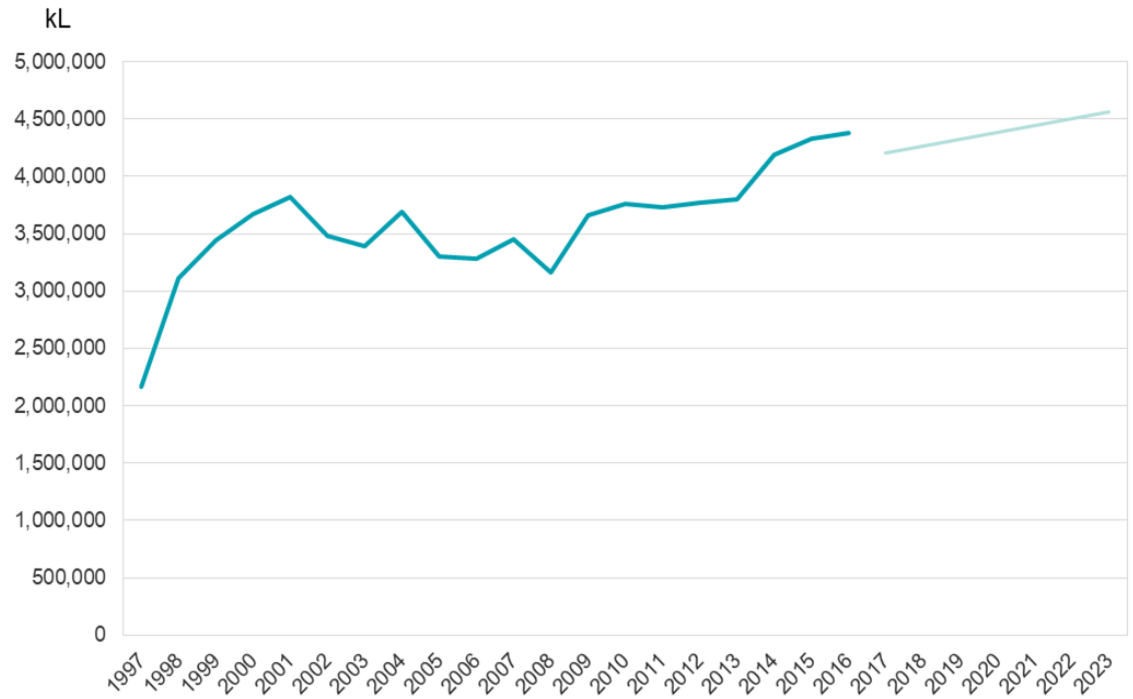
Table 75 Regression of Busselton Water billed consumption on time

Parameter	Coefficient	p-value
Intercept	-116384078.6	0.00
Year	59787	0.00
Observations	20	
R Square	0.54	

Source: ERA Analysis

The coefficients are significant at the 1 per cent level while the R-square indicates that the regression explains around 54 per cent of the variation in consumption over the years. The actual and forecast consumption are shown in Figure 64.

Figure 64 Historic and ERA forecast Busselton Water total demand

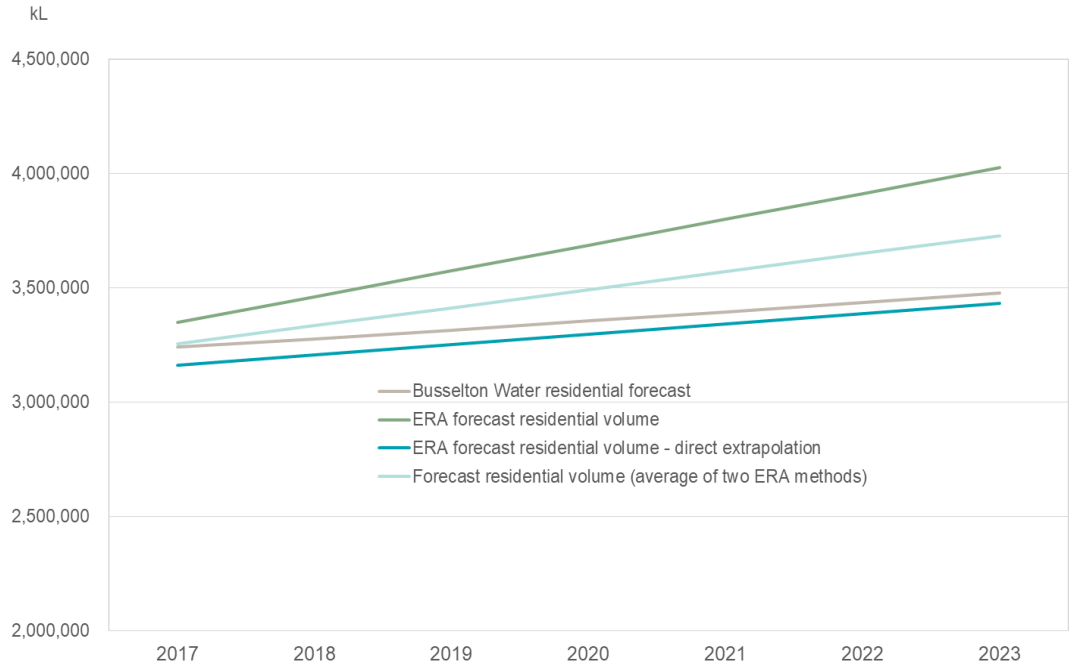


Source: ERA Analysis, Busselton Water

The 1997 consumption figure appears to be an outlier because it represents a 44 per cent increase going into 1998. This suggests that the 1997 consumption data may be incomplete. The outlier may result in a steeper regression line and over forecast consumption. The same regression excluding consumption for 1997 produced a slope coefficient of 44,939 kilolitres per year, which is 14,848 kilolitres per year lower than the slope coefficient estimated in Table 75 , and a standard error of 10,997 kilolitres per year. The ratio of the difference in slope coefficient to the standard error of slope coefficient estimate is 1.35. Since this is less than the critical value of 1.96, at 5 per cent statistical significance, the slope is not statistically different. The existing regression in Table 75 is therefore considered to be acceptable.

The directly extrapolated estimates of total volume can be used to produce residential and non-residential forecasts based on their respective proportions of total demand. The 12 residential volume observations that were provided on average represented 75 per cent of the total annual volume shown in Figure 64 across 2005 to 2016. This proportion is applied to the forecasts shown in Figure 64. The results are shown in Figure 65.

Figure 65 Busselton Water vs ERA residential volume forecasts



Source: ERA Analysis, Busselton Water

The direct extrapolation based results are also averaged with the constant consumption based forecasts to produce the final ERA forecasts. The various forecasts are compared to the Busselton Water residential forecasts (originally shown in Figure 63) in Figure 65. The Busselton Water forecasts fall in between both of the ERA methods, but is much closer to the direct extrapolation method.

Table 76 shows that Busselton Water's forecasts imply constant residential consumption per connection of 266 kilolitres.

Table 76 Busselton Water forecasts of residential consumption per connection

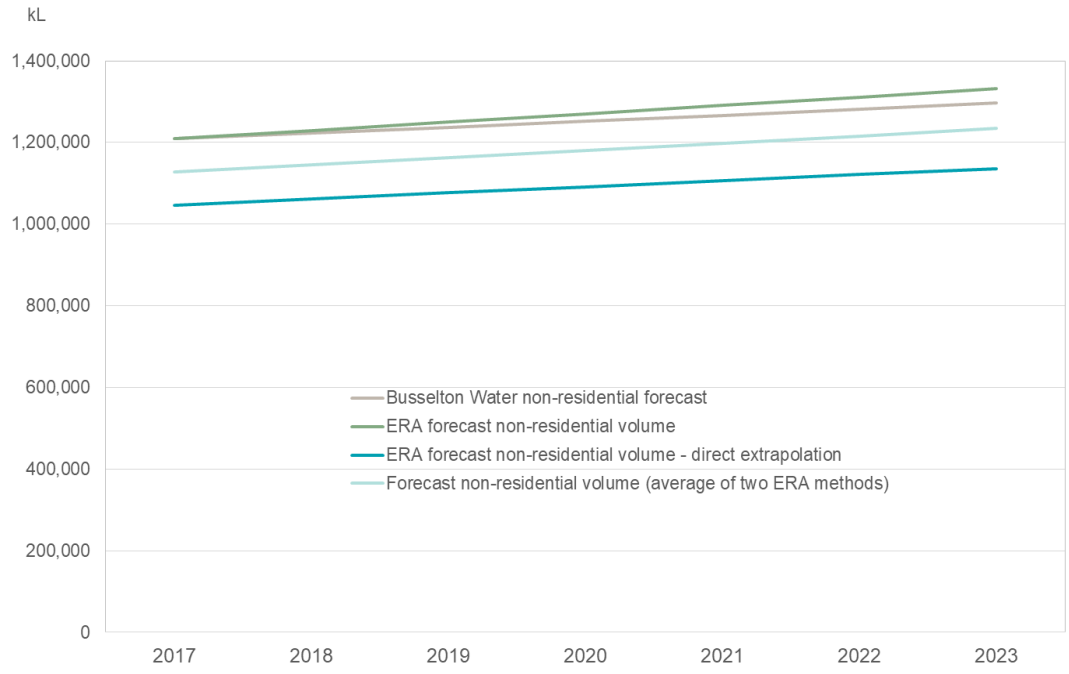
	2017	2018	2019	2020	2021	2022	2023
Residential kilolitres	3,238,959	3,276,207	3,314,211	3,353,319	3,393,223	3,433,942	3,475,492
Residential connections	12,175	12,315	12,457	12,604	12,754	12,907	13,064
Kilolitres per connection	266	266	266	266	266	266	266

Source: ERA Analysis

This means that Busselton Water's relatively low volume growth forecasts shown in Figure 65 are driven by a strong decrease in connection growth. Although this is possible, the ERA prefers to place some reliance on the data in Figure 60 and Figure 62 which shows that historical connection growth exhibits a very stable linear trend. Hence, the ERA uses the average of two methods to take the stable linear growth into account.

Figure 66 compares the various ERA non-residential forecasts to the Busselton Water non-residential forecasts. These are based on the assumption that the remaining 25 per cent of total extrapolated volumes is non-residential demand.

Figure 66 Busselton Water vs ERA non-residential volume forecasts



Source: ERA Analysis

The Busselton Water non-residential forecasts are at the upper end of the range which is based on constant consumption. The ERA's forecast based on the average of both methods maintains non-residential consumption closer to the historical proportion of 25 per cent. For this reason it is lower than Busselton Water's forecast although follows a similar trajectory.

The results are summarised in Table 77.

Table 77 ERA forecast compound annual growth rates in volumes for Busselton Water

	2017	2018	2019	2020	2021	2022	2023	CAGR (%)
Residential kilolitres	3,253,765	3,332,698	3,411,632	3,490,565	3,569,499	3,648,432	3,727,365	**2.29**
Growth (%)	2.16	2.43	2.37	2.31	2.26	2.21	2.16	
Non-residential kilolitres	1,128,143	1,145,778	1,163,413	1,181,048	1,198,684	1,216,319	1,233,954	**1.51**
Growth (%)	-5.10	1.56	1.54	1.52	1.49	1.47	1.45	
Total kilolitres	4,381,908	4,478,476	4,575,045	4,671,614	4,768,182	4,864,751	4,961,320	**2.09**
Total growth (%)	0.19	2.20	2.16	2.11	2.07	2.03	1.99	

Source: ERA Analysis

For consistency with the approach used for Aqwest, the forecast kilolitres are only used for producing the CAGRs shown in the last column. These CAGRs are then used to index

historic Busselton Water demand to create load forecasts for the tariff model. The final load results used in the tariff modelling are shown in Table 78.

Table 78 Busselton Water residential and non-residential load forecast

	2019	2020	2021	2022	2023
Volume					
Residential kilolitres	3,389,002	3,466,610	3,545,995	3,627,199	3,710,261
Growth (%)	**2.29%**	**2.29%**	**2.29%**	**2.29%**	**2.29%**
Non-residential kilolitres	1,245,807	1,264,618	1,283,714	1,303,098	1,322,775
Growth (%)	**1.51%**	**1.51%**	**1.51%**	**1.51%**	**1.51%**
Connections					
Residential connections	12,946	13,350	13,766	14,196	14,639
Growth (%)	**3.12%**	**3.12%**	**3.12%**	**3.12%**	**3.12%**
Non-residential connections	1,005	1,021	1,038	1,055	1,072
Growth (%)	**1.62%**	**1.62%**	**1.62%**	**1.62%**	**1.62%**

Source: ERA Analysis

Appendix 6 Factors affecting efficient costs

Given the terms of reference, the ERA needs to focus on the efficient costs of providing services, including the impacts of:

- service standards;
- environmental and health regulations; and
- efficiency targets.

Service standards

The ERA is required to consider the water corporations' efficient costs of providing services, including with reference to the resources necessary to meet service standards.

Standards broadly cover specifications, procedures and/or guidelines to ensure safety, reliability and/or consistency. Standards are typically based on either industrial, scientific or consumer experience.[240] The term "service standard" is normally associated with the provision of a service that involves an outcome to a customer. The term "performance standard" is sometimes also used to mean the same thing.

In the context of this inquiry, the term "performance standards" is used within key water legislation[241] that is applicable to the water corporations and because of this the term is also used within the water licences issued by the ERA. While there may be a technical distinction between the terms[242], for the purpose of this inquiry the terms "service standards" and "performance standards" are considered to mean the same thing and encompass standards that relate to the provision of water services and water service outcomes to the customer.

The ERA previously considered service standards applicable to each of the water corporations as part of its 2004, 2008 and 2012 water inquires.[243] Summaries of final recommendations made by the ERA are provided in Table 79.

[240] *Standards Australia*, [website], 2017, www.standards.org.au (accessed March 2017).

[241] Water Services Act 2012 and Water Services Code of Conduct (Customer Service Standards) 2013.

[242] Performance standards can include standards that do not involve a customer outcome (for example, the performance standard of a particular asset), whereas service standards typically relate to standards that involve a customer outcome.

[243] See Economic Regulation Authority, *Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009 and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013.

Table 79 Final recommendations of previous ERA water inquiries relating to service standards

ERA Inquiry Recommendation(s)
2004 – Inquiry on Urban Water and Wastewater Pricing
Water Corporation • The ERA is satisfied that the Water Corporation is providing its services in accordance with standards and requirements imposed by the terms and conditions of its licence. The ERA does not consider that the Water Corporation requires additional financial resources – and hence higher prices and revenues – to meet these standards and requirements. [Recommendation 16] • While the Water Corporation has assessed its customers' willingness to pay for improvements to unregulated services, the ERA considers that additional work using more reliable methods may be warranted. [Recommendation 17] • The ERA considers that additional information on customer bills could improve customers' awareness of water prices and usage. [Recommendation 18]
Aqwest While no specific recommendations were provided about service standards for Aqwest, the ERA noted the following. • Despite compliance with operating licence standards, Aqwest's annual customer satisfaction surveys between 1998 and 2004 show a decline in customer satisfaction in the areas of effective planning, pricing, water service interruptions and water supply quality. Aqwest believes its customers are becoming increasingly demanding and expectant of higher service levels. • Aqwest intends to adopt more stringent targets for iron and manganese concentrations in water supplies and anticipates that additional investment will be required to reduce the number of dirty water complaints. This investment has not been fully scoped and hence the ERA has not considered the works and costs contemplated for the improvement of water quality. • Aqwest indicates that customers may be willing to pay for higher levels of service, particularly for non-health related drinking water quality. • The Department of Health noted to the ERA that one omission from Aqwest's submission was the potential cost of complying with the *1996 Australian Drinking Water Guidelines*. In particular, Aqwest may experience a significant increase in staff and other resources in order to meet compliance with the Guidelines. • Requirements to meet new or higher standards of operational performance that relate to water quality will affect the costs incurred. Such costs should not be anticipated. Rather, the costs should be taken into account when and if the new or higher standards are imposed and forecasts made of the costs of meeting the standards at that time.
Busselton Water While no specific recommendations were provided about service standards for Busselton Water, the ERA noted the following. • Busselton Water has complied with its operating licence standards over the past five years. Customer satisfaction surveys indicate a high overall level of customer satisfaction. • Busselton Water does not currently plan to undertake capital investment programs or additional operating activities for the purpose of achieving compliance with licence requirements or otherwise improving performance standards. • As with Aqwest, the Department of Health noted that one omission from Busselton Water's submission was the potential cost of complying with the *1996 Australian Drinking Water Guidelines*. Busselton Water may experience a significant increase in staff and other resources in order to meet compliance with the Guidelines. • Requirements to meet new or higher standards of operational performance, in respect of water quality, will likely affect the costs incurred. Such costs should not be anticipated. Rather,

ERA Inquiry Recommendation(s)
the costs should be taken into account when and if the new or higher standards are imposed and forecasts made of the costs of meeting the standards at that time.
2008 – Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water,
For this inquiry the ERA considered service standards in three broad areas: 1) incentive regulation; 2) aligning service standard reviews with price reviews; and 3) resources necessary to meet service standards. • Incentive regulation – The ERA considered whether service commitments could be refined to provide additional incentives to service providers to meet service standards. Submissions were invited on whether a stricter compensation regime should be implemented, such as through guaranteed service levels (GSL) and received no comments. – While the ERA makes no recommendations on the strengthening of incentives to meet service standards, it considers that this issue should be examined as part of any future review of service standards. • Aligning service standard reviews with price reviews – There is a lack of clarity regarding the process for reviewing service standards for the Water Corporation, Aqwest and Busselton Water. Service standards could be reviewed as part of the triennial review of their tariffs, such as this inquiry. Service standards are also regulated to some extent through the licensing process, with operational and asset management system audits taking place generally every two years. It may be appropriate to better align reviews of service standards with price reviews, since service standards provide the framework for expenditure requirements, and ultimately drive prices. – The ERA is of the view that there would be advantages in aligning the reviews of service standards to coincide with the three-yearly price reviews. • Resources necessary to meet service standards – Compliance with the terms and conditions of operating licences results in related costs. Prices should be set at a level sufficient to ensure that the legitimately incurred costs (for achieving the required levels of service) are recovered. – The most recent operational audits for the Water Corporation, Aqwest and Busselton Water show that each is compliant with the conditions of their respective operating licences. None of the service providers indicated a need for additional expenditure to improve on existing service standards on the basis of customer demands. – Introducing a code of conduct in the water services sector would bring the water sector in line with current arrangements in the electricity sector, where there is a code of conduct for small use customers, as well as formal regulations on codes of conduct and customer contracts, under the *Electricity Industry Act 2004*. In the gas sector, the *Compendium of Gas Customer Licence Conditions* (the *Gas Customer Code 2008*) provides consumer protection for gas customers commensurate with the code of conduct for the supply of electricity to small use customers. Similarly, the establishment of a Water Industry Ombudsman would reflect the arrangements currently in place in the electricity and gas sectors, which have an Energy Ombudsman.
2012 – Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board
For this inquiry the ERA did not undertake any specific consideration of service standards. Rather, service standards were considered in the following contexts. • Approach in determining tariffs / operating expenditure – An operating efficiency target has been adopted for the Water Corporation. Since the first water pricing inquiry in 2005, the ERA has recommended that the Water Corporation's tariffs be set in accordance with the assumption that it achieves an ongoing efficiency in real base operating costs per connection of 2.0 per cent per year. No specific efficiency target is

ERA Inquiry Recommendation(s)
applied to the operating expenditure of Aqwest and Busselton Water, but projected expenditure of these providers is reviewed as part of the price determination process. – In addition to base operating expenditure, the Water Corporation incurs "level of service" operating expenditure. Level of service operating expenditure is loosely defined as expenditure undertaken to improve the Water Corporation's service standards above a base level that existed in 2005 (the time of the first water pricing inquiry). There is no efficiency target applied to level of service operating expenditure. • Determining efficient costs of service provision – Identifying an efficient level of costs involves ensuring that a service provider incurs sufficient costs so as to be able to provide services to the required standard whilst also ensuring that costs are not excessive and unnecessary. – An efficient level of expenditure is one that enables the Water Corporation, Aqwest and Busselton Water to continue to meet service requirements whilst not unjustifiably burdening consumers.

Source: Economic Regulation Authority

Considering its previous inquires and recommendations, the ERA is of the view that overall performance of the water corporations continues to be satisfactory. Each of the water corporations is providing water services in accordance with the terms and conditions of its water licence. Given this, the ERA considers that the water corporations have the resources necessary to meet and maintain service standards at current levels, and that these resources are being appropriately allocated and represent an efficient use of costs.

In coming to this view, the ERA has considered the:

- water licensing regime and water service licence requirements applicable to each of the water corporations;
- *Water Services Code of Conduct* and the ERA's current review of this code;
- service standards performance data reported by each of the water corporations and other national performance data; and
- service standards of other water corporations within Australia.

Water licensing regime and licence requirements

The ERA administers the licensing scheme set out in the Western Australian *Water Services Act 2012* (the Water Act). Section 12 of the Water Act sets out the conditions of a licence. Specifically, licences may be subject to conditions that deal with:

- The quality and performance standards to be met by the licensee in the provision of a water service authorised by the licence (section 12(1)(a)).
- The licensee complying with specified standards or codes of practice, with specified modifications, other than a code of practice made under section 26 (section12(1)(c)).

As indicated above, section 26 of the Water Act allows for the relevant minister to introduce codes of practice that deal with any licence condition matters, including service standards. A code of practice, where introduced by the minister, can require a licensee that fails to meet a standard to pay a specified amount to any person affected by the failure. No such codes of practice currently exist.

Section 27 of the Water Act details provisions for the introduction of, and compliance with, a code of conduct that deals with the conduct of water licensees with respect to customers. The Water Act requires the relevant minister to make the initial code of conduct, which has occurred with the introduction of the *Water Services Code of Conduct (Customer Service Standards) 2013* (the Water Code).[244] While the Water Code applies to all licensees that provide a potable water supply service, sewerage service, irrigation service or drainage service, nothing in the code prevents a licensee and a customer from "contracting out" of the code requirements.[245]

The ERA has ongoing administrative responsibility for the Water Code.

The ERA's predecessor, the Office of Water Regulation, first issued water licences for the Water Corporation, Aqwest and Busselton Water in June 1996, January 1997 and October 1996 respectively,[246] which was around the time of corporatisation of the former government entities. All the water corporations are licensed, for their respective operating areas, to provide potable water supply services. In addition to potable water supply services, the Water Corporation is also licensed to provide non-potable water supply, sewerage, drainage, and irrigation services.

Clause 4.2 of each water licence contains the following general requirements relating to individual performance standards. The individual performance standards as specified in each of the licences for the water corporations are summarised in Table 80 (below). Further details, including the measurable target(s) for each performance standard, are provided under separate considerations for each water corporation elsewhere in this report.[247]

> 4.2 **Individual performance standards**
>
> 4.2.1 The licensee must comply with the individual performance standards as set out in Schedule [x].
>
> 4.2.2 The ERA may prescribe individual performance standards in relation to the licensee of its obligations under this licence or the applicable legislation.
>
> 4.2.3 Before approving any individual performance standards under this clause, the ERA will:
>
> (a) provide the licensee with a copy of the proposed individual performance standards;
>
> (b) allow 15 business days for the licensee to make submissions on the proposed individual performance standards; and
>
> (c) take into consideration those submissions.
>
> 4.2.4 Once approved by the ERA, the individual performance standards are included as additional terms and conditions to this licence as set out in Schedule [x].

[244] Refer Schedule 1, clause 11 of the Water Act ("*The Minister, instead of the Authority, must make the initial code of conduct under section 27 and is not required to consult the consultative committee referred to in section 28 in doing so.*").

[245] Section 4(2) of the Water Code. Section 5 (Contracting out) states that "nothing in this code prevents a licensee and a customer from entering into an agreement that varies or displaces the requirements of this code in relation to the licensee or customer".

[246] The water licence number, licence commencement / expiry dates for the Water Corporation, Aqwest and Busselton Water are as follows: Water Corporation: WL32, 28 June 1996 / 28 June 2021; Aqwest: WL2, 17 January 1997 / 17 January 2022; Busselton Water: WL3, 1 October 1996 / 1 October 2021.

[247] See section 3.6 of this report for the Water Corporation, section 4.6 for Aqwest and section 5.6 for Busselton Water.

Table 80 Individual performance standards of the water corporations as specified in their respective water licences

Water corporation / water licence	Individual performance standards
Water Corporation / WL32	**Potable Water** Potable water supply system – pressure and flow standards Potable water supply system – pressure and flow exemptions Water restrictions **Drainage** Drainage service standards **Irrigation** Irrigation service standards **Farmlands** Farmland areas water system standards
Aqwest / WL2	**Potable Water** Potable water supply system – pressure and flow standards Potable water supply system – pressure and flow exemptions Water restrictions
Busselton Water / WL3	**Potable Water** Potable water supply system – pressure and flow standards Potable water supply system – pressure and flow exemptions Water restrictions

Source: ERA, Water Services Licence: WL32 (version 15), WL2 (version 9), WL3 (version 8)

The ERA removed many of the service standards for water services and customer service provisions when it issued new versions of the licences under the Water Act in November 2013, consistent with the 2013 changes in the Water Act and the subsequent development of the Water Code. The Water Act repealed and replaced the *Water Services Licensing Act 1995* and allowed the introduction of the Water Code. The Water Act specifies that the purpose of the Water Code is to:[248]

> ...deal with the conduct of licensees in relation to customers and potential customers and, without limiting that, the [Water] [C]ode may deal with the following:
>
> - the marketing of water services;
> - the connection of water services to land;
> - the metering of water services;
> - the billing and payment for water services;
> - the provision of water services to customers in financial hardship;
> - the suspension of the provision of water services;
> - the provision of information to customers and others about water services;
> - complaints procedures.

The *initial* Water Code was made by the relevant minister, under Schedule 1 (clause 11) of the Water Act. Table 81 (below) provides a summary of the licence requirements prior to

[248] Section 27(3) of the Water Act.

and after the introduction of the Water Act and Water Code. As indicated, many of the service standards for customer service provisions have been removed from the licences. Many of these standards are now covered by provisions within the Water Code, which has established minimum customer service standards that the water corporations must comply with.

While no longer contained within the licences, other performance targets and measures (for example, telephone calls to the customer enquiry 1300 number) are still reported by the water corporations to achieve other reporting requirements. Such requirements include the ERA's annual water licence performance reporting requirements, where reportable (non-financial) data is used to prepare an annual water report that examines the performance of water licensees.[249] The water corporations are also required to report on various indicators under the National Water Initiative (**NWI**) Agreement, which allows the Bureau of Meteorology (**BoM**) to produce its urban national performance report.[250] The reporting and availability of service standard performance data is considered in more detail elsewhere in this chapter.

Table 81 Summary of old and new licence requirements

OLD licence requirements ***Water Services Licensing Act 1995***	**NEW licence requirements** ***Water Act and Water Code***
Water Corporation (WL32)	
Customer Provisions	
Customer Service Charter • The licensee must have in place a customer service charter that meets the ERA's review guidelines. • The licensee must set out in writing the terms, principles and conditions upon which it intends to provide water services to its customers. • It is a condition of the licence that services are provided consistent with the customer service charter.	The provision for *Customer Service Charter* has been removed from the licence. • The licensee is no longer required to have a customer charter. • Instead, the Water Code requires the licensee to have a financial hardship policy (clause 26).
Customer Complaints • The licensee must have in place a process for receiving, recording and resolving customer complaints within a timeframe of 15 business days.	The provision for *Customer Complaints* has been removed from the licence. Customer complaints is now covered by the Water Code, which requires the licensee to have a procedure for dealing with complaints about water services (clause 35).
Service and Performance Standards	
Customer Service Standards The licensee must answer telephone calls on the *"customer enquiry 13"* number and resolve complaints as follows.	The provisions for *Customer Service Standards* have been removed from the licence. • The licensee is still required to report on "telephone calls answered" under ERA

[249] Annual water, sewerage and irrigation performance reports are available from the ERA website at: https://www.erawa.com.au/water1/water-licensing/performance-reports

[250] The urban national performance report provides an annual, independent benchmark of pricing and service quality of Australian urban water utilities. Further information about this report and the NWI is available at: http://www.bom.gov.au/water/npr/.

<table>
<tr><th>OLD licence requirements
Water Services Licensing Act 1995</th><th>NEW licence requirements
Water Act and Water Code</th></tr>
<tr><td>
• For telephone calls answered: 70% of calls answered within 30 seconds.
• For abandoned telephone calls: no more than 5% of calls abandoned after 5 seconds.
• For complaints: 90% of complaints resolved within 15 business days.
</td><td>
annual performance reporting and National Water Initiative reporting requirements.
• The licensee is also required to report on “complaints” under ERA annual performance reporting requirements.
• The requirement for a complaints procedure and measurable performance target (of 90%) is now covered by the Water Code (clause 35).
</td></tr>
<tr><td>
Potable Water System – Pressure, Flow and Continuity
The licensee must maintain water pressure and flow standards as follows.
• For the Perth Metropolitan Area
<table>
<tr><th>Min Static Pressure</th><th>Max Static Pressure</th><th>Min Flow</th></tr>
<tr><td>15</td><td>100</td><td>20L / min</td></tr>
</table>
• For Country Urban Areas
<table>
<tr><th>Min Static Pressure</th><th>Max Static Pressure</th><th>Min Flow</th></tr>
<tr><td>13</td><td>100</td><td>20L / min</td></tr>
</table>
The licensee must maintain the continuity of water services as follows.
• For pressure and flow: in preceding 12 month period 99.8% of all potable water connected properties received the service standard above.
• For potable water interruptions to supply: in the preceding 12 month period 75% of all metropolitan and urban potable water connected properties wont experience an interruption to supply.
• For leaks and bursts: in the preceding 12 months there were fewer than 20 leaks or bursts per 100 km of main pipe.
</td><td>
“Minimum static pressure”, “maximum static pressure” and “minimum flow” performance targets have been retained within the licence for the Perth Metropolitan and Country Urban areas.
Other performance targets for the Potable Water System have been removed from the licence.
• The licensee is still required to report on pressure and flow performance – “% of connected properties supplied at pressure and flow standard” – under ERA annual performance reporting requirements.
• The licensee is still required to report on the “total number of water main breaks” under National Water Initiative reporting requirements.
</td></tr>
<tr><td>Farmland Areas Water System Standards – Agreement Conditions, Pressure and Flow</td><td></td></tr>
<tr><td>
Where services are provided by agreement to farms, the licensee must provide annual notifications to customers of the conditions under which the service is supplied as follows.
• In the preceding 12 month period, 95% of customers receiving these services were notified.
The licensee must ensure that customers have a water pressure and flow that meets the following standards.
• For farmland services supplied from specified water supplies:
</td><td>
The provisions for Farmland Areas Water System Standards have be retained in the licence.
The licensee is required to report on farmland area water services performance under ERA annual performance reporting requirements.
</td></tr>
</table>

<table>
<tr><th>OLD licence requirements
Water Services Licensing Act 1995</th><th>NEW licence requirements
Water Act and Water Code</th></tr>
<tr><td>
<table>
<tr><th>Min Static Pressure</th><th>Max Static Pressure</th><th>Min Flow</th></tr>
<tr><td>n/a</td><td>200</td><td>3kL / day per service</td></tr>
</table>
• For rural water supply schemes:
<table>
<tr><th>Min Static Pressure</th><th>Max Static Pressure</th><th>Min Flow</th></tr>
<tr><td>n/a</td><td>200</td><td>1.8kL / day per service</td></tr>
</table>
The licensee must ensure that in preceding 12 month period, 99.8% of customers have a water pressure and flow as listed above.
</td><td></td></tr>
<tr><td>Sewerage System Standards</td><td></td></tr>
<tr><td>The licensee must ensure that customers will not experience a sewage overflow on their property, which results from any failure of sewerage assets, as follows.
• For sewerage overflows: in preceding 12 month period, 99.8% of sewerage customers receive the standard.
• For sewer blockages: in the preceding 12 months there were fewer than 40 blockages per 100 km of main pipe.</td><td>The provisions for Sewerage System Standards have been removed from the licence.</td></tr>
<tr><td>Drains and Drainage Standards</td><td></td></tr>
<tr><td>The licensee must operate, manage, maintain, plan and construct drains and drainage schemes as follows, and shall consult in relation to such activities as required.
• Urban drainage scheme infrastructure provided by the licensee for protection against flooding shall be designed, constructed, operated and maintained such that the peak flows of stormwater runoff from rainfall events can be accepted into and will not overflow from the system in accordance with the following:
<table>
<tr><td>Drainage – design of new urban infrastructure</td><td>100% of schemes audited comply with standard</td></tr>
</table>
</td><td>The provisions for Drains and Drainage Standards have been retained in the licence.
Performance targets for flood protection works have been specified in the licence as follows.
• Flood protection works will be operated and maintained to cater for the peak flows of stormwater runoff from individual rainfall events set out below.
<table>
<tr><th>Protection Works</th><th>Location</th><th>Level of Protection*</th></tr>
<tr><td>Preston Rover Levees</td><td>Bunbury</td><td>1 in 100 year</td></tr>
<tr><td>Vase River Diversion</td><td>Busselton</td><td>1 in 20 year</td></tr>
<tr><td colspan="3">* average recurrence interval</td></tr>
</table>
</td></tr>
<tr><td>Services Provided by Agreement</td><td></td></tr>
<tr><td>Where advised of a change of customer/owner, the licensee must notify the new customer/owner (or their agent) of the conditions of supply that applied to the service as follows.
• For documented agreements: in the preceding 12 month period, 90% of services newly added to the scheme and provided by agreement in the sample areas audited had documented agreements.</td><td>The provisions for Services Provided by Agreement have been removed from the licence.</td></tr>
</table>

<table>
<tr><th>OLD licence requirements
Water Services Licensing Act 1995</th><th>NEW licence requirements
Water Act and Water Code</th></tr>
<tr><td></td><td>Irrigation</td></tr>
<tr><td></td><td>Provisions for Irrigation standards have been added to the licence.
The licensee must provide water that is suitable for irrigation and must provide at least 5 business days notice to a customer of any planned service interruption.
The licensee must comply with the following standards and principles.
<table><tr><th>Water Quality</th><th>Customers given 5 business days notice of disruption</th></tr><tr><td><1,200mg/L TDS</td><td>>90%</td></tr></table>
The licensee is required to report on irrigation performance under ERA annual performance reporting requirements.</td></tr>
<tr><td colspan="2">Aqwest (WL2) and Busselton Water (WL3)</td></tr>
<tr><td>Customer Provisions</td><td></td></tr>
<tr><td>Customer Service Charter
The licensee must have in place a customer service charter that meets the ERA’s review guidelines.
The licensee must set out in writing the terms, principles and conditions upon which it intends to provide water services to its customers.
It is a condition of the licence that services are provided consistent with the customer service charter.</td><td>The provision for Customer Service Charter has been removed from the licence.
The licensee is no longer required to have a customer charter.
Instead, the Water Code requires the licensee to have a financial hardship policy (clause 26).</td></tr>
<tr><td>Customer Complaints
The licensee must have in place a process for receiving, recording and resolving customer complaints within a timeframe of 15 business days.</td><td>The provision for Customer Complaints has been removed from the licence.
– Customer complaints is now covered by the Water Code, which requires the licensee to have a procedure for dealing with complaints about water services (clause 35).</td></tr>
<tr><td>Service and Performance Standards</td><td></td></tr>
<tr><td>Customer Service Standards – Emergency Response
The licensee must provide an emergency telephone advice system, such that customers only need to make one call to report an emergency and that the customers shall be advised of the nature and timing of action to be undertaken in accordance with the following standard.<table><tr><td>Telephone answering emergency response</td><td>90% of customers within 1 hour of reporting are advised of the nature and timing of the action to be undertaken by the licensee</td></tr></table></td><td>Provisions for Customer Service Standards (Emergency Response) have been removed from the licence.</td></tr>
</table>

<table>
<tr><th>OLD licence requirements
Water Services Licensing Act 1995</th><th>NEW licence requirements
Water Act and Water Code</th></tr>
<tr><td>Customer Service Standards – Customer Complaints
The licensee shall respond to customer complaints in accordance with the following standard:
90% of customer complaints are resolved within 15 business days.</td><td>The provision for Customer Service Standards (Customer Complaints) has been removed from the licence.
The requirement for a complaints procedure and measurable performance target (of 90% of complaints resolved within 15 business days) is now covered by the Water Code (clause 35).
The licensee is required to report on “complaints” under ERA annual performance reporting requirements.</td></tr>
<tr><td>Potable Water System – Pressure and flow
The licensee shall ensure connected customers have water pressure and flow that meet the following standards.<table><tr><th>Min Static Pressure</th><th>Max Static Pressure</th><th>Min Flow</th></tr><tr><td>15</td><td>100</td><td>20L / min</td></tr></table>Over each 12 month period at least 99.8% of connected customers have water pressure and flow is as listed above.</td><td>“Minimum static pressure”, “maximum static pressure” and “minimum flow” performance targets have been retained in the licence.
Other performance targets for the Potable Water System have been removed from the licence.
The licensee is still required to report on pressure and flow performance – “% of connected properties supplied at pressure and flow standard” – under ERA annual performance reporting requirements.</td></tr>
<tr><td>Potable Water System – Continuity
The licensee shall make every endeavor to meet the following continuity of supply standard.
Over each 12 month period at least 75% of connected properties shall not experience a complete interruption of supply (no flow) exceeding 1 hour to the supply standard set out in the licence.</td><td>The provision for the Potable Water System (Continuity) has been removed from the licence.</td></tr>
</table>

Source: Water Corporation Licence: WL32 (version 10, 18/09-2013 and version 15, 19/07-2016)
Aqwest Licence: WL2 (version OL7, 28/08-2013 and version 9, 01/07-2016)
Busselton Water Licence: WL3 (version OL3, 06/04-2009 and version 8, 01/07-2016)

In developing the Water Code, the Department of Water established a working group (the Water Services Customer Code Working Group or “**Code Working Group**”) consisting of water service providers, customer and government agency representatives.[251] The Code Working Group released a discussion paper for public consultation,[252] prior to preparing a final report and proposed code provisions for consideration by the relevant minister. The establishment of a working group (or committee) and preparation of any report(s) to the minister are not required under the Water Act, for the minister to make the *initial* Water Code – the initial code is essentially made by the minister at their discretion. The ERA

[251] Representatives included: Water Corporation; Busselton Water; Aqwest; Western Australian Local Government Association; Western Australian Council of Social Service; Consumers Association of Western Australia; Tenants Advice Service; and Department of Housing. The ERA was an observer on the working group.

[252] Department of Water, *The Water Services Customer Code: Discussion paper for public comment*, September 2012.

understands that the Water Code currently in force, and made by the relevant minister, does not incorporate the code provisions as originally suggested by the Code Working Group.

Considering the old and new licencing regimes, the ERA notes the Water Code has replaced the old "customer provisions" that were originally within schedule 3 of the licence, as well as "other service provisions" that were originally within schedule 6.[253] Conversely, the ERA notes that some old licence requirements are not covered by the Water Code, but continue to be specified within a schedule to the licence. These "missing" requirements appear to be requirements that are:

- more technical in nature and not principally focused on elements of customer service (for example, the requirement to meet minimum/maximum static pressure and water flow rates); and/or
- specific in nature to the individual planning and operating circumstances of water licensees (for example, drains and drainage requirements are applicable only to licensees that provide drainage services).

The ERA further notes that there are only two explicitly set "minimum performance standards" within the Water Code with measurable targets. These concern water supply connections (clause 8) and the restoration of water supply (clause 34).

8. Minimum performance standards for standard water supply connections

(1) In this clause —

connection means a connection of a metered water supply service to an existing main comprising 20 mm water supply pipes.

(2) A connection must be completed before the end of the period of 10 business days starting on the day on which both of these things have been complied with —

(a) the customer has done, or complied with, all the things that the customer must do and comply with before a connection is made;

(b) the fees that apply in relation to the connection have been paid.

(3) Subclause (2) does not apply if the licensee and customer expressly agree otherwise.

(4) A licensee must ensure that there is a 90% compliance rate with subclause (2) in any 12 month period ending on 30 June.

…

34. Minimum performance standards for restoration of water supply

(1) In this clause —

metropolitan region means the region described in the Planning and Development Act 2005 Schedule 3;

restoration event means—

(a) payment under clause 30(1)(a); or

(b) entering into an arrangement under clause 30(1)(b); or

(c) the licensee being satisfied under clause 30(2).

[253] Old 'customer provisions' covered provisions relating to service charters, complaints, contracts and surveys. 'Other service provisions' covered the availability and connection of a water service.

(2) If the licensee is the Water Corporation and the land is in the metropolitan region, the Water Corporation must restore a water supply—

(a) if the restoration event occurs before 3 p.m. on a business day, by the next business day; or

(b) if the restoration event occurs at any other time, within the next 2 business days, unless the licensee and customer expressly agree otherwise.

(3) If the licensee is the Water Corporation and the land is outside the metropolitan region, the Water Corporation must restore a water supply—

(a) if the restoration event occurs before 3 p.m. on a business day, within the next 2 business days; and

(b) if the restoration event occurs at any other time, within the next 3 business days,

unless the licensee and customer expressly agree otherwise.

(4) A licensee other than the Water Corporation must restore a water supply—

(a) if the restoration event occurs before 3 p.m. on a business day, by the next business day; and

(b) if the restoration event occurs at any other time, within the next 2 business days, unless the licensee and customer expressly agree otherwise.

(5) The Water Corporation must ensure that there is a 90% compliance rate with both of subclauses (2) and (3) in any 12 month period ending on 30 June.

(6) A licensee other than the Water Corporation must ensure that there is a 90% compliance rate with subclause (4) in any 12 month period ending on 30 June.

The ERA considers the minimum service standard requirements within the Water Code and individual water licences are such that the water corporations should not require any additional resources above current resource levels to meet the requirements. The ERA comes to this view based on a conclusion that the current services standard requirements are at least the same, if not less, than previous requirements.

ERA review of the Water Code

As indicated, section 27 of Water Act provides for the introduction of a code of conduct that water licensees must comply with. Hence, any changes to the code will directly affect the water corporations. As noted above, the initial code of conduct – the Water Code – was made by the relevant minister and is to be reviewed by the ERA at least once every five years. The ERA began its first review of the Water Code in July 2016. A consultation paper was published in October 2016, with the consultation period closing in November 2016.

The ERA's consultation paper included a number of proposals to add new provisions and amend or delete existing provisions of the Water Code. For example, the paper included proposals to require licensees to send reminder and restriction notices to customers and for licensees to advise customers at least 48 hours in advance of a planned interruption. The paper also sought comment on a number of questions, including whether a guaranteed service level (**GSL**) scheme should be introduced. Under a GSL scheme licensees would have to make a service standard payment to customers if certain service standards were

not met. The ERA noted that such payments were contemplated by the Water Act and Water Code.[254]

> Section 27(5), in conjunction with section 26(4), of the Water Act states that the Water Code may provide that if a licensee fails to meet a standard, the licensee must pay a specified amount to any person affected by the failure who comes within a specified description. These type of payments are commonly referred to as "service standard payments" or "guaranteed service level rebates".
>
> The Water Code currently does not prescribe any service standard payments.
>
> Electricity licensees in WA, and Victorian and ACT water licensees must make such payments. Service standard payments for Victorian water licensees differ per licensee, and only apply to urban water licensees.

The most common service standard payments that apply within Victoria and the ACT concern the service standard areas listed below. The associated payments, for failing to meet these service standards, range from $20 (for failing to respond to a complaint within 20 business days) to $1,000 (for failing to contain a sewage spill within a specified number of hours once notified).

- Customer connection times
- Responding to complaints
- Planned and unplanned interruptions
- Spills
- Restriction of water supply

Further to considering the merits of introducing a GSL scheme and associated payments, the ERA also considered the administration, implementation and timing requirements for introducing such payments (if they are to be introduced). Four service standard payments were proposed:

- $20 for failing to resolve a complaint within 15 business days;
- $20 for failing to give notice of a planned interruption;
- $50 for failing to restore a water supply to an affected property within 12 hours; and
- $60 per day (maximum $300) for failing to comply with the procedures required before reducing a customer's water supply.

The consultation paper sought comments to the following specific questions.

- Should service standard payments be introduced into the Water Code?
- If so, which service standard payments should be included in the Water Code?
- Should licensees be given until 1 July 2018 to implement those service standard payments?
- Should licensees only be required to make payment upon application by an eligible customer?
- Should licensees be required to advise their customers at least once a year of the service standard payments available?

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[254] Economic Regulation Authority, *Consultation Paper: 2016-17 Review of the Water Services Code of Conduct (Customer Service Standards) 2013*, 13 October 2016, p. 57.

A number of submissions made in response to the ERA's consultation paper commented directly on the questions above, including submissions from the Water Corporation, Aqwest and Busselton Water.[255] In summary, all three water corporations did not support the introduction of service standard payments into the Water Code.

The ERA expects to publish, for further consultation, a draft decision and recommended draft amendments to the Water Code. A final decision and associated Water Code amendments are expected by December 2017, however, the amended Water Code would not come into effect until sometime later.[256] Changes to the service standards within the Water Code are expected to affect the costs incurred in the provision of water services. The ERA will take this into consideration as part of this inquiry.

Service standard performance data

As indicated, many of the performance targets and measures originally contained within the water licences (under the old licensing regime) are still reported by the water corporations under other reporting requirements, including:

- the ERA's annual water licence performance reporting requirements; and
- the Bureau of Meteorology's annual national performance reporting requirements.

ERA compliance and performance reporting

The ERA's *Water Compliance Reporting Manual* requires water licensees to confidentiality report on their compliance with the terms and conditions of their licence for each year ending 30 June.[257] Sections 9 and 11 of the manual summarise the licence compliance requirements applicable to each licence under the Water Act and Water Code respectively. Compliance requirements concerning minimum service standards for the provision of water services and customer service provisions, with measurable targets, are reproduced in Table 82 (below).

Along with reporting on compliance with the terms and conditions of licences, water licensees must also have their asset management system independently reviewed and an independent operational audit conducted at least every two years. The asset management review aims to independently assess the effectiveness of the licensees' asset management system, which sets out the measures that will be taken to properly maintain the assets used in providing licenced water services. The operational audit aims to independently assess the effectiveness of measures taken by the licensee to meet the performance standards required and verify actual compliance with licence requirements.

The results of individual asset management reviews and operational audits for the water corporations are discussed under separate considerations for each water corporation elsewhere in this report.[258] In summary, the water corporations are all operating in accordance with individual licence requirements, including the individual performance standards set within the licence schedules.

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[255] Submissions to the ERA's consultation paper are available on the ERA's website at: https://www.erawa.com.au/water1/water-licensing/water-services-code-of-conduct-customer-service-standards-2013-2016-2017-code-review.

[256] It is anticipated that the amended Water Code will not come into effect until 1 July 2018.

[257] Economic Regulation Authority, *Water Compliance Reporting Manual*, July 2016.

[258] See section 3.6 of this report for the Water Corporation, section 4.6 for Aqwest and section 5.6 for Busselton Water.

Table 82 Summary of service standard compliance requirements under the Water Act and Water Code

Obligation	Summary of obligation
Obligations under the Water Services Act 2012	
Section 26(3)	The licensee must comply with each code of practice made by the Minister to the extent to which it applies to the licensee. *Note: no such codes of practice currently exist*
Section 27	The licensee must comply with the code of conduct that may be made by the ERA to the extent to which it applies to the licensee and is not inconsistent with the licence. *Note: the initial code of conduct is to be made by the Minister*
Obligations under the Water Services Code of Conduct (Customer Service Standards) 2013	
Clause 8	The licensee must ensure that, in any 12 month period, 90% of connections are completed before the end of 10 business days, starting on the day on which the customer has paid the relevant fees and complied with the relevant requirements.
Clause 34(2)	The Water Corporation must restore a water supply to land in the metropolitan region within the specified timeframe, unless the licensee and customer expressly agree otherwise.
Clause 34(3)	The Water Corporation must restore a water supply to land outside the metropolitan region within the specified timeframe, unless the licensee and customer expressly agree otherwise.
Clause 34(4)	The licensee (other than the Water Corporation) must restore a water supply to land within the specified timeframe, unless the licensee and customer expressly agree otherwise.
Clause 34(5)	The Water Corporation must ensure that there is a 90% compliance rate with clauses 34(2) and 34(3) in any 12 month period ending on 30 June.
Clause 34(6)	The licensee (other than the Water Corporation) must ensure that there is a 90% compliance rate with clause 34(4) in any 12 month period ending on 30 June.

Source: Economic Regulation Authority, Water Compliance Reporting Manual, July 2016

In addition to the compliance reporting above, water licensees are required to provide the ERA with non-financial performance data, as set out in the *Water, Sewerage and Irrigation Licence Performance Reporting Handbook*.[259] This reporting requirement is made under

[259] Economic Regulation Authority, *Water, Sewerage and Irrigation Licence Reporting Handbook*, April 2016.

section 12 of the Water Act.[260] The performance data is used by the ERA for monitoring and reporting purposes and the preparation of an annual water, sewerage and irrigation report that examines the performance of water licensees. Where licensees are captured by the "urban framework" (outlined below) the reporting requirements are aligned with this framework.

National water initiative performance reporting

Under the NWI agreement[261], Australian water utilities that are captured under the "urban framework"[262] are required to report on various indicators, which the BoM uses to produce annual national performance reports that benchmark the performance of Australian water utilities. The Water Corporation, Aqwest and Busselton Water are all captured under the urban framework.

The reported indicators include water resource supply and usage, financial operations, bills and pricing, assets, water quality compliance and customer performance. Appendix D of the national performance report for 2015-16 details the complete set of reportable urban performance indicators.[263] This report is available from the BoM's website.

Customer views

The pricing approach taken by the Victorian Essential Services Commission (**ESC**) for its current water price review presents an alternative way for setting water prices (see Box 3 below). The ESC's approach encompasses a framework which requires water businesses to prepare their water pricing proposals *"in terms that reflect the outcomes they will be delivering to their customers"*.[264] Determining and delivering the most valued customer outcomes, and setting standards appropriate to these outcomes, can assist in determining the legitimate costs of a water business and the setting of efficient water charges.

A review of, and the provision of guidance on, existing service standards applicable to the water industry is beyond the scope of this inquiry. Any such review would need to be comprehensive and involve representation from all key water industry stakeholders, including customers.

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[260] Under section 12 of the Water Act the ERA may determine licence terms and conditions, including requiring a licensee to provide specified information. The ERA has included in each water services licence specific clauses dealing with the provision of information, including for licensees to provide the ERA with the data required for performance reporting purposes that is specified in the *Water, Sewerage and Irrigation Licence Performance Reporting Handbook*.

[261] The NWI agreement was established and signed at the 25 June 2004 COAG meeting by all State/Territory governments (Tasmania subsequently signed in 2005, and Western Australia in 2006) and was overseen by the National Water Commission (NWC). The NWC was abolished in June 2015. The BoM now oversees the collection of NWI performance indicator data to continue the publication of national performance reports for the urban water sector. Archived information from the NWC is available at: http://www.nwc.gov.au/nwi.

[262] The urban framework comprises a handbook with performance indicators and definitions. The urban framework captures all urban water service providers, that service 10,000 or more connected properties. In Western Australia, this covers: Aqwest (water only); Busselton Water (water only); City of Kalgoorlie-Boulder (sewerage only); and the Water Corporation (water and sewerage).

[263] Bureau of Meteorology, *National performance report 2015-16: urban water utilities, part A (Appendix D Urban performance indicators)*, March 2017. The report is available at http://www.bom.gov.au/water/npr/index.shtml.

[264] Essential Services Commission, *Water Pricing Framework and Approach: Implementing PREMO from 2018*, October 2016.

Box 3 – Victorian 2018 Water Price Review

The ESC has commenced its most recent review to establish maximum prices for water and sewerage services for 17 Victorian water corporations.[265] The review covers the regulatory period from 1 July 2018. In preparation for this review, the ESC released a water pricing framework and approach paper that describes the elements of the water pricing approach and the information that each water corporation must provide in its price submission.[266]

The approach ("PREMO") follows a separate review that commenced in April 2015 after the Victorian Government revised the Water Industry Regulation Order to give the ESC greater discretion to decide on the manner, approach and method (pricing approach) used to set prices and service outcomes for Victorian water and sewerage customers. PREMO aims to address limitations of the original (previous) pricing framework and approach.

> *Businesses have had limited incentives to be accountable to customers for delivering on their service commitments. While service standards and performance reporting have been central features of the pricing approach, there have been no material consequences for water businesses that don't achieve the standards to which they commit.*

The new framework requires the water corporations to prepare their price submissions to focus on customer outcomes that it proposes to deliver.

> *A set of outcomes focused on what the water business will deliver to its customers will effectively replace the previous core 'service standards' encapsulated in the Commission's Customer Service Code. These service standards are a mostly generic set of KPI metrics, for which each business sets its own performance targets for each year of the pricing period, with little stewardship or accountability for meeting these performance targets. The suite of service standards does not directly reflect the customer experience, nor provide an aggregate indication of good or poor service. However, the existing service standards do serve as a comparative measure of performance for specific metrics for each business from year to year, and also across businesses each year, and to this end will remain as part of the Commission's comparative performance reporting program.*

The ESC requires all water corporations to implement a guaranteed service level (GSL) scheme.

> *A GSL scheme provides incentives for water businesses to make efficient investment decisions, or internalise the costs of making investment decisions that leave some customers with poor service outcomes. It also provides a form of recognition that an individual customer has received relatively poor levels of service.*
>
> *Where businesses do not meet certain defined service standards, they pay (or rebate) a pre-determined amount to affected customers.*
>
> *GSLs should reflect the most important service outcomes identified by customers. The customer engagement process should identify the specific services to be guaranteed, the appropriate service level, and the payment or rebate amount. A business may set itself higher GSL payments as a stronger incentive to deliver its proposed customer outcomes.*
>
> *The Commission may also mandate specific GSLs to be included in a business's GSL scheme.*

The ESC has since published a further guidance paper, which sets out the ESC's detailed approach to the price review and information requirements for price submissions.[267] The guidance paper specifies the criteria that a GSL scheme must achieve.

> *A GSL scheme will:*
>
> - *reflect the main service priorities and concerns of customers, informed by a water business's customer engagement*
> - *provide incentives for the business to provide efficient service levels to all customers.*

[265] The water corporations include: Barwon Water, Central Highlands Water, City West Water, Coliban Water, East Gippsland Water, Gippsland Water, Goulburn Valley Water, Grampians Wimmera Mallee Water (GWMWater), Lower Murray Water, North East Water, South East Water, South Gippsland Water, Southern Rural Water, Wannon Water, Western Water, Westernport Water and Yarra Valley Water.

[266] Essential Services Commission, *Water Pricing Framework and Approach: Implementing PREMO from 2018*, October 2016.

[267] Essential Services Commission, *2018 Water Price Review, Guidance Paper*, November 2016.

Each GSL must be objectively defined, easily understandable, and able to be reported.

The GSL scheme must include the payment difficulty information disclosure GSL that has been in place since 2010. That is, a payment or rebate will be made available to customers if a business breached its service level obligation by:

"Restricting the water supply of, or taking legal action against, a residential customer prior to taking reasonable endeavours to contact the customer and provide information about help that is available if the customer is experiencing difficulties paying."

The ESC requires pricing submissions to be lodged by 29 September 2017.

The ERA considers any changes to service standards for the water industry in Western Australia should also focus on delivering and achieving customer outcomes that have been determined with customer input. Such input will help to ensure service standards reflect the services and outcomes most valued by customers and are a true driver of a water business's costs and ultimately the prices customers pay. The ERA notes the Water Corporation is currently looking to better understand its customers and the things they value through its customer engagement project – *Tap-In*.

Conclusions

Having considered the performance data available, the ERA considers the overall performance of each of the water corporations to be satisfactory. The ERA is satisfied that each are providing their water services in accordance with the terms and conditions of their respective licences, including set service standards.

Any changes to service standards that result in the water corporations being required to provide services at a higher level and/or meet new service standards will affect the costs incurred in the provision of water services. The ERA considers, as in past inquiries, that the costs related to changes to service standards should not be predicted. Rather, such costs should be considered if, and when, they arise. The ERA believes its approach to managing material variations (see appendix 11) will enable the water corporations to adjust their resourcing (costs) to meet any changes in service standards.

As indicated, the ERA is currently undertaking its first review of the Water Code where the introduction of service standard payments has been raised. While water corporations did not generally support the introduction of such payments, the Department of Water did indicate support.[268] The ERA is currently preparing a draft decision and recommended code amendments for further consultation.

The service standards established under the Water Code are expected to change. As with changes to existing service standards within water licences, any changes to the standards within the Water Code will affect the costs incurred in the provision of water services. Again, the ERA considers its approach to managing material variations will enable the water corporations to make adjustments to their costs to meet any service standard changes within the Water Code.

[268] Public submissions in response to the ERA's Water Code consultation paper are available from the ERA website at: https://www.erawa.com.au/water1/water-licensing/water-services-code-of-conduct-customer-service-standards-2013-2016-2017-code-review.

Environmental and health regulations

The ERA is required to consider the water corporations' efficient costs of providing services, including with reference to the impact of environmental and health regulations on efficient costs.

In its previous inquiries, the ERA did not separately consider the effects of environmental and health regulations on the efficient costs of the water corporations. Rather, these effects were considered as part of the ERA's assessment of service standards that were applicable to the water corporations at the time. The ERA's previous recommendations concerning its assessment of service standards are summarised in Table 79 (above). Some of these recommendations are about environmental and health outcomes. Further recommendations, specific to the costs of environmental impacts and water resource management activities, are reproduced in Table 83.

Table 83 Final recommendations of previous ERA water inquiries relating to environmental and/or health regulations

ERA Inquiry Recommendation(s)
2004 – Inquiry on Urban Water and Wastewater Pricing
All water corporations • The costs of environmental impacts caused by provision of water and wastewater services is appropriately passed through to water users through the imposition of regulatory requirements and standards on the water businesses and the inclusion of the costs of meeting these requirements and standards in the cost forecasts for service provision. [Recommendation 11] • Recovery from water users of the costs of the water resource management activities of the Department of Environment is ultimately a matter for determination by the State Government. In the event that the Government determines that such costs should be recovered from water users, attention should be given to the efficiency and equity considerations of different mechanisms for recovery of these costs from water users in different regions of the State. [Recommendation 12]
2008 – Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water,
No additional recommendations.
2012 – Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board
No additional recommendations.

Source: Economic Regulation Authority

The ERA considers the effects of environmental and health regulations on efficient costs to be varied. The current and ongoing work of the Western Australian State Government to review, consolidate and simplify water resource management legislation (administered by the Department of Water) and public health legislation (administered by the Health Department of Western Australia) should have a positive effect on the efficient costs of the water corporations. Any changes made to consolidate and simplify legislative requirements should result in efficiency gains, with resources being better aligned and allocated. Overall, the health regulations, and the water corporations' understanding of their obligations concerning these regulations, appears to be well established. In particular, the *Memorandum of Understanding for drinking water* (**MOU**) between the Department of

Health and each of the water corporations appears to be an effective and efficient way to meet the *Australian Drinking Water Guidelines*.[269]

The ERA considers that there may be some negative effects on the efficient costs of the water corporations arising from environmental regulations. Unlike health regulations, the regulations for environmental outcomes are somewhat unclear. There is no MOU approach established for outlining and assisting compliance with environmental regulations. Such an approach may be worthwhile to simplify regulatory requirements, which may assist with efficiency gains by having resources better aligned and allocated to meet agreed environmental outcomes. The ERA considers any improvements to simplify environmental regulations will help the water corporations to improve their cost efficiency.

The ERA cannot quantify the effects of environmental and health regulations on the efficient costs of the water corporations because of limited information. The water corporations are unable to provide the ERA with sufficient information to accurately quantify such effects. Absent this information, the ERA has focused its considerations on the procedures and processes in place to meet and maintain environmental and health regulations and whether this represents and efficient use of resources.

The ERA considered the following matters.

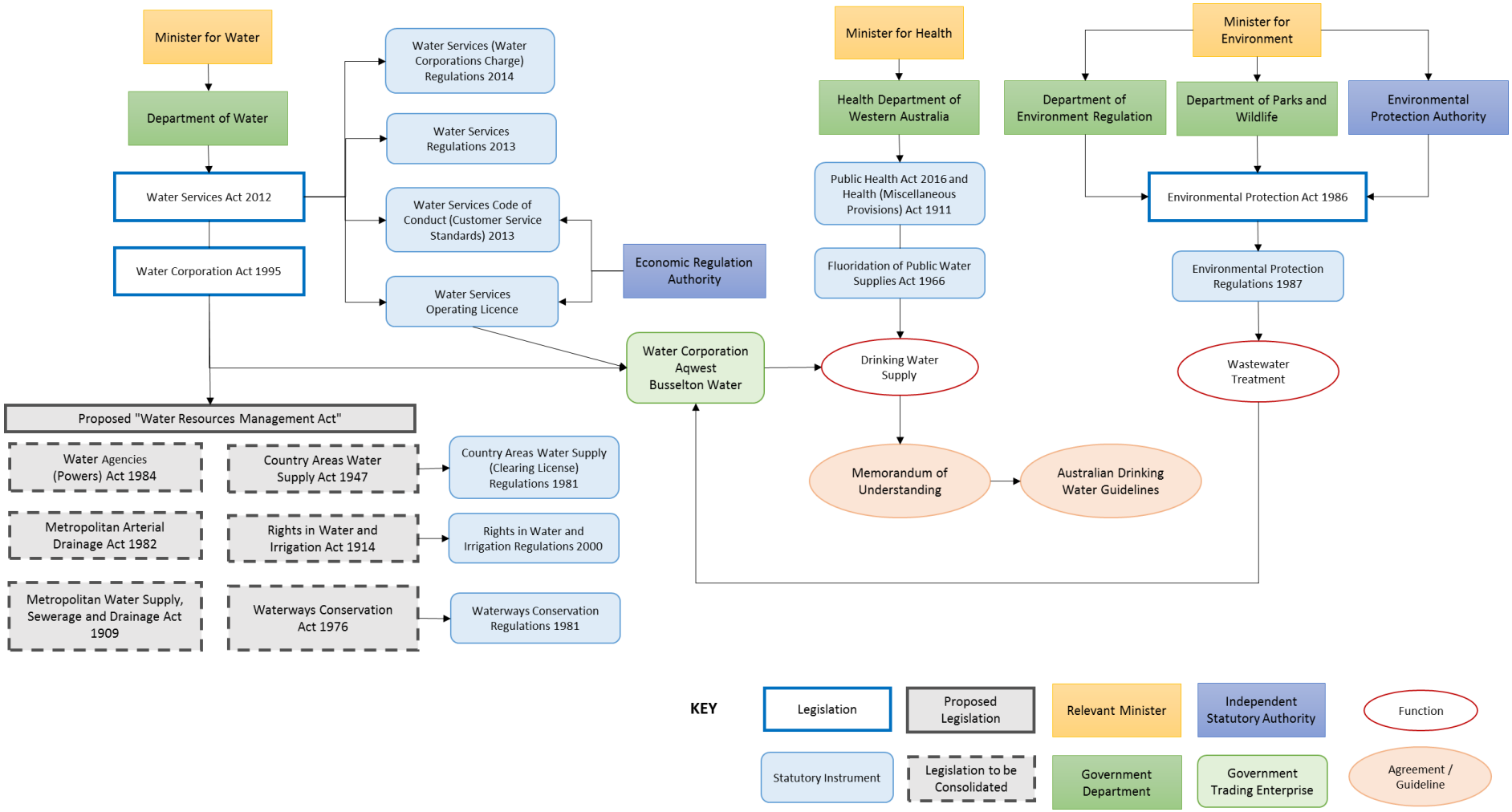
- The legislative framework for environmental and health regulations, and the agencies involved.
- The key health and environmental regulations that the water corporations are required to meet.

Legislative framework and agencies

The environmental and health regulatory frameworks relevant to the water industry in Western Australia are comprehensive and complex. Figure 67 (below) provides an overview of the key legislation and administering agencies.

[269] Natural Resource Management Ministerial Council, *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy (Version 3.3 Updated November 2016)*, 2011.

Figure 67 Key legislation and administering agencies relevant to environmental and health regulations within the water industry



Source: Economic Regulation Authority

Water Corporations Act

The *Water Corporations Act 1995* is administered by the Department of Water on behalf of the Minister for Water. The Corporations Act establishes each of the water corporations.

Water Services Act

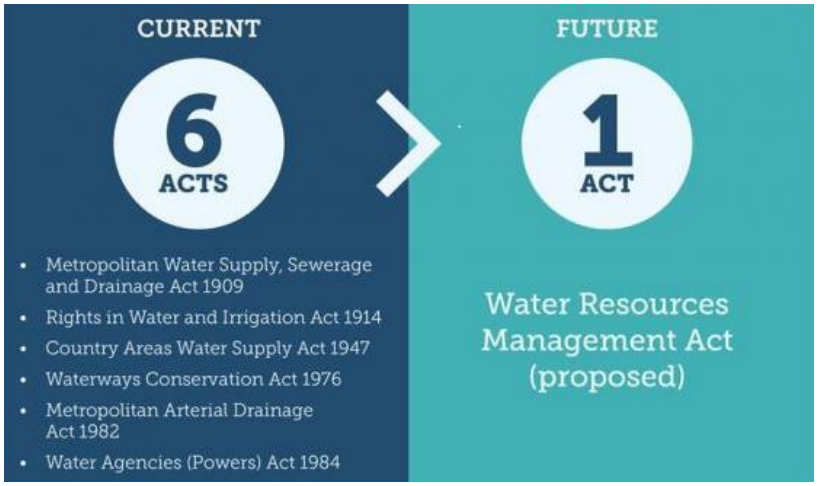
The *Water Services Act 2012* (**Water Act**) consolidates legislative provisions that were previously distributed across nine separate Acts.[270] It is administered by the Department of Water on behalf of the Minister for Water.

The ERA administers the licensing scheme set out in the Water Act. The water licences issued by the ERA include conditions for water service providers to comply with relevant legislation and performance standards (as previously discussed in this appendix). In addition, water service providers that are licenced to supply potable water services must enter into a MOU with the Department of Health. The MOU's primary purpose is to establish a legally binding document for managing drinking water quality in Western Australia.

Water Resources Management Act

Water resource management within Western Australia is currently managed under six different Acts, which are administered by the Department of Water on behalf of the Minister for Water. Additional legislative reforms to streamline and better manage Western Australia's water resources are underway. In February 2015, the State Government approved drafting of the *Water Resources Management Bill*, which will consolidate legislation for water resource management into one Act (Figure 68).[271]

Figure 68 Reform of water resources management legislation



Source: Department of Water

Under the current legislative framework, public drinking water source areas, including water reserves and catchment areas, within Western Australia are proclaimed under the Metropolitan Water Supply, Sewerage and Drainage Act 1909 and Country Areas Water Supply Act 1947. There are 155 proclaimed water source areas within the State, with 33 of

[270] Department of Water, *"Water services legislation"* available at: http://water.wa.gov.au/legislation/current-legislation/water-services-legislation.

[271] Department of Water, *"New water resources management legislation"* available at: http://water.wa.gov.au/legislation/water/water-resource-management-legislation.

these areas delegated to the Water Corporation. The management of these proclaimed source areas is overseen by the Department of Water. As part of its management, the Department of Water develops drinking water source protection reports for each of the source areas, which are published on the Department's website.

The ERA understands that the proposed Water Resources Management Act will include provisions for the management of water resources, including water catchments, and that the Department of Water will continue to be the lead agency responsible for overseeing the legislation. Other agencies, such as the Department of Environment Regulation, may have specific responsibilities under the legislation.

Public Health Act

Public health legislation in Western Australia has undergone significant reform, with the passing of the *Public Health Act 2016* and supporting *Public Health (Consequential Provisions) Act 2016* (**"Health Acts"**). The Department of Health administers the Health Acts on behalf of the Minster for Health. When fully legislated, the Health Acts will repeal the previous *Health Act 1911*.

The transition process to from the old to new legislative framework for public health will be implemented in five stages over the next three to five years. The development of new regulations for environmental health matters, including water, will commence in the final stage (Stage 5). Until Stage 5 is implemented, health regulation of water will be covered by the framework of the *Health (Miscellaneous Provisions) Act 2011*.[272] Any changes to environmental health regulations may affect the current MOU arrangements between the water corporations and the Department of Health.

Fluoridation of Public Water Supplies Act

Drinking water supplies within Western Australia can only be fluoridated by direction from the Minister for Health, in accordance with the *Fluoridation of Public Water Supplies Act 1966* (**Fluoridation Act**). Under the Act, the Minister for Health can only make such a direction on the advice of the Fluoridation of Public Water Supplies Advisory Committee, which is a statutory committee established under the Fluoridation Act. A function of the Committee is to consider, advise and make recommendations to the Minister for Health about any proposal to add fluoride to any public water supply.[273]

Environmental Protection Act

Parts of the *Environmental Protection Act 1986* are administered by the Department of Environment Regulation on behalf of the Minister for Environment.[274] The Department has three service delivery areas that cover environmental regulation, environmental policy and

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[272] *Department of Health, 'About the Public Health Act',* [website], 2017, http://ww2.health.wa.gov.au/Improving-WA-Health/Public-health/Public-Health-Act (accessed 15 May 2017).

[273] *Department of Health, 'Fluoridation',* [website], 2017, http://ww2.health.wa.gov.au/Articles/F_I/Fluoridation (accessed 15 May 2017).

[274] The Western Australian Government announced that the Department of Environment Regulation will be amalgamated with the Department of Water and the Office of the Environment Protection Authority to create a new Department of Water and Environmental Regulation. New departments will begin to come into effect on 1 July 2017 (see Government of Western Australia, *Public Sector Renewal*, 28 April 2017).

waste strategies. In relation to water services, the Department grants work approvals and licences for wastewater treatment plants.[275]

The Environmental Protection Authority (**EPA**) also administers some provisions of the Environmental Protection Act. The EPA conducts environmental impact assessments, initiates measures to protect the environment and provides independent advice to the State Government on environmental matters. While the EPA makes recommendations to the Minister for Environment, it is the Minister who decides (in consultation with other Ministers) whether a proposal that has been assessed by the EPA should be allowed to proceed, and if so, under what conditions.

The Office of the Environmental Protection Authority (**OEPA**) assists the EPA in conducting environmental impact assessments and developing polices to protect the environment. The OEPA is accountable to both the Minister for Environment and the EPA.[276]

In addition to the Department of Environment Regulation and the EPA, the Department of Parks and Wildlife has a role under the Environmental Protection Act for wetlands. While the Department of Parks and Wildlife provides advice to relevant decision making bodies and conducts wetland research and monitoring, the Department of Water remains the lead agency for managing most waterways, estuaries and associated policy.[277]

Key health and environmental regulations

For the purpose of this current inquiry, the ERA has focused on the key health and environmental regulations administered by the Department of Health for drinking water and the Department of Environment Regulation for wastewater treatment. The ERA considers these regulations are most likely to affect the efficient costs of the water corporations because they affect the primary water services provided by the water corporations. That is, the provision of potable (drinking) water and wastewater services.

Health regulations for drinking water

Memorandum of Understanding

As indicated, the water licences issued by the ERA contain a standard requirement for licensees that provide potable water services to enter into a MOU with the Department of Health. The primary purpose of the MOU is to establish a legally binding document for managing drinking water quality in Western Australia. The MOU allows the Department of Health to impose health requirements on the water corporations, including that the water corporations demonstrate compliance with the *Australian Drinking Water Guidelines* (**ADWG**), and that compliance is independently audited at intervals agreed between the water corporations and the Department of Health.

An overview of the ADWG is provided in Box 4. The MOU signed by each of the water corporations reflects the framework for drinking water quality contained within the ADWG. This framework contains 12 guiding elements that are considered good practice for the management of drinking water.

[275] See the Department of Environment Regulation's website at www.der.wa.gov.au.

[276] See the Environmental Protection Authority's website at www.epa.wa.gov.au.

[277] See the Department of Parks and Wildlife's website at https://www.dpaw.wa.gov.au/.

Box 4 – What are the Australian Drinking Water Guidelines?

The *Australian Water Drinking Guidelines* (**AWDG**) provide a framework for good management of drinking water supplies that seek to assure safety at point of use. The AWDG contain 12 elements that are considered good practice for the management of drinking supplies.

- Element 1 – Commitment to drinking water quality management
- Element 2 – Assessment of the drinking water supply system
- Element 3 – Preventative measures for drinking water quality management
- Element 4 – Operational procedures and process control
- Element 5 – Verification of drinking water quality
- Element 6 – Management of incidents and emergencies
- Element 7 – Employee awareness and training
- Element 8 – Community involvement and awareness
- Element 9 – Research and development
- Element 10 – Documentation and reporting
- Element 11 – Evaluation and audit
- Element 12 – Review and continual improvement

The AWDG have been developed after consideration of the best available scientific evidence. They are designed to provide an authoritative reference on what defines safe, good quality water, how it can be achieved and how it can be assured. The AWDG are concerned both with safety from a health point of view and with aesthetic quality.

The AWDG are intended for use by the Australian community and all agencies with responsibilities associated with the supply of drinking water, including catchment and water resource managers, drinking water suppliers, water regulators and health authorities.

The AWDG provide the authoritative Australian reference for use within Australia's administrative and legislative framework to ensure accountability of drinking water suppliers and state and territory health authorities. The Guidelines are not, however, mandatory legally enforceable standards.

Source: National Health and Medical Research Council, Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy, 2011.

Reflecting on discussions held with each of the water corporations, the ERA considers that the MOU is an effective approach to ensure health regulations for drinking water are met. The ERA understands that the MOU works well in its current form. In part, this is because there is flexibility within the MOU that allows the water corporations to work with the Department of Health to achieve the required outcomes. This flexibility assists in the appropriate and effective allocation of resources to meet regulatory requirements, while maintaining efficient costs. Removing this flexibility by, for example, replacing the MOU with regulations and/or legislation, may add to compliance costs with little commensurate benefit.

The MOU appears to be the primary instrument for mandating health regulations (and to a lesser extent some environmental regulations) for drinking water within Western Australia. Changes to the MOU will therefore affect the efficient costs of the water corporations. The ERA understands that the current MOU arrangements result in the efficient allocation and use of resources by the water corporations because the MOU is well established and understood by all signatories. Good working partnerships between the Department of Health and the water corporations also assist to ensure compliance with the MOU.

Public health legislative reforms currently in place within Western Australia will change the health regulations for water. The ERA understands that it may be possible to replace the

current MOU arrangement under the water licence regime with regulations and enforcement provisions under the new Health Acts. There are some concerns surrounding the implementation of such regulations and provisions.

- There is uncertainty about the transition to the new regulatory framework, given the regulations for environmental and health matters, including water, will not commence until the final (fifth) stage of the transition process.
- The drafting of new provisions under the new regulatory framework is complex and there are reservations about gaps in the legislation that may occur, which may result in inefficiencies in process and cost.

As indicated, any changes to environmental and health regulations will affect the water corporations and the costs incurred in the provision of water services. In particular, legislating the obligations under the MOU could require more resources to be spent on compliance measures unrelated to health and environmental factors at the operational level. However, as part of their service delivery, the water corporations will still need to address these operational factors, irrespective of whether the current or changed arrangements apply.

The current legislative reforms in the areas of water and health provide opportunities to conduct thorough regulatory impact assessments on relevant legislation (Box 5). Such assessments can help to ensure that the regulatory costs imposed on the water corporations are appropriate, as well as being efficient in terms of outcomes. The ERA considers such assessments to be beyond the scope of this current inquiry. Regulatory impact assessments will be conducted, or have been conducted, by other relevant government departments.

- The Department of Health has commenced consultations for the remaining stages of implementation of the *Public Health Act 2016*. The remaining stages include new proposed legislation in the area of water regulation *"to provide a risk-based framework to all waters (drinking water, wastewater, recycled water and recreational water)"*. During the development process for new regulations the Department of Health must (among other things) comply with the Department of Finance's regulatory impact assessment process.[278]
- The Department of Water undertook relevant regulatory impact assessments for the *Water Services Act 2012*. The outcomes of these assessments are available on the Department's website.[279] The ERA understands that a similar process should occur with the proposed Water Resources Management Act.

The ERA's recommended approach to managing material variations (see appendix 11) will enable the water corporations to adjust their resourcing (costs) to meet any regulatory changes.

[278] *Department of Health, 'Regulation review program*', [website], 2017, http://ww2.health.wa.gov.au/Improving-WA-Health/Public-health/Public-Health-Act/Regulation-review-program (accessed 19 June 2017).

[279] *Department of Water, 'Regulatory Gatekeeping Assessments'*, [website], 2017, http://www.water.wa.gov.au/legislation/current-legislation/water-services-legislation/regulatory-gatekeeping-assessments (accessed 19 June 2017).

Box 5 - Regulatory Impact Assessment Process

The regulatory impact assessment process applies to all regulatory proposals introducing regulatory instruments, including primary legislation approved by the Cabinet and enacted through the Parliament (and other regulatory policy proposals approved by the Cabinet), subordinate legislation enacted through the Governor in Executive Council, remaining forms of subordinate legislation and quasi regulation.

The process for assessing regulatory proposals is two-tiered to determine the impacts on business (including government businesses), consumers or the economy.

- A Preliminary Impact Assessment (**PIA**) must first be undertaken on each regulatory proposal to determine its impact on business, consumers and/or the economy.
- If the PIA identifies a significant negative impact associated with the regulatory proposal, a Regulatory Impact Statement (**RIS**) is required to be completed prior to consideration by the decision maker. The RIS process consists of a Consultation RIS and a Decision RIS.

A RIS is not required for regulatory proposals where a PIA has been completed and shows no significant negative impact on business, consumers or the economy. Proposals that are non-regulatory fall outside the regulatory impact assessment process and assessment is not required.

A Treasurer's Exemption from the regulatory impact assessment process may be sought at any stage during policy or regulatory development.

Source: Department of Finance (Western Australia)

Fluoridation of drinking water

Drinking water supplies within Western Australia can be fluoridated only by direction from the Minister for Health, in accordance with the Fluoridation Act. Currently, around 91 per cent of Western Australia's population is provided with fluoridated drinking water, mainly in the Perth metropolitan area and larger regional centres.[280]

A function of the statutory committee established under the Fluoridation Act is to consider, advise and make recommendations to the Minister for Health about any proposal to add fluoride to any public water supply. To assist with this function, the Department of Health on behalf of the Committee may survey communities that do not have fluoridated drinking water to determine the community's perception on fluoridation of their drinking water supply.[281]

Section 9 of the Fluoridation Act details the provisions concerning the fluoridation of public water supplies. The ERA notes that where the Committee makes a recommendation to the

[280] Including Geraldton, Kalgoorlie, Broome, Derby, Karratha, Esperance, Collie, Manjimup and Albany, as well as a number of smaller communities supplied from the same source or treatment plant as the regional centres. See *Department of Health, 'Healthy WA – Fluoridated drinking water',* [website], 2017, http://ww2.health.wa.gov.au/sitecore/content/Healthy-WA/Articles/F_I/Fluoridated-drinking-water (accessed 16 May 2017).

[281] The statutory committee is the Fluoridation of Public Water Supplies Advisory Committee. The ERA notes the water fluoridation survey for the Bunbury area that was conducted in September 2011, which concluded: 'The results from the Water Fluoridation Survey indicate that the majority of the population aged 18 years and over in Bunbury and its surrounds are in favour of the addition of fluoride to the public drinking water supply and agree that its addition can assist in the prevention of tooth decay.' (Department of Health, *Water Fluoridation Survey: Bunbury Area*, September 2011, p. 2.)

Minister that fluorine be added to a particular water supply, and the Minister accepts the recommendation:

- the Minister is required to direct the relevant water supply authority to give effect to the recommendation within a specified time (which may be subsequently extended by the Minister); and
- the relevant water supply authority must undertake the direction, and the direct and incidental costs of doing so are to be covered by it.

In instances where the relevant water supply authority does not fluoridate the water supply as directed by the Minister for Health, the Minister may arrange to have the water supply fluoridated and the costs of doing so invoiced to the water authority. Provisions for collecting any costs (not paid within 30 days) from the water supply authority also exist (section 10 of the Fluoridation Act).

The provisions of the Fluoridation Act, and in particular, the powers of the Minister to direct the water corporations to fluoridate their water supplies (or make changes to a previous direction to fluoridate their water supplies) may affect the efficient costs of the water corporations. The water corporations must cover both the direct and incidental costs of fluoridation and meet specified timeframes. The ERA considers its recommended approach to managing material variations would enable the water corporations to adjust their resourcing (costs) to meet any directions from the Minister for Health for the fluoridation of their drinking water supplies.

Environmental regulations for wastewater treatment

There are many environmental regulations that can affect the efficient costs of the water corporations relating to wastewater treatment – these regulations are varied and complex. Reflecting this complexity, the Water Corporation has indicated that it complies with more than 40 pieces of environment related legislation, including the *Environmental Protection Act 1986*.[282]

Aqwest and Busselton Water do not provide wastewater services; only the Water Corporation provides such services.

Relevant government departments and their primary functions concerning wastewater services are outlined in Table 84 (below). Depending on the wastewater project, each of the departments may become involved. Coordination is therefore key to an efficient and effective governance of wastewater treatment.

[282] Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 18.

Table 84 Government departments relevant to wastewater services

Government Department	Primary Function(s)
Department of Water and Environment Regulation	Managing the impacts of discharges to waterways. Achieving effective odour management and water treatment to ensure acceptable environmental outcomes.
Environmental Protection Authority (**EPA**) and Office of Environment Protection Authority (**OEPA**)	Achieving acceptable outcomes in the environment more broadly, external to wastewater treatment (for example, relating to recharge aquifers and ocean outfalls).
Department of Health	Ensuring wastewater pathogens are managed effectively to ensure public health and safety.
Department of Parks and Wildlife	Maintaining the integrity of the wetland conservation estate.

The main wastewater provisions are contained in Parts IV and V of the *Environmental Protection Act 1986*.[283] Part V of the Act has been administered by the Department of Environment Regulation on behalf of the Minister for Environment. The Department is now part of the Department of Water and Environmental Regulation following the recent machinery of government changes.[284] The key function of the Department is to grant work approvals and licences for wastewater treatment plants. In carrying out this function, the Department undertakes risk assessments of wastewater treatment plants that are of a size that meet the production and/or design capacity for prescribed premises as set out in the *Environmental Protection Regulations 1987*.[285]

- Registration with the Department is required for treatment plants that have 20 to 100 cubic metres of wastewater discharge per day.
- Licencing and subsequent monitoring by the Department is required for treatment plants that have greater than 100 cubic metres of wastewater discharge per day.[286]
- Wastewater discharge of less than 20 cubic metres per day is overseen by the Department of Health.

Once an application for registration or licencing under the Environmental Protection Act is received, the Department undertakes a risk assessment. Guidelines relating to these risk assessments are provided on the Department's website.[287] Risk assessments are conducted by the Department's Environment Science Assessment Unit, on a case by case

[283] See Part IV: Environmental Impact Assessment and Part V: Environmental Regulation.

[284] Public Sector Commission, Public Sector Renewal, 28 April 2017.

[285] Schedule 1 (Parts 1 and 2) of the Environmental Protection Regulations classify the following sewage facilities as prescribed premises. Sewage facility: (a) premises on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters:
Category Number 54: 100m^3 or more per day
Category Number 85: more than 20 but less than 100m^3 per day

[286] The Department of Environment Regulation currently administers 118 licences relating to the Water Corporation's wastewater operations.

[287] *Department of Environment Regulation, Risk Assessments*, [website], 2017, https://www.der.wa.gov.au/our-work/regulatory-framework (accessed 22 May 2017).

basis, as each application can have unique features. Depending on the evaluation, improvements to the wastewater scheme may be sought before approval is granted.

The EPA, with assistance from the OEPA, may also become involved if any new project (or proposal) meets the criteria under Part IV of the Environmental Protection Act, which sets out provisions for environmental impact assessments. For example, the EPA has had a key role in the assessment and approval processes for the Water Corporation's aquifer recharge project at the Beenyup Wastewater Treatment Plant (see Box 6).

Box 6 – The Beenyup Aquifer Recharge Project

The Environmental Protection Authority (**EPA**) has assessed the Water Corporation's proposal to construct an advanced water recycling plant at the Beenyup Wastewater Treatment Plant and associated water recharge and conveyance infrastructure. The recycling plant and infrastructure will recharge up to 14 gigalitres of recycled water to the Leederville and Yarragadee aquifers each year.

The *Environmental Protection Act 1986* requires the EPA to produce a report for the Minister for Environment that details the outcome of its assessment, sets out the key environmental factors identified and recommendations as to whether or not the proposal may be implemented. Where the EPA recommends that a proposal be implemented, it can state the conditions and procedures that should apply.

Having assessed the Water Corporation's Beenyup proposal, the EPA concluded the proposal to be environmentally acceptable. The proposal may be implemented, subject to the recommended conditions and procedures set out in its assessment report, which include the following:

- ensuring there are no indirect impacts to Banksia woodlands from trenchless technology construction within five years post construction;
- implementing hygiene protocols;
- undertaking weed control;
- treating and managing acid sulfate soils consistent with the Department of Environment Regulation guidelines;
- rehabilitating areas of native vegetation disturbed during construction; and
- undertaking actions to minimise impacts to terrestrial fauna during construction.

Source: Environmental Protection Authority, Report 1597: Perth Groundwater Replenishment Scheme – Stage 2, May 2017.

Further to the EPA's assessment, the Department of Environmental Regulation is required to grant a works approval for the construction of the facility. The Department is unable to licence the project until the Minister is satisfied that the "recharge element" of the project is sustainable.

The Department of Health also has a role in the approval and licensing of wastewater recycling schemes. The Water Corporation must comply with both health and environmental regulations for wastewater disposal. Health requirements for the Water Corporation's recycled water schemes are contained within the MOU entered into with the Department of Health.

Source: Department of Environment Regulation, Department of Health, Water Corporation.

Under Part IV of the Environmental Protection Act "significant proposals" may be referred to the EPA for assessment.[288] If there is public concern about the likely effect of a proposal

[288] The Environmental Protection Act (section 37B) defines 'significant proposal' as 'a proposal likely, if implemented, to have a significant effect on the environment'.

(whether significant or not),[289] the Minister may refer the proposal to the EPA, and/or direct the EPA to undertake an assessment. Where a significant proposal has not been referred to the EPA, the EPA can request that the proposal be referred to it for an assessment. As noted, good coordination and clear lines of responsibility are required if the regulatory framework for wastewater is to be efficient and effective. While the framework appears to be achieving its intended and appropriate purpose (which is to maintain public health and protect the environment), there are questions around the clarity and administration of the current governance.

For example, the Water Corporation has noted:[290]

Similarly, Waterwest state:[291]

> The Water Corporation is the incumbent and dominant provider of water services in the Perth Metropolitan area.
>
> The *Water Services Act 2012* went a long towards cleaning up process, role and responsibility issues that had previously impeded private sector involvement in the sector.
>
> However, planning and approval issues remain a challenge that restricts private sector engagement.

Some of this criticism may be a result of the case by case basis for approvals. The ERA accepts that each wastewater treatment facility will be different, reflecting the location and load of the facility. However, it is also likely that greater clarity and consistency in arrangements may be beneficial. In this context, the Water Corporation submitted the following.[292]

> The [Water] Corporation considers that the approvals timeframe [for the Department of Environment Regulation] is directly affected by the lack of published and transparent standards by [the Department]… The absence of published standards by [the Department] has resulted in:
>
> - The Corporation's environmental approvals being protracted;
> - Requests for information, investigations, data, modelling etc. (in some cases unnecessary from an environmental risk perspective), giving rise to additional and unforeseen project costs;
> - Unpredictable condition setting, which in some cases give rise to additional and unforeseen capital expenditure resulting in projects being suspended or redesigned;

[289] The Environmental Protection Act (section 3) defines 'proposal' as 'a project, plan, programme, policy, operation, undertaking or development or change in land use, or amendment of any of the foregoing, but does not include [a] scheme'.

[290] Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 17.

[291] Waterwest, *Future Opportunities for Water Services in Perth*, December 2016.

[292] Water Corporation, *Response to WC 16*, 7 July 2017.

- Inappropriate condition setting, where conditions are onerous and disproportionate to the environmental risk giving rise to unnecessary expenditure and compliance activities;
- Inappropriate condition setting, where conditions fail to in fact address the environmental risk giving rise to unnecessary expenditure and compliance activities whilst the environmental risk remains unmitigated;
- Disruption to the [Water] Corporation's planned asset investment program giving rise to unforeseen costs and resourcing reallocation, as a result of capital improvements required by [the Department]; and
- Inconsistent condition setting, which gives rise to inefficiencies in the [Water] Corporation's reporting and regulatory compliance.

Further, the Water Corporation cited a number of actual instances where approvals from the Department of Environment Regulation are taking longer than they should. The Water Corporation submits that the Department of Environment Regulation's approval process can take over 12 months to complete, notwithstanding the Department's published assessment timeframe within its *Guidance Statement* for decision making of 60 calendar days.[293]

The ERA understands that the Department of Environment Regulation (now part of Water and Environment Regulation, as noted above) has endeavoured to address clarity and process issues concerning its assessments. The Department recently developed a new risk assessment guideline,[294] which better articulates the decision making process. In particular, the guideline outlines the Department's risk-based approach for assessing prescribed premises under Part V (Division 3) of the *Environmental Protection Act*. Improvements to other supporting documents, including the works approval and licence application form, has enhanced usability and clarified information requirements.[295] The availability of an online *Industry Licensing System*[296] to access materials related to industry licensing under Part V of the Environmental Protection Act and to make applications for work approvals, licences and registration are helping to improve process efficiencies.

The exact cost saving from streamlining approvals is difficult to determine. Nonetheless, it is apparent that savings may be available.

- First, the Water Corporation reports that it currently spends around $2.5 million per annum running the branch responsible for environmental approvals. It follows that any direct labour cost savings are likely to be modest, given the scale of the Water Corporation's overall operations.
- Second, and perhaps more importantly, actual capital and operating expenditures for projects are extremely significant. To the extent that there are inappropriate conditions set within the licence that the Water Corporation is expected to meet, then costs may be material.

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[293] Department of Environment Regulation, *Guidance Statement: Decision Making*, February 2017.
The Department of Environment Regulation's assessment timeframe allows the Department to 'stop the clock' on a number of grounds. These 'stop the clock' periods are excluded from the assessment timeframes when determining the total assessment days elapsed.

[294] Department of Environment Regulation, *Guidance Statement: Risk Assessments*, February 2017.

[295] *Department of Environment Regulation, 'Applications and forms'*, [website], 2017, https://www.der.wa.gov.au/our-work/licences-and-works-approvals/applications (accessed 23 May 2017).

[296] *Department of Environment Regulation*, '*Industry Licensing System'*, [website], 2017, https://ils.der.wa.gov.au/ (accessed 23 May 2017).

On balance, the ERA is of the view that the current governance arrangements concerning environmental regulations for wastewater treatment are achieving their intended purpose, but at some cost over and above what is reasonable.[297] The ERA considers that further improvements should be sought to clarify and simplify environmental regulations, with the objective of improving cost efficiencies. The ERA acknowledges that any improvements to environmental regulations and associated costs are policy matters for the State Government and are beyond the control of the water corporations. The ERA's recommended approach to managing material variations (see appendix 11) will ensure any material changes to the water corporations' costs that result from changes to regulations are accounted for.

Conclusions

The ERA considers that the water corporations are each providing their water services in accordance with the terms and conditions of their respective licences. On balance, the impacts of environmental and health regulations on efficient costs appears to be minimal under current arrangements.

The MOU approach to ensure compliance with health regulations for potable water is well established and accepted by all signatories, resulting in an appropriate and effective allocation of resources. In comparison, the approach for compliance with environmental regulations for wastewater services could be improved. The ERA considers an approach that involves all relevant agencies and sets out agreed outcomes and compliance measures would assist in simplifying and achieving environmental regulations. Such an approach should provide the water corporations with a clearer framework to better allocate their resources and achieve efficient costs.

Efficiency targets

This section provides further information to support the ERA's consideration of efficiency targets for operating expenditure in chapters 3 to 6.

To date there has been no ongoing efficiency target applied to capital (as opposed to operating) expenditure, for any of the three water corporations. However, the ERA – at the time of each price inquiry – has reviewed the business case for proposed capital expenditure, as well as whether the past and proposed levels of capital expenditure are efficient. This process is considered to ensure efficient capital expenditure, without recourse to an ongoing efficiency target. The issue of efficiency targets on capital expenditure is considered in appendix 7**.**

Efficiency targets 2005 to 2016

The ERA has previously considered operating efficiency targets as part of its 2004, 2008 and 2012 inquires.[298] Summaries of recommendations made by the ERA are provided in Table 85.

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[297] The ERA is unable to quantify this cost because it the water corporations are unable to provide adequate information.

[298] See Economic Regulation Authority, *Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009 and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013.

Table 85 Final recommendations of previous water inquiries

ERA inquiry recommendation(s)
2004 – Inquiry on Urban Water and Wastewater Pricing
• Cost forecasts used in the determination of revenue requirements for each service provider should incorporate efficiency gains reasonably envisaged to be achievable over the period of the forecast. [Recommendation 8]
Water Corporation • The Water Corporation's forecast of operating costs should be adjusted to reflect an efficiency gain in real operating costs per connection of 1.25 per cent per annum. [Recommendation 22] – The Water Corporation's operating efficiency was assessed by benchmarking its operating costs and staff numbers against domestic and overseas water/wastewater providers. – Taking the benchmarks into account, an annual efficiency gain in operating costs of about 2.5 per cent per annum was thought to be possible over at least the next three to five years. An even split of the benefits of the projected efficiency gains between customers and the business was recommended as appropriate. – The forecast operating costs provided by the Water Corporation were adjusted to reflect an efficiency gain in real operating costs per connection of half of the value of 2.5 per cent per annum, i.e. 1.25 per cent per annum. – Following the 2004 inquiry, the State Government decided that the Water Corporation's tariffs would be set according to an assumption that it would achieve reductions in real 'base' operating costs per connection of 1.88 per cent per year for the review period. The Water Corporation was to be fully compensated (via tariffs) for any operating expenditure required to increase its level of service above 2004-05 levels. • The Corporation's forecast capital costs were recommended as being appropriate for consideration in determination of the revenue requirement. [Recommendation 22] – It was noted that, given the absence of quantitative information that could be used to make projections of potential gains in the efficiency of capital programmes, it was not appropriate to recommend efficiency targets for capital expenditure.
Aqwest and Busselton Water While no specific recommendations were provided about operating efficiency for Aqwest and Busselton Water, the following was noted. • Aqwest's cost forecasts indicate efficiency gains in operating costs at average rates (in real terms) of 2.8 per cent per annum on a cost per connection basis. Busselton Water's indicate efficiency gains in operating costs at average rates (in real terms) of 1.5 per cent per annum on a cost per connection basis. These efficiency gains exceed the proposed target of 1.25 per cent per annum. Aqwest and Busselton Water's forecasts of operating expenditure therefore provide an appropriate basis for determination of service prices. • Capital efficiency targets should not be imposed on Aqwest and Busselton Water at the current time, because only minor cost savings via changes to the project delivery process are thought to be achievable. This is due to the relatively small size of their capital programs by industry standards and the fact that the program is generally made up of predominantly small projects.

ERA inquiry recommendation(s)
2008 – Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water
Water Corporation • The Water Corporation's revenue requirement should be set on the basis of reductions in base real operating costs per connection of 1.88 per cent per year (i.e. the same target level as applied, and achieved by the Water Corporation, for the previous review period). [Recommendation 29] – This efficiency target was in line with the target applying to water businesses in New South Wales and higher than the target applying in Victoria. – The efficient level of base operating expenditure was projected by applying the efficiency target to the base level of operating expenditure in 2004-05. • The Water Corporation's revenue requirement should be set on the basis of its projected increases in operating costs to achieve level of service improvements. [Recommendation 30] – The ERA noted it was concerned that a full analysis could not be undertaken due to the lack of information on similar expenditure that was also included in base operating costs. It noted that at the next review, it would expect information that would permit a full analysis of proposals to increase level of service expenditure. • The Water Corporation's revenue requirement should be set on the basis of its capital expenditure projections. [Recommendation 31] – The Water Corporation's planning and prioritisation processes were found to provide confidence that it had appropriate processes in place to guide capital expenditure decisions. A review of five of the Water Corporation's largest capital expenditure projects indicated that the Water Corporation's expenditure was, in general, justified.
Aqwest and Busselton Water • Aqwest and Busselton Water's revenue requirements should be set on the basis of their operating and capital expenditure projections. [Recommendation 33] – Aqwest and Busselton Water's operations were considered too small to apply an explicit efficiency target. An appropriate level of efficiency gain was believed to be being targeted by the Water Boards.

ERA inquiry recommendation(s)
2012 – Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board
Water Corporation • **Level of the target:** 2.0 per cent is an appropriate target to apply to base operating expenditure, and is achievable due to the impact of economies of scale while growth remains steady. • **Choice of price deflator for converting operating expenditure from nominal to real:** the Water Corporation argued that its Operating Cost Index (OCI) should be used to calculate forward projections of the Water Corporation's efficient level of real operating expenditure. The Consumer Price Index (CPI) was used by the ERA previously. – In the draft report, the ERA calculated the Water Corporation's efficient level of base operating expenditure for the previous period by taking its operating expenditure in 2007 and then adjusting for inflation and connections such that in each subsequent year real operating costs per connection decreased by 2 per cent. When adjusting for inflation, the ERA used the 8-cities CPI. This approach resulted in the Water Corporation having overspent relative to the efficiency target. On the other hand, if the OCI had been used to adjust for inflation, the Water Corporation would have underspent relative to the efficiency target. – Given divergence between the OCI and 8-cities CPI, the ERA decided it would consider moving away from a CPI deflator. However, because the issue was only highlighted between the draft and final reports, the ERA did not have sufficient time to fully evaluate the appropriateness of the OCI. Instead, the ERA decided to accept the forecast nominal operating expenditure that the Water Corporation submitted for the draft report. – The ERA noted it intended to undertake a full review of this matter in its next inquiry. • **Rebasing of base operating expenditure:** the Water Corporation proposed that its operating expenditure be rebased to 2010-11, which the ERA interpreted to mean shifting some elements of level of service expenditure into base operating expenditure. In the draft report the ERA accepted the proposal on the basis that: – a rebase of expenditure means that the 2.0 per cent efficiency target will apply to the total level of operating expenditure (for 2010-11 at least); and – going forward, the ERA can accurately determine what items should and should not be included in the level of service category. Rather than shift only some items of level of service operating expenditure to the base operating expenditure, the ERA recommended adding all level of service expenditure into the base operating expenditure category. The ERA did not believe that expenditure items should remain classified as level of service for an indefinite period of time. However between the draft and final reports, the Water Corporation submitted that the ERA's re-basing of operating expenditure had inappropriately re-based expenditures. In its final decision the ERA decided against re-basing level of service expenditure, noting the issue would be considered at the next inquiry. The ERA also noted it would apply a more specific classification of operating expenditure categories going forward. • The ERA did not recommend an efficiency target on capital expenditure.
Aqwest and Busselton Water • Aqwest and Busselton Water should not be subject to an efficiency target. Their budgeting processes are sound and appropriate, and they are already low cost water service providers.

Source: Economic Regulation Authority

Efficiency targets for 2019 to 2023

The ERA is of the view that, given the growth scenarios expected over the review period, a 2.5 per cent per annum efficiency target should be applied to the real base operating

expenditure per connection of each of the water corporations. (The determination of aggregate real base operating expenditure is set out in appendix 8.)

In coming to this view, the ERA has considered:

- submissions provided by interested parties;
- benchmark comparisons with other Australian service providers;
- the approaches taken by other regulators nationally; and
- advice provided by engineering consultants, Cardno Ltd (**Cardno**).

Water Corporation

For the Water Corporation, the ERA has considered the following issues:

- What categories of operating expenditure the efficiency target should apply to.
- The appropriate index to apply when converting forecast operating expenditure into real terms – the Consumer Price Index (**CPI**) or the Water Corporation's own Operating Cost Index (**OCI**).[299]
- What the level of the efficiency target should be.

The Water Corporation states that:[300]

- it has an ongoing operating efficiency target of reducing the real operating cost per property by an average of 2 per cent per annum (non-level of service operating expenditure only);
- historically it has met the 2 per cent target — however, the sustainable delivery of this in the short to near term will be a challenge in the current lower growth and inflationary environment, as most of its efficiencies are realised through economies of scale;
- the real 2 per cent target is predicated on annual growth in services of 2.5 per cent to deliver efficiencies through economies of scale of between 1.2 – 1.5 per cent — the remainder of the 2 per cent efficiency target is delivered through continuous business efficiency and initiatives;[301] and
- in recent years, a restructure has contributed to operating efficiencies being above the underlying 2 per cent target.

The way in which the ERA has applied the efficiency target to forecast the Water Corporation's operating expenditure is set out in appendix 8, Figure 92. Box 7 summarises the way in which the Water Corporation applies efficiency targets internally in order to cross check that the operating expenditure forecast generated by its Macro Budget Model meets efficiency targets set by the State Government. The efficiency target set by the State Government requires that the Water Corporation reduce its real 'non-level of service'

[299] The efficiency target is a 'real operating cost per connection' target.

[300] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 33-49.

[301] If operating expenditure is held constant and connections grow by 2.5 per cent, then real operating expenditure per connection would decrease by 2.5 per cent. It follows that – with the 2 per cent target and with 2.5 per cent growth – Water Corporation was allowing real operating expenditure per connection to increase by 0.5 per cent.

operating expenditure per connection by 2 per cent per annum, on average. In addition, the Water Corporation has been required to deliver 'one off' efficiency dividends.

Box 7 - The Water Corporation's approach to applying efficiency targets[302]

The Water Corporation uses two models to forecast operating expenditure and verify whether it is meeting the efficiency targets set by the State Government.

One of these models is the Macro Budget Model. Its purpose is to set the Water Corporation's operating expenditure budget, for consideration by the State Government in its Whole of Government budget cycle. The steps the Macro Budget Model adopts in forecasting budget operating expenditure are as follows:

- Take the previous year's operating expenditure budget as the starting point, and adjust for non-recurring operating expenditure items.
- Inflate that operating expenditure by the increase in costs the Water Corporation expects to face for various operating expenditure items (e.g. wage increases set out in Enterprise Agreements, as opposed to a market based wage price index).
- Subtract the amount of operating expenditure required to meet an internally imposed 0.5 per cent per annum efficiency target on the above aggregate operating expenditure.
- Add expected increases in operating expenditure due to firstly, capital investment ('Financial Impact Statement' operating expenditure), and secondly, specific initiatives ('Operating Implementation Business Case' operating expenditure).

The second model is the Economic Efficiency Model. Its purpose is to check that the forecasts of operating expenditure developed by the Macro Budget Model meet the required efficiency targets. The steps adopted to undertake this check are as follows:

- Determine non-level of service operating expenditure for each year of the forecast period by subtracting off level of service operating expenditure from the Macro Budget Model forecast. (The distinction between non- level of service and level of service operating expenditure is explained further below.)
- Convert the non-level of service operating expenditure into 2010-11 dollars by deflating it by the OCI. (The composition of the OCI is explained further below.)
- Subtract the increase in non-level of service operating expenditure that will be required to service forecast connections growth.

The above steps generate a forecast of what the Macro Budget Model implies for annual non-level of service operating expenditure in 2010-11 dollars, if it was the case that only the 2010-11 customer base was being serviced. The year on year change in this forecast operating expenditure is then assessed to establish whether a 2 per cent per connection per annum reduction occurs. The cumulative change in efficiency since 2010-11 is also established, to determine whether, on average, a 2 per cent per connection per annum reduction occurs.

302 [redacted]

Operating expenditure the efficiency target should apply to

The ERA has previously recommended that the Water Corporation's tariffs be set assuming the Water Corporation can reduce its real base operating costs per connection by an annual efficiency target. 'Base operating costs' maintain levels of service to customers consistent with existing service standards. The ERA has not previously recommended that an efficiency target be applied to operating expenditure undertaken to meet *newly* imposed standards or requirements.

Until the 2012 inquiry, the level of service to be provided with base operating expenditure was assumed to be the level of service provided in 2004-05 (the time of the first water pricing inquiry).

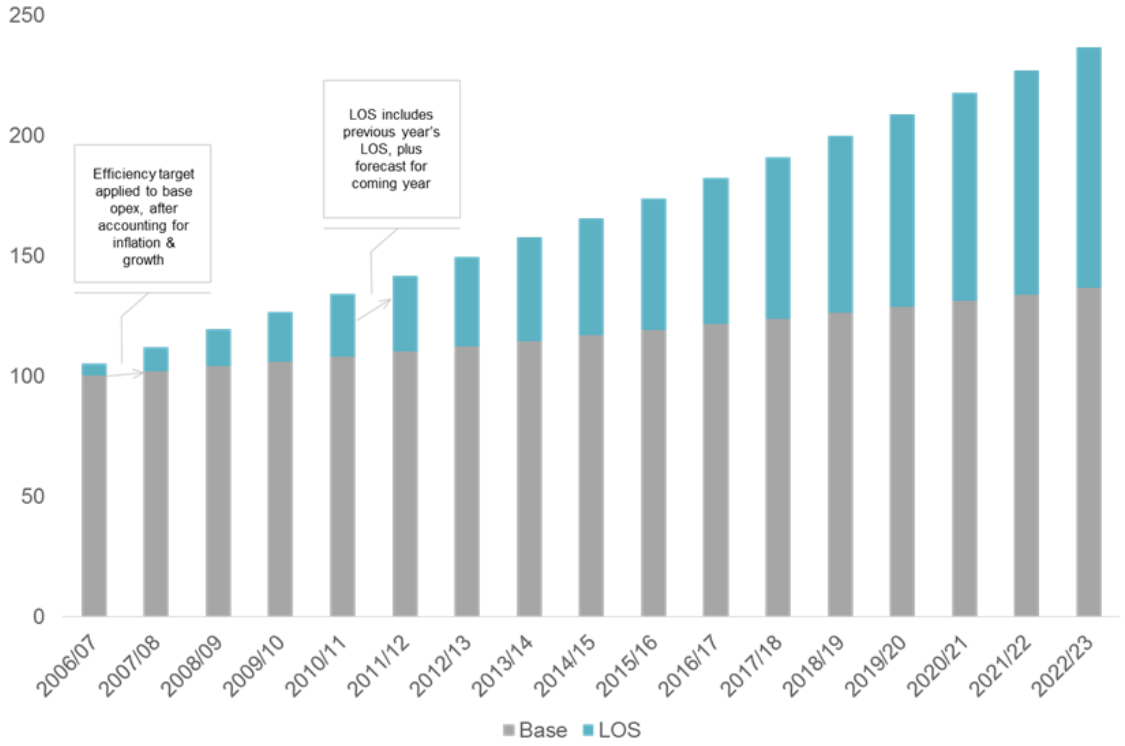
However, in the 2012 inquiry, the ERA proposed to re-classify all of the Water Corporation's 2010-11 level of service operating expenditure as base operating expenditure, stating that it was not appropriate that operating expenditure items remain classified as level of service items for an indefinite period of time. While the ERA did not ultimately recommend re-basing any level of service operating expenditure, it noted that it would consider the issue of resetting the level of base operating expenditure at the commencement of each review in greater detail as part of the next inquiry.

Re-classifying operating expenditure – previously classified as level of service – into base operating expenditure means that it would become subject to the efficiency target. Figure 69 demonstrates the implications of this change from a conceptual perspective. If level of service operating expenditure is not re-classified as base operating expenditure, the efficiency target is applied to a continually shrinking proportion of the total operating expenditure cost base (Approach 1). This is not the case if level of service operating expenditure is re-classified (Approach 2).

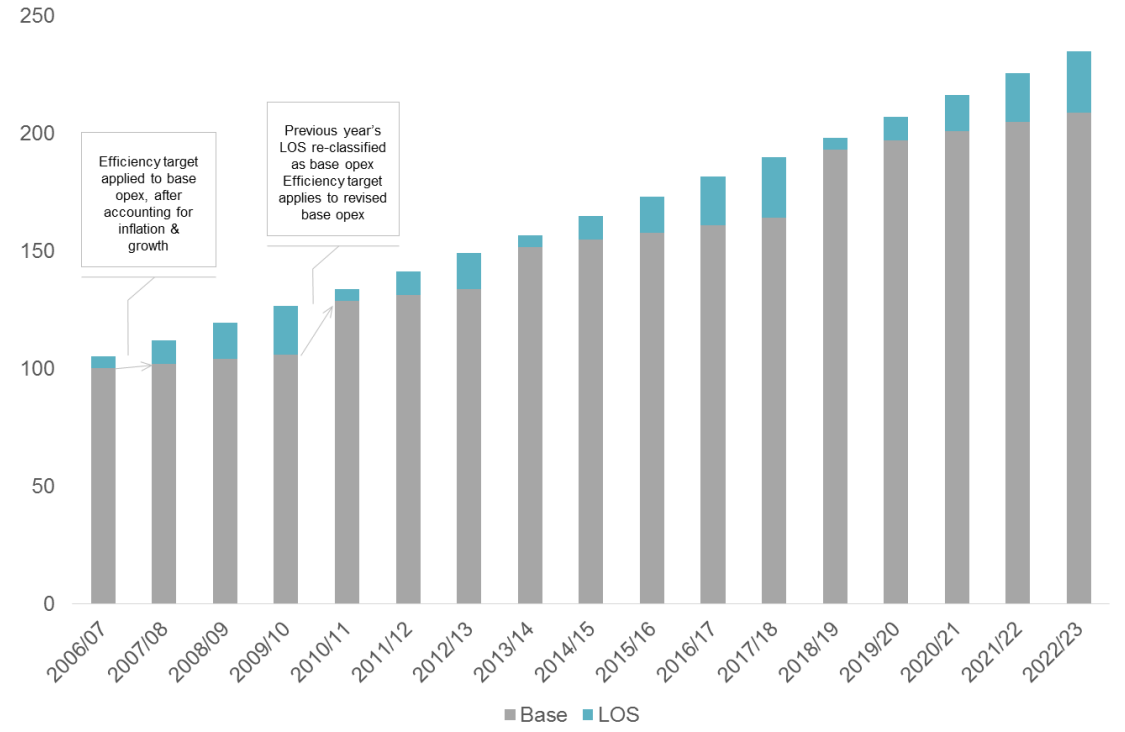
[redacted]

Figure 69 Re-classifying level of service operating expenditure as base operating expenditure

Approach 1: Level of service operating expenditure not re-classified as base at price reviews



Approach 2: Level of service operating expenditure re-classified as base at price reviews



It is not uncommon for regulators to apply different approaches to encourage efficiency for base operating expenditure versus 'enhancement' operating expenditure, and to adjust the level of base operating expenditure at the start of a new regulatory period to reflect current service standards.

For example, the Essential Services Commission (**ESC**) has to date incorporated a 'productivity hurdle' into forecasts of 'business-as-usual' operating expenditure. Business-as-usual operating expenditure is the last year of actual operating data from the previous regulatory period, excluding one-off operating expenditure items.[303] This figure is then adjusted to allow for forecast average customer growth and the productivity hurdle, so as to produce a target business-as-usual operating expenditure figure for each year of the regulatory period.[304] Forecast operating expenditure items that are identified by the businesses as costs related to new initiatives (such as meeting new obligations and/or meeting higher service levels) are assessed for their efficiency separately.[305]

The Independent Pricing and Regulatory Tribunal (**IPART**) applies an efficiency target to Sydney Water's 'core operating expenditure'. Core operating expenditure is defined as the day-to-day operating, maintenance and administration costs Sydney Water incurs in delivering its water, wastewater and stormwater drainage services.[306] Efficiency targets are not applied to Sydney Water's Build Own Operate agreements for water filtration services at its four largest water filtration plants — the efficiency of operating expenditure on these agreements is assessed separately.[307] Similarly, efficiency targets are not applied to the cost of purchasing bulk water as these costs are not within Sydney Water's control.[308]

In its determinations of SA Water's prices, the Essential Services Commission of South Australia (**ESCOSA**) defines base costs as the actual operating expenditure incurred in the last year of the previous regulatory period (after having determined that year's operating expenditure to be efficient).[309] The efficiency target is applied to this base level of operating expenditure. The prudency of specific cost categories identified by SA Water as driving increases in costs relative to the base year (e.g. increased license fees, superannuation liabilities) is assessed separately by ESCOSA — the efficiency target is not applied to those cost categories for the coming regulatory period.[310]

The United Kingdom's Office of Water (**Ofwat**) has now moved to a 'totex-based' approach to assessing efficient expenditure, where efficiencies may be achieved either in capital or operating expenditure. However, it previously distinguished between 'base service' operating expenditure and 'enhancement' operating expenditure.[311] Base service operating expenditure was based on total reported operating expenditure in the last year of the previous regulatory period, adjusted for exceptional and atypical items and expected cost

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303 Essential Services Commission, *Price Review 2013: Greater Metropolitan Water Businesses — Draft Decision, Volume I*, April 2013, p. 63.

304 Ibid.

305 Ibid.

306 IPART, Review of prices for Sydney Water Corporation From 1 July 2016 to 30 June 2020 — Final Report, June 2016, p. 89.

307 Ibid.

308 Ibid, p. 90.

309 ESCOSA, SA Water Regulatory Determination 2016 — Final determination, June 2016, p. 68.

310 Ibid, p. 94.

311 Ofwat, *Setting price limits for 2010-15: Framework and approach*, 2009, p. 32.

growth.[312] Efficiency targets were applied to both categories of operating expenditure, but each target was set at a different level.[313]

In summary, regulators in other jurisdictions tend to distinguish between business-as-usual operating expenditure and operating expenditure that is not directly controllable by the business (that is, operating expenditure that is necessary to meet externally imposed service standards or other regulations). The latter category is generally a far narrower component of total operating expenditure than the former. Efficiency targets are typically only applied to business-as-usual operating expenditure, with different approaches taken to ensure the efficiency of non-business-as-usual or non-controllable operating expenditure.

The Water Corporation states that, for its internal budgeting purposes, only non-level of service operating expenditure is assessed against the efficiency target. Non-level of service operating expenditure is defined as *"business-as-usual expenditure that maintains existing service levels to [Water Corporation] customers*."[314] However in practice, the value of non-level of service operating expenditure is determined as the residual of total operating expenditure minus level of service operating expenditure. The Water Corporation applies the following criteria for classifying level of service operating expenditure, as being operating expenditure:[315]

- resulting in an improved level of service to customers, the community or the environment — initiatives aimed at improving the quality of the products and services provided, reducing the risk of service disruption or improving the environmental outcome of the Water Corporation's activities;
- arising from regulatory or externally imposed requirements — these are the costs of meeting mandatory requirements imposed by social, environmental and economic regulators, where penalties would apply for non-compliance;
- driven by Ministerial requirements — costs associated with undertaking activities which assist the State Government in discharging its responsibilities; or
- justified by NPV considerations — additional operating expenditure undertaken to provide a lower NPV than the current projections. This can be achieved by either providing greater additional non-regulated revenue than the additional operating expenditure, or replacing a planned capital solution with a cheaper operating solution.

The Water Corporation does not provide any explicit submissions about whether any level of service operating expenditure should be re-classified as non-level of service operating expenditure. However, the ERA understands that the approach it has adopted to generate the forecasts of non-level of service and level of service operating expenditure in its submission is as follows:[316]

- A forecast derived from the Macro Budget Model defines the total operating expenditure forecast.

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[312] Ofwat, Future water and sewerage charges 2005-10 Final determinations, 2004, p. 169.

[313] Ibid.

[314] Water Corporation, *Submission to the Economic Regulation Authority, March 2017*, p. 34.

[315] Ibid.

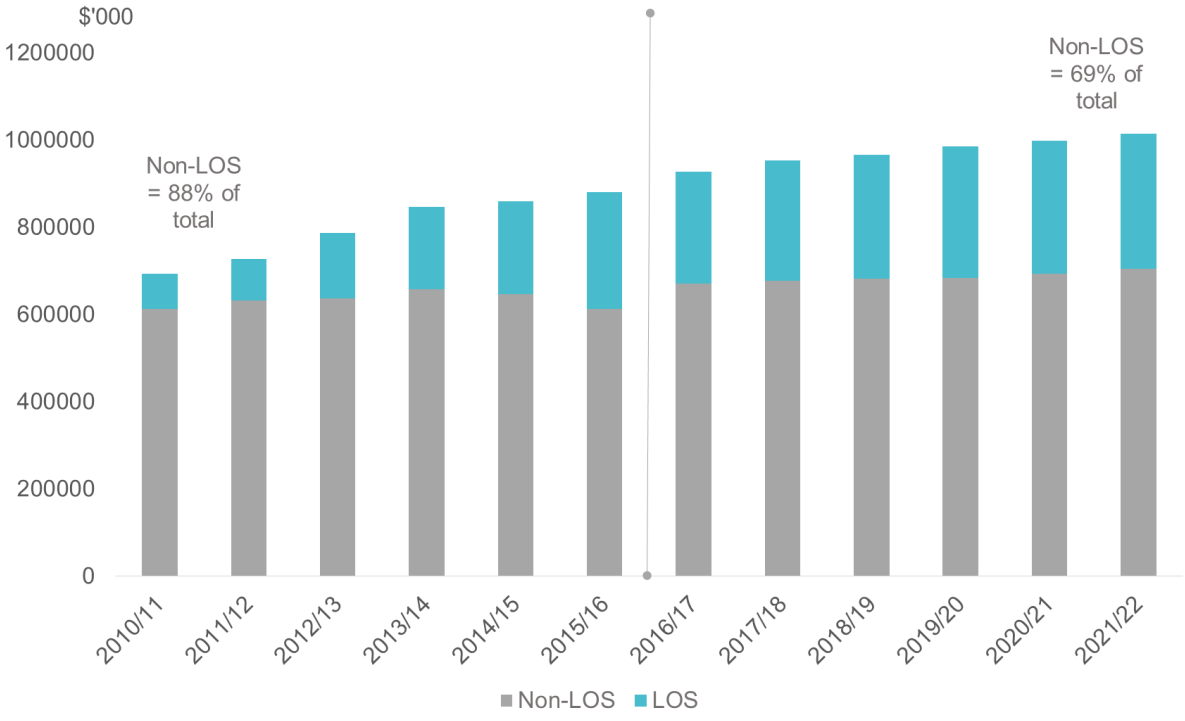
[316] Ibid, pp. 36-43; [redacted]

- Forecast non-level of service operating expenditure is calculated as forecast total operating expenditure, minus level of service operating expenditure, and minus operating expenditure on 'Reimbursement Projects' and 'Contestable Businesses'.
- Level of service operating expenditure is calculated as desalination operating expenditure; plus operating expenditure incurred on Financial Impact Statement projects, corporate initiatives, externally imposed requirements and certain 'other items'. It incorporates operating expenditure on projects, initiatives, requirements and other items that have been ongoing since 2008-09.
- Reimbursement Project operating expenditure is calculated as the sum of all 'revenue offsets', and incorporates items that have been ongoing since 2008-09.
- Contestable Businesses operating expenditure is calculated as the sum of operating expenditure on contestable businesses, and incorporates contestable businesses that have been going concerns since 2010-11.

It is not clear why the last two sub-categories of operating expenditure are included in the forecast of total operating expenditure, given that they appear to relate to 'non-regulated' service provision. This issue is further discussed in appendix 8.

The above-described approach means that any operating expenditure that has historically been classified as level of service operating expenditure is never re-classified as non-level of service operating expenditure. Non-level of service operating expenditure is merely the residual of total operating expenditure after level of service operating expenditure has been deducted. The approach therefore reflects Approach 1 shown in Figure 69. This can also be seen in the levels of Water Corporation's non-level of service and level of service operating expenditure since 2010-11, and its forecast out to 2022-23 (Figure 70).

Figure 70 Water Corporation level of service and non-level of service operating expenditure (nominal)



Source: [redacted]

The approach also means that the Water Corporation's forecast level of service operating expenditure includes operating expenditure which could now be considered 'business-as-usual'. For example, it includes operating expenditure on projects and initiatives that have been ongoing since 2008-09.

The ERA's consultant Cardno queried why some operating expenditure items are categorised as level of service, noting that the inclusion of operating expenditure on desalination plants as level of service is "somewhat at odds" with Water Corporation's future outlook for a drying climate – that relies on desalination as a business as usual water source.[317] Cardno reiterates its advice provided to the 2012 inquiry, that the Water Corporation has an incentive to allocate operating expenditure items to the level of service category.[318]

Cardno also advises that:[319]

- the split between non-level of service and level of service operating expenditure is "somewhat arbitrary", and the definition and classification of costs between the categories is "somewhat ambiguous";
- applying the efficiency target only to non-level of service operating expenditure undermines its effectiveness; and
- the starting point for its recommendations is that efficiency should be considered against operating expenditure in its entirety rather than making a distinction between non-level of service and level of service operating expenditure.

On the basis of the above analysis, the ERA continues to hold the view – expressed in its 2012 inquiry – that it is not appropriate that all operating expenditure items classified as level of service remain so for an indefinite period of time.

More broadly, and as explained in appendix 8, the ERA has evaluated the approach and associated information (including data and models) Water Corporation relies upon to consider the efficiency of its proposed operating expenditure. The ERA has drawn more heavily on the approach and information included in the Water Corporation's Macro Budget Model, as opposed to that in the Water Corporation's Economic Efficiency Model.

In determining what operating expenditure should be included in base operating expenditure for the coming review period, the ERA has therefore considered the operating expenditure categories included in the Macro Budget Model, rather than the non-level of service and level of service categories included in the Economic Efficiency Model.

As set out in more detail in appendix 8, the ERA is recommending that all actual operating expenditure from 2015-16 (once adjusted for non-recurring operating expenditure items) be categorised as 'base operating expenditure' except for that derived from:

- agreements with private sector entities that incorporate efficiency targets; and
- projects which the Water Corporation has no authority to change ('non-controllable' operating expenditure).

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317 Cardno, *Review of capital and operating expenditure plans for the Water Corporation*, Report prepared for the ERA, August 2017, pp. 40-41.

318 Ibid.

319 Ibid, pp. 40-42.

Specifically, this means that the following operating expenditure will not be subject to the efficiency target, but rather passed directly through to the revenue requirement – that on:

- Alliance Contracts, because these already incorporate efficiency targets; and
- initiatives (Operating Implementation Business Cases) driven by regulatory circumstances.

The result of this recommendation is that 85 per cent of the Water Corporation's operating expenditure over the period 2018-19 to 2022-23 will be subject to the ERA's recommended efficiency target. This compares to the 70 per cent of operating expenditure classified as non-level of service and assessed against the efficiency target under the Economic Efficiency Model.

Choice of index for converting forecast nominal operating expenditure to real terms

The efficiency target applied to the Water Corporation's operating expenditure is a real, per connection target.

In its first two inquiries, the ERA recommended using the CPI to convert nominal forecast operating expenditure into real terms for the purpose of assessing whether the Water Corporation's forecast nominal operating expenditure would meet the efficiency target. However, in the 2012 inquiry, the ERA noted that in future inquiries it would consider moving away from the CPI, towards some measure that more accurately reflects the Water Corporation's operating environment.

The choice of deflator affects the calculated level of forecast real operating expenditure, with a higher (lower) deflator leading to lower (higher) forecast real operating expenditure. This in turn means that the forecast nominal operating expenditure is more (less) likely to be consistent with meeting the efficiency target, which is expressed in real terms. At the time of the last inquiry, the Water Corporation's OCI was higher than the CPI. As outlined further below, over the coming period, the CPI is forecast to be higher than the Water Corporation's OCI. Adopting the CPI to deflate forecast nominal operating expenditure would therefore effectively make the real efficiency target easier to meet.

For the current inquiry, the Water Corporation states that:

- the OCI is calculated based on labour, consumer and producer indices specific to Perth as published by the ABS, weighted as per its operating expenditure items (Table 86);
- it welcomes a review of the impact of inflation on efficiency performance.

Table 86 Composition of the Water Corporation's OCI

OCI - ABS Index	Weighting
Wage Price Index consisting of:	53%
• *Professional, Scientific and Technical Services (WA)*	*34%*
• *Administrative and Support Services (WA)*	*13%*
• *Construction Services (WA)*	*6%*
Producer Price Index - Manufacturing Division	9%
Producer Price Index – Rental and Hiring Services	3%
Producer Price Index – Architectural, Engineering and Technical Services	8%
Producer Price Index – Engineering Design and Engineering Consulting Services	3%
Producer Price Index – Computer System Design and Related Services	5%
Producer Price Index – Basic Chemical and Chemical Product Manufacturing	3%
Consumer Price Index (Perth)	8%
Consumer Price Index – Utilities (Perth)	8%
Total	**100%**

Source: Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 41.

It is important to distinguish between the different purposes of the two cost indices used by the Water Corporation. In developing the Macro Budget Model forecasts, a set of cost escalation assumptions is used to forecast nominal operating expenditure (summarised in Table 87). The OCI is *not* applied in generating the Macro Budget Model's forecast of nominal operating expenditure. Rather the OCI is only used in the Economic Efficiency Model to deflate that forecast and convert it to real dollars, for the purposes of checking whether the Macro Budget Model forecast meets the efficiency target (which is expressed in real terms).

Table 87 Cost escalation assumptions in the Macro Budget Model [redacted]

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

[redacted]

The average of the Water Corporation's forecast OCI for the review period is 1.46 per cent per annum, compared to the weighted average of the escalation factors set out in Table 87

of 1.75 per cent per annum.[320] The average of the forecast CPI is 1.79 per cent per annum. The ERA has considered which of these deflators to apply for the purpose of assessing whether forecast nominal operating expenditure would meet the efficiency target.

First, the CPI is readily available, widely understood and sufficiently broadly based that the actions of any regulated business cannot affect it. The ERA elects to apply the CPI consistently – elsewhere in this inquiry – to determine real values, for use in its real revenue modelling approach. The use of the CPI ensures that the resulting revenue and prices are generated on a consistent basis with regard to the weighted average cost of capital.[321]

Second, for the coming period, the ERA's forecast CPI appears to approximate the increase in costs that the Water Corporation expects to face, as set out in its 2016-17 Macro Budget Model, more closely than the Water Corporation's forecast OCI.

On the other hand, since the ERA's 2012 review, the Water Corporation has consistently applied the OCI to cross-check whether its Macro Budget Model forecasts will meet the real efficiency target.

On balance of the above considerations, the ERA has decided to use the CPI to convert forecast nominal operating expenditure to real terms for the purpose of applying the efficiency target.

Level of the efficiency target

Efficiency targets are typically applied where a regulated business is found not to be operating at the efficiency frontier ('catch-up' efficiency targets); and to encourage continuing efficiency associated with the efficiency frontier shifting ('continuing' efficiency targets).

Measuring the efficiency of regulated water utilities focuses on comparing the observed input (measured as expenditure) against the minimum potential input required to produce a given quantity of output. Inefficiency is represented by a material deviation from the optimal point on the production or cost frontier. There are three factors which affect the efficiency of a water provider:[322]

- Use of technology — improvements in technology enable providers to reduce the quantity of inputs required to produce a given quantity of output, which leads to a frontier shift.
- Allocation of inputs — optimising the mix of inputs to produce a given output based on the respective input prices.

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[320] Estimated adopting the 2016-17 Macro Budget Model forecast of labour cost increases. In the 2017-18 Macro Budget process, the Water Corporation revised this forecast downwards. The weighted average of the escalation factors set out in the table would therefore be lower using the 2017-18 assumptions than the 1.75 per cent per annum estimated using the 2016-17 Macro Budget Model.

[321] For example, the Authority recommends against using the Water Corporation's proposed 'replacement cost' valuation of the asset base, within a nominal model, based on the Water Corporation's Capital Cost Index (**CCI**). This is due, first, to the 'double count' of inflation issues that arise (see appendix 9). Second, the use of a different inflation index, as compared to the CPI used for the rate of return, introduces inconsistencies in the return on and of capital.

[322] KPMG, *SA Water Corporation A benchmarking study of the operating and capital costs of SA Water in support of a regulatory business proposal – RBP2016, using NPR data Advisory*, August 2015, pp. 10-11.

- Operating environment — changes to the operating environment including climate, political, social, economic and legal/regulatory may affect inputs or outputs.

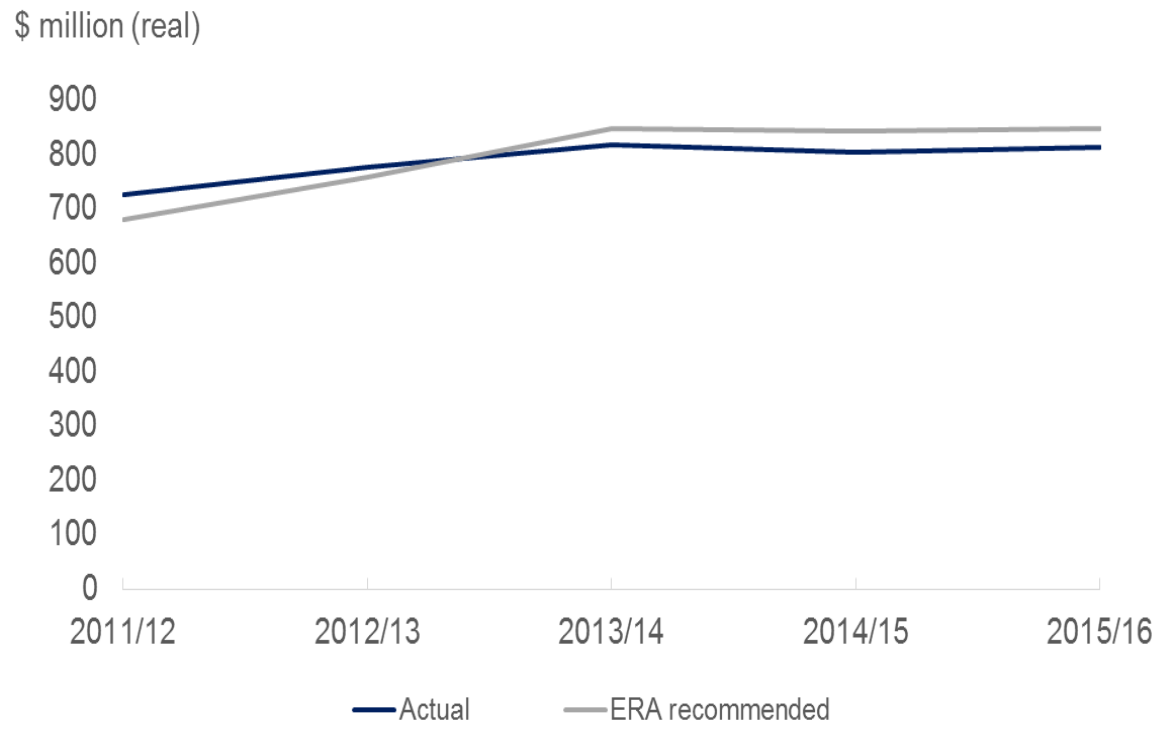
Allocative efficiency is another relevant dimension of efficiency. Allocative efficiency refers to a business producing the goods and services that are demanded by consumers, given its available resources. However, setting efficiency targets for operating expenditure abstracts from allocative efficiency. The above elements imply a focus on productive efficiencies, and the productive aspects of dynamic efficiency (over time).

Measuring the operating efficiency of regulated water utilities typically involves considering the first two factors listed above, in the context of the environment in which the entity operates in comparison to its peers. Benchmarking against a business's own historic performance and other comparable businesses' current performance is typically used to assess where a business is operating relative to the efficiency frontier, and therefore whether catch-up and/or continuing efficiency targets should be applied.

The use of benchmarking between water service providers is not straightforward. Difficulties arise in determining whether differences in operating costs reflect efficiency or other factors (such as the availability of water sources, geography, demography, hydrology, climate, technology and social factors). Despite these limitations, some useful insights can be gained.

Turning first to the Water Corporation's historic performance, Figure 71 shows the Water Corporation's actual real total operating expenditure compared to that recommended by the ERA in the previous inquiry. The Water Corporation spent less over the period than the total quantum recommended by the ERA, and the increase in its annual operating expenditure over the period was less than that allowed for by the ERA's forecast.

Figure 71 Water Corporation real total operating expenditure, 2011-12 — 2015-16



Note: Deflated to 2011-12 dollars using the 8-cities CPI.

Source: [redacted] and Economic Regulation Authority, Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board Revised Final Report, 28 March 2013, p. 51.

The Water Corporation explains that its operating expenditure was lower than the ERA's target, due to:[323]

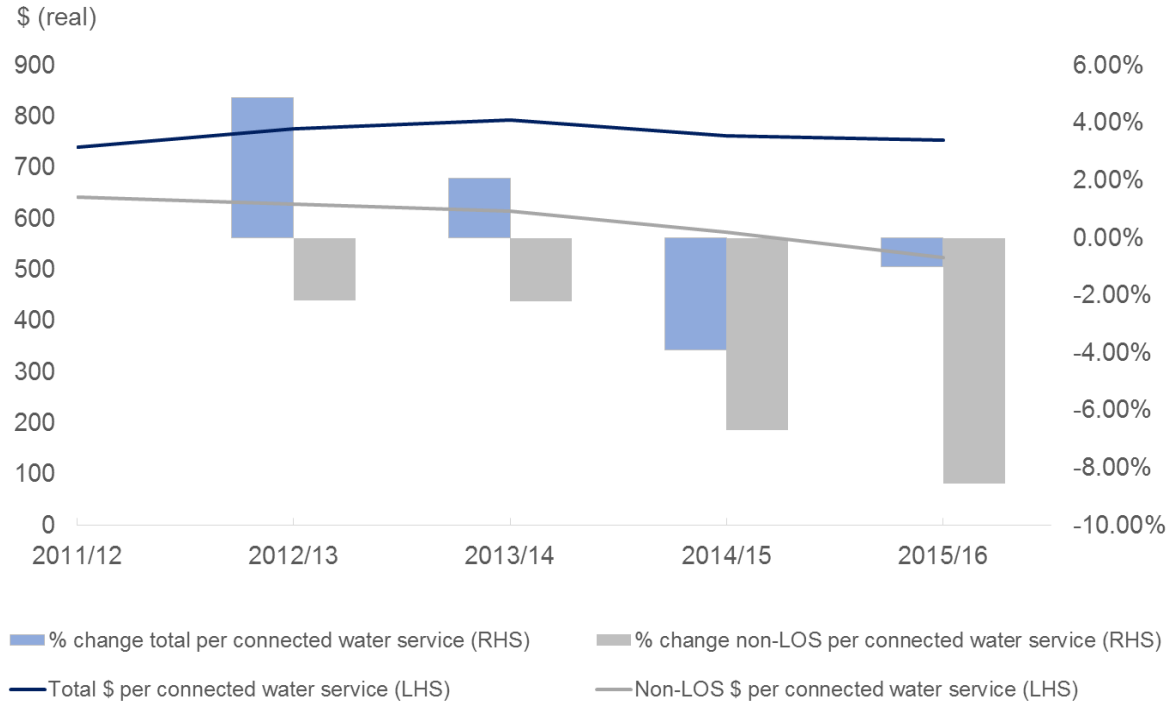
- inflation being lower than expected at the time of the 2012 inquiry;
- lower energy costs due to repeal of the carbon tax;
- business reform projects resulting in labour savings; and
- savings from once-off windfall gains from accounting adjustments (capitalisation of certain expenses, reversal of a number of purchase orders incorrectly receipted and contract supplier's warranty contributions).

Figure 72 shows that the Water Corporation's real total operating expenditure per connected water service remained steady over the period, increasing in some years but decreasing in others. In contrast, annual real non-level of service operating expenditure per connection consistently fell. The target of a 2 per cent per annum reduction in real non-level of service operating expenditure per connection was met in each year — the average reduction over the period was 4.94 per cent per annum. This outperformance reflects that – in addition to the 2 per cent per annum per connection efficiency target on non-level of

[323] [redacted]

service operating expenditure – the Water Corporation was required to meet 'one off' efficiency dividends set by the State Government.[324]

Figure 72 Water Corporation real operating expenditure per connection, 2011-12 — 2015-16



Note: Deflated to 2011-12 dollars using the 8-cities CPI.

Source: [redacted] and Water Corporation, Annual Report 2016, 'Five-year statistical summary' data table, 2016.

The Water Corporation states that it was able to achieve efficiencies of:[325]

- 1.2 – 1.5 per cent per annum due to economies of scale driven by 2.5 per cent per annum growth in connected services; and
- more than 2 per cent per annum due to an organisational restructure.

In terms of the efficiency effects of restructuring, the Water Corporation states that it is still in a transition phase and results such as those seen in the recent past may be unsustainable into the future.[326]

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[324] These required that the Water Corporation reduce its operating expenditure by a set amount each year from 2011-12 to 2014-15, [redacted]

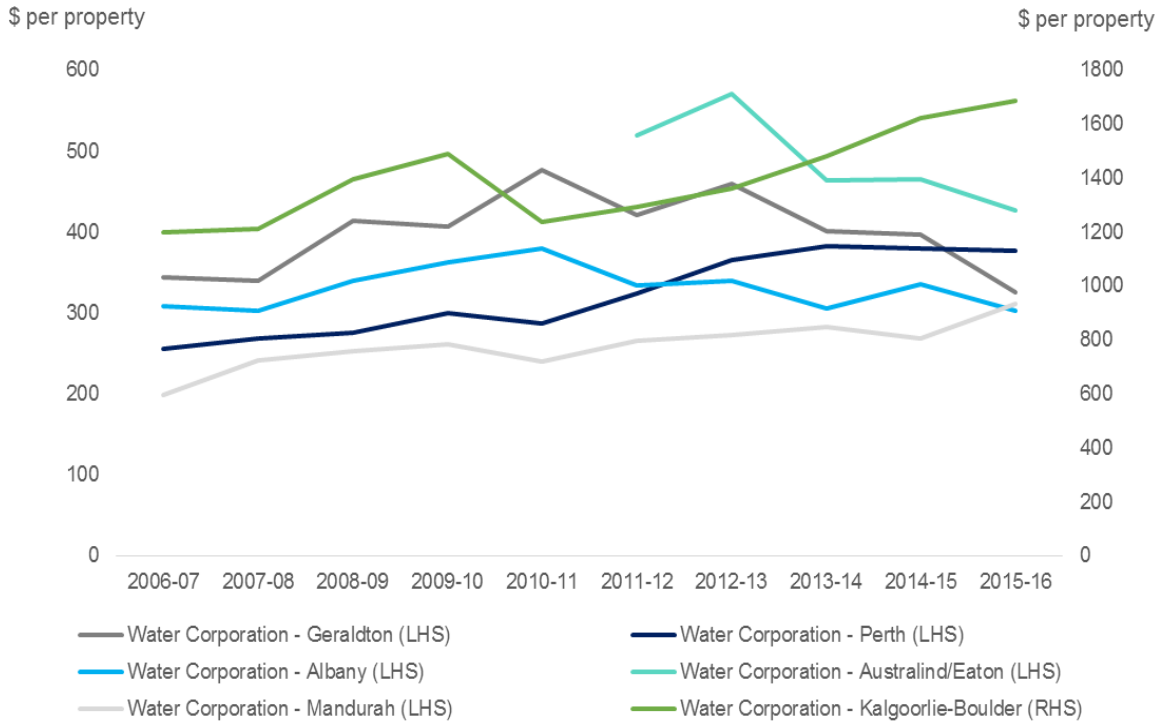
[325] Water Corporation, *Submission to the Economic Regulation Authority,* March 2017, p. 44 and p.48.

[326] [redacted]

Comparing the historic performance of the Water Corporation's business lines using National Performance Report data, Figure 73 and Figure 74 show mixed performance across the surveyed regions since 2006-07.

Figure 73 shows that for most of the Water Corporation's businesses for which there is data, its real water operating costs per property have been declining in recent years. However, for Kalgoorlie-Boulder, Mandurah and Perth, real operating costs per property have been increasing or flat. In 2015-16, Perth's real water operating costs per property were the third highest across all the surveyed regions.

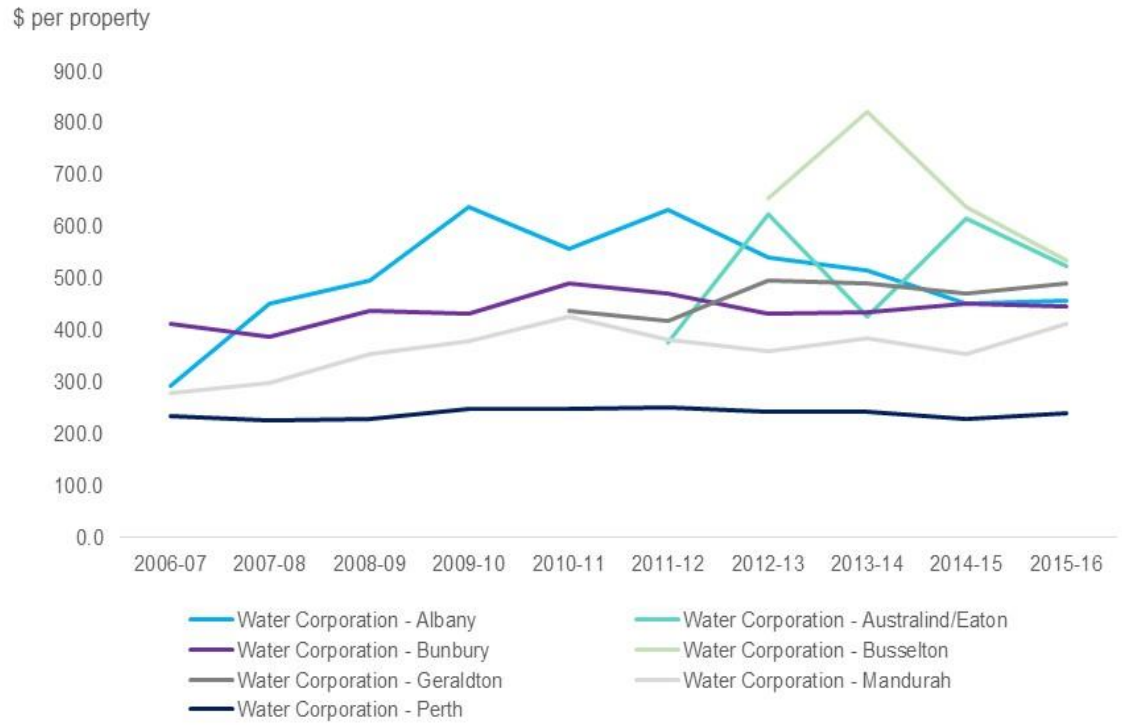
Figure 73 Real water operating cost per property: the Water Corporation (2006-07 to 2015-16)



Source: Economic Regulation Authority analysis of Bureau of Meteorology, *National Performance Report 2015–16: urban water utilities – Part B the complete data set,* Urban National Performance Report series, 2017.

In contrast, the Water Corporation's real wastewater operating costs per property were substantially lower in Perth than in the other regions (Figure 74). Real wastewater operating costs per property have generally been flat over the period, with the exception of real wastewater operating costs per property in Albany, Busselton and Australind/Eaton, which have been more variable.

Figure 74 Real wastewater operating cost per property: the Water Corporation (2006-07 to 2015-16)



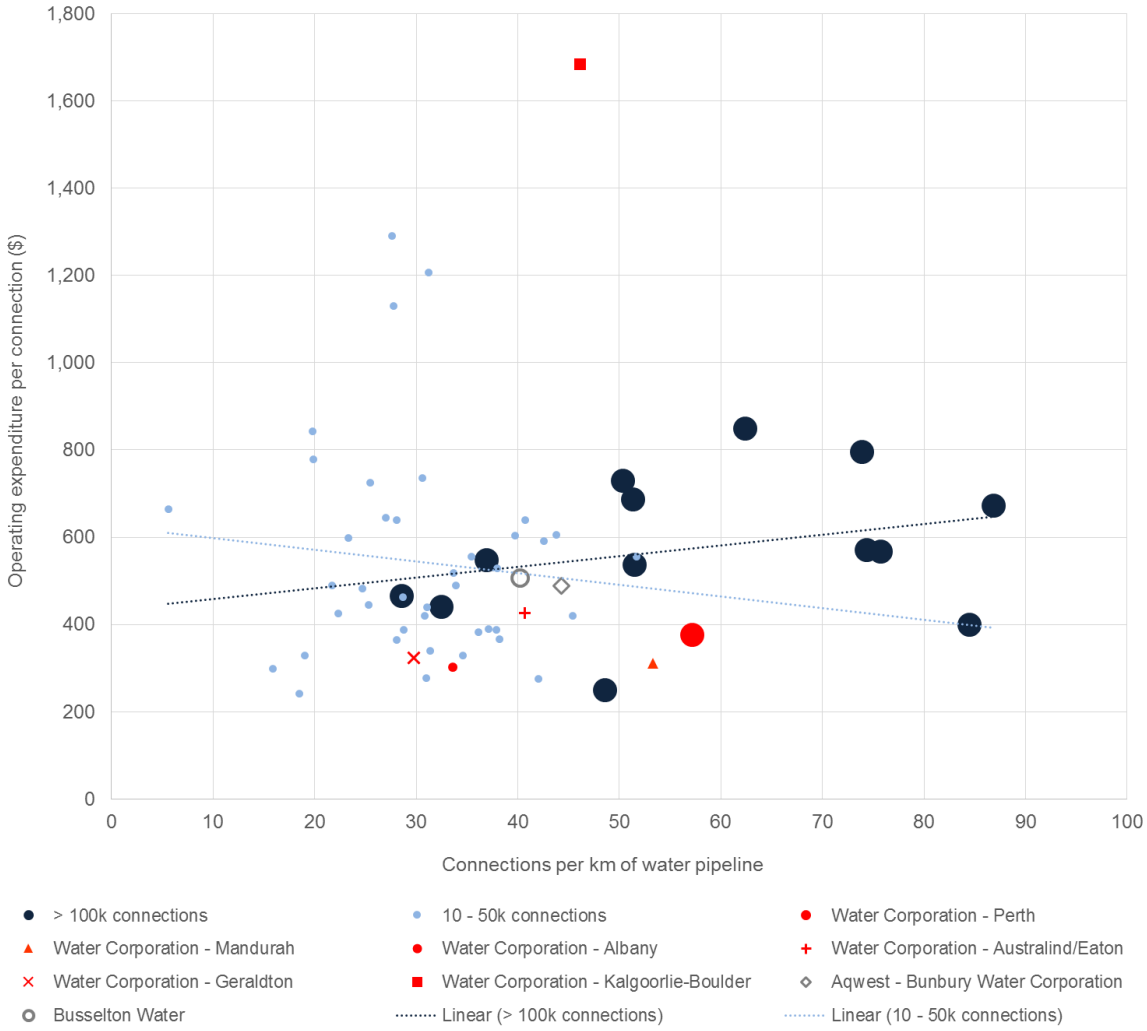
Note: Data not available for Kalgoorlie-Boulder.

Source: Economic Regulation Authority analysis of Bureau of Meteorology, *National Performance Report 2015–16: urban water utilities – Part B the complete data set*, Urban National Performance Report series, 2017.

Benchmarking the Water Corporation's water operating costs against other Australian water utilities, the ERA has found that the Water Corporation is more efficient than most of its peers. Figure 75 compares the Water Corporation's Perth operating expenditure per connection to that of other Australian water utilities servicing over 100 thousand connections. It shows that the Water Corporation's Perth operation is more efficient than many water utilities that service denser populations; and it sits below the trend line for large water utilities.

In terms of smaller water utilities, the Water Corporation's operations outside of Perth also sit below the trend line (except for in Kalgoorlie-Boulder). Given the population densities served by these businesses, their operating costs per connection are relatively low compared to most of their peers.

Figure 75 Water operating cost per property — Australian benchmarks, 2015-16

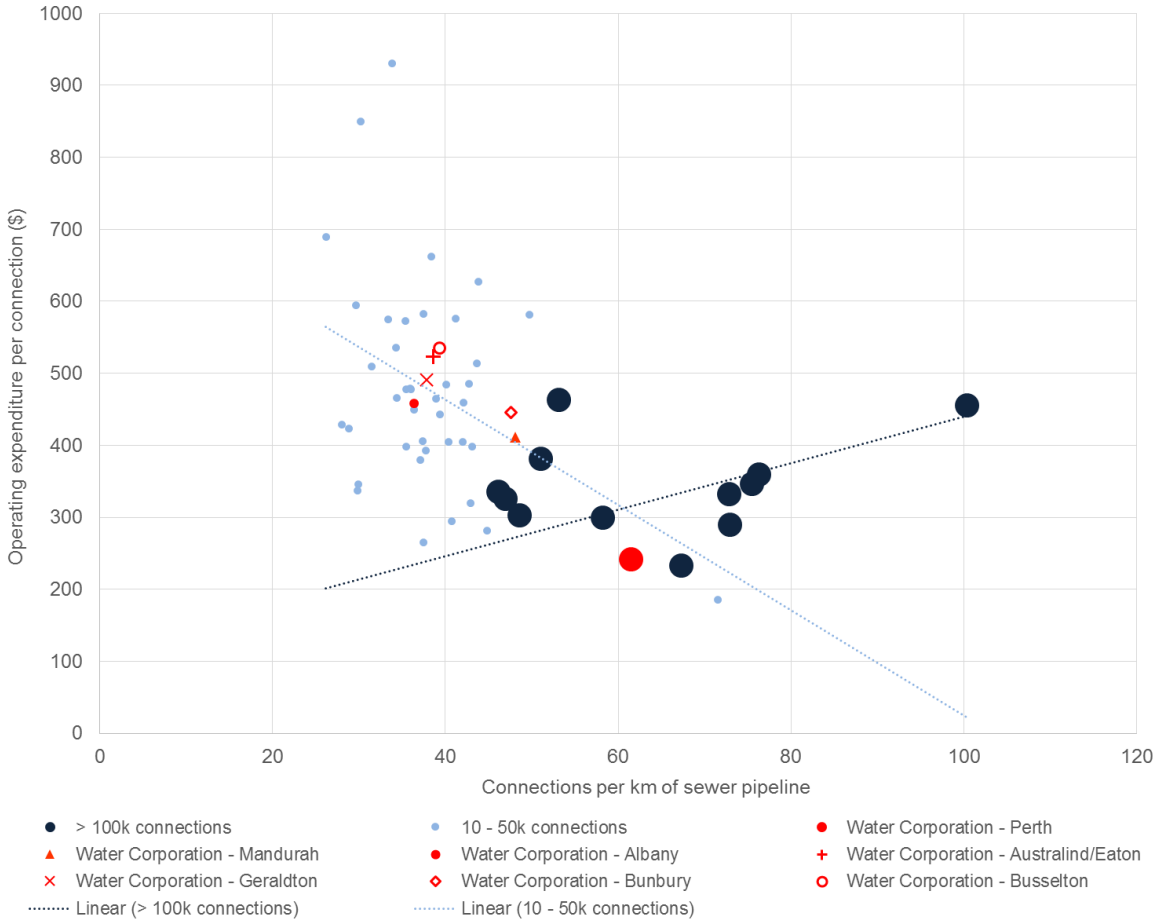


Note: *Data for Australian water utilities with between 50 and 100 thousand connections are excluded, as none of the Western Australian businesses are of this size.*

Source: Economic Regulation Authority analysis of Bureau of Meteorology, *National Performance Report 2015–16: urban water utilities – Part B the complete data set*, Urban National Performance Report series, 2017.

The Water Corporation's Perth wastewater supply operation also appears to be more efficient than many of its Australian peers (Figure 76). In contrast, most of the Water Corporation's wastewater business lines outside of Perth appear less efficient than many other smaller wastewater utilities around the country (Figure 76).

Figure 76 Wastewater operating cost per property — Australian benchmarks, 2015-16



Note: *Data for Australian water utilities with between 50 and 100 thousand connections are excluded, as none of the Western Australian businesses are of this size.*

Source: *Economic Regulation Authority analysis of Bureau of Meteorology, National Performance Report 2015–16: urban water utilities – Part B the complete data set, Urban National Performance Report series, 2017.*

Cardno largely confirms these findings, advising that:[327]

- The Water Corporation's combined operating costs per property for water and wastewater for the Perth region are among the lowest in the comparator group.
- While the Water Corporation's combined and water-only real operating costs per property vary from year-to-year, real wastewater operating costs per property generally appear to be remaining constant or decreasing. No significant peaks are observed in the annual combined and water-only real operating costs per property.
- The Water Corporation's operating cost per ML of water in the Perth region is among the lowest in the comparator group. The Water Corporation's wastewater operating costs, when considered on a per ML basis, are low to mid-range. Benchmarks on a volumetric basis are difficult to interpret due to the relatively high fixed costs in providing water and wastewater services and the different levels of consumption between businesses, i.e. high consumption will make a utility appear more efficient, all else being equal.

[327] Cardno, *Review of capital and operating expenditure plans for the Water Corporation,* Report prepared for the ERA, August 2017, pp. 7-10.

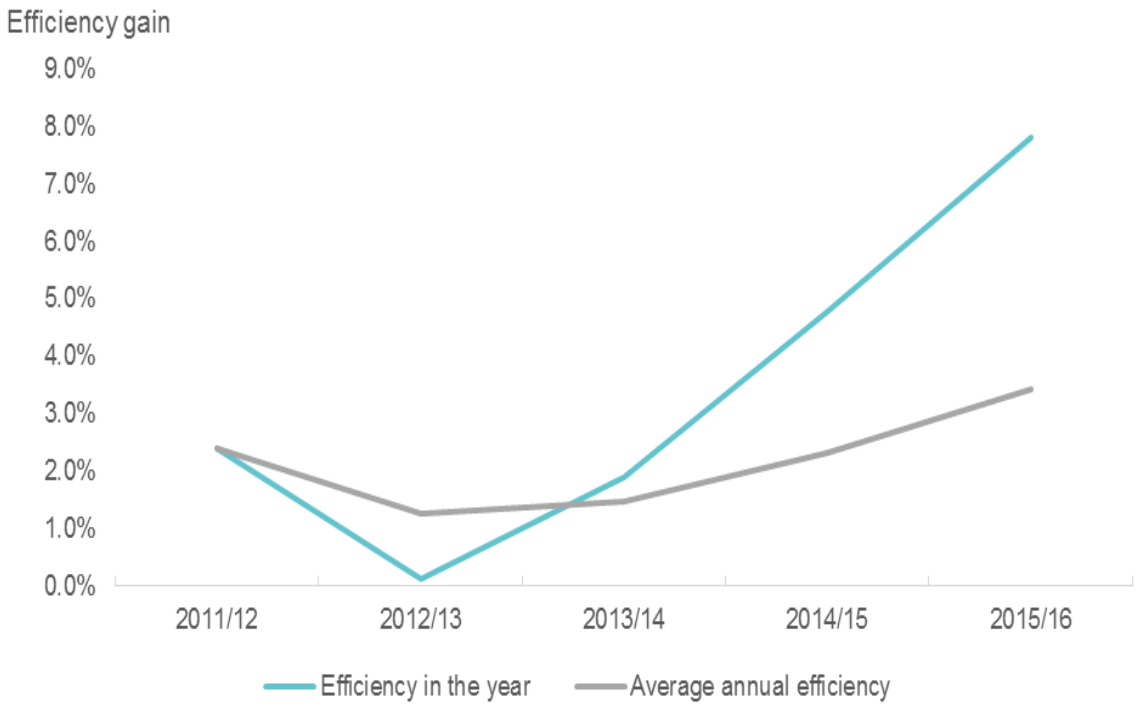
- It is reasonable to conclude that the Water Corporation is relatively efficient compared to its peers. However, it is not possible to separate out drivers and constraints on efficiency, such as economies and diseconomies of scale, varying cost of inputs and varying product quality.
- The Water Corporation faces notably higher operating costs in regional areas compared to the Perth region. This means that it appears to perform poorly when benchmarking is undertaken based on its State-wide operating expenditure.

Cardno also advises that there is evidence that the Water Corporation has been achieving efficiency gains.[328] Cardno makes this assessment on the basis of the non-level of service operating efficiencies calculated by the Water Corporation, via its Economic Efficiency Model, over the period since 2010-11:

- from year-to-year; and
- on a cumulative, annualised basis.

The calculated efficiencies are shown in Figure 77.

Figure 77 Operating efficiency achieved by the Water Corporation (non-level of service, $2010-11)



Source: Cardno, *Review of capital and operating expenditure plans for the Water Corporation,* Report prepared for the ERA, August 2017, p. 40.

The Water Corporation annualises cumulative efficiency since 2010-11 in order to smooth out year-to-year fluctuations. As Figure 77 shows, the non-level of service operating expenditure efficiencies calculated from one year to the next vary quite substantially. This is largely a function of the way in which the Water Corporation calculates its year on year

[328] Cardno, *Review of capital and operating expenditure plans for the Water Corporation,* Report prepared for the ERA, August 2017, pp. 40-41.

efficiency. As explained in Box 7, non-level of service operating expenditure is the residual of total operating expenditure, less level of service operating expenditure. Increases (decreases) in the operating expenditure classified as level of service from year-to-year, as a proportion of total operating expenditure, therefore lead to decreases (increases) in the level of non-level of service operating expenditure, which in turn affects the calculated efficiency outcome. As an example, the spike in non-level of service operating efficiency in 2015-16 was the result of a step increase in level of service operating expenditure, due to increased operation of the Southern Seawater Desalination Plant. This occurred because the spike in level of service operating expenditure led to a sharp fall in residual non-level of service operating expenditure, giving higher efficiency over the same total level of non-level of service services.

Cardno advises that the Water Corporation's application of the efficiency target:[329]

> …is relatively complex. This requires Water Corporation to allocate resources to this task and to reconciling with its bottom-up budget models. It also makes scrutiny by other parties difficult which reduces its transparency.

Cardno further considers that a number of aspects of the efficiency mechanism may limit its effectiveness in the next review period. In addition to the issues outlined above in relation to the distinction between level of service and non-level of service operating expenditure, it states the following limitations of the efficiency mechanism:[330]

- The current approach does not appear to have led the Water Corporation to long term, holistic and coordinated strategies for achieving efficiency gains. There is evidence that the Water Corporation is moving in this direction through the FLOWS project, but this is at early stages of development.

- The top down nature of the mechanism means that it is not always possible to quantify the saving attributed to a specific initiative or change in practice.

- Incorporating the efficiency mechanism in the Water Corporation's long term forecasts leads it to include one-off adjustments and balancing items that do not reflect actual services delivered or activities undertaken. (The example that Cardno provides is that, where — after the 0.5% efficiency adjustment has been made to all bottom up budget categories — the bottom up budget identified through the Macro Budget Model still exceeds the efficient level of operating expenditure, a negative balancing item is added.)

As noted above, as a way forward, Cardno advises that efficiency should be considered against operating expenditure in its entirety, rather than making a distinction between non-level of service and level of service operating expenditure.

The ERA agrees that the way in which the Water Corporation applies the efficiency target internally may not be creating incentives to develop long term, holistic and coordinated strategies for achieving efficiency gains. This is primarily because reported and forecast non-level of service operating expenditure can decrease merely by categorising operating expenditure as level of service instead of non-level of service. This in turn creates the appearance of efficiencies being achieved with respect to non-level of service operating expenditure, without real world efficiencies necessarily having actually been achieved.

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[329] Cardno, *Review of capital and operating expenditure plans for the Water Corporation,* Report prepared for the ERA, August 2017, p. 42.

[330] Ibid, pp. 41-42.

The ERA considers that, in contrast, the way in which the Water Corporation applies the 0.5 per cent per annum efficiency target within the Macro Budget Model *does* have the potential to create incentives to develop strategies for achieving ongoing, sustainable efficiency gains. As set out in further detail in appendix 8**,** the ERA has therefore applied its recommended efficiency target in a manner more reflective of the approach used in the Macro Budget Model.

Determining the level of the efficiency target

In terms of the level of the target, Cardno advises that the Water Corporation be set:[331]

- a continuing efficiency target of 0.25 per cent per annum — this is considered to be a conservative and achievable forecast of the continuing efficiency that Water Corporation will be able to realise; and
- a catch-up efficiency target of 0.25 per cent per annum — this is considered to be a relatively modest target, in light of the Water Corporation being benchmarked as having relatively low operating costs compared with its peers.

The efficiency target recommended by Cardno is on aggregate real operating expenditure, rather than on real operating expenditure per connection. It is therefore a more demanding target than a 0.5 per cent per annum reduction in real operating expenditure per connection. This is because connections are forecast to grow at 1.8 per cent per annum on average over the review period – no change in real operating expenditure would mean an approximately 1.8 per cent per annum reduction in real operating costs per connection. All else equal, a 0.5 per cent per annum target on real aggregate operating expenditure implies approximately a 2.3 per cent per annum target on real operating expenditure per connection.

Further, the efficiency target recommended by Cardno would be *in addition* to the efficiencies implicit in Cardno's recommendations about restricting allowable labour cost increases to inflation (discussed in appendix 8). Combined, the continuing, catch-up and labour cost efficiencies imply total efficiencies of 1.18 per cent per annum on aggregate operating expenditure. However, Cardno recommends that the labour cost adjustments be made directly to the operating expenditure forecast, and therefore Cardno's recommended total efficiency target is 0.5 per cent on aggregate real operating expenditure.

Table 88 summarises efficiency targets applied in recent regulatory decisions around Australia. While Cardno's recommended 0.25 per cent continuing efficiency target is in line with regulatory precedent, a 0.5 per cent per annum total efficiency target is comparably very modest. Applying this level for the target would suggest implicitly that the Water Corporation has less scope for catch-up efficiencies than the businesses included in Table 88.

[331] Cardno, *Review of capital and operating expenditure plans for the Water Corporation,* Report prepared for the ERA, August 2017, p. 43.

Table 88 Efficiency targets applied in recent regulatory decisions

Regulated business	Regulator	Year	Continuing	Catch-up	General	Implied per connection
SA Water	ESCOSA	2016			1.0 – 1.5	2.7 – 3.2
Sydney Water	IPART	2016	0.25	0.5 – 2.0		2.5 – 4.0
Sydney Desalination	IPART	2017			0.75	2.5
All businesses	ESC	2013			1.0	2.7

Note: All of the efficiency targets in the above table are on aggregate operating expenditure, rather than operating expenditure per connection.

Source: Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016: Final Determination*, June 2016, pp. 91-93; Independent Pricing and Regulatory Tribunal, *Review of Prices for Sydney Water Corporation From 1 July 2016 to 30 June 2020: Water — Final Report*, June 2016, pp. 16 & 110; Atkins Cardno, *Expenditure Review — Sydney Water*, December 2015, pp. 83-84; Independent Pricing and Regulatory Tribunal, *Sydney Desalination Plant Pty Ltd Review of Prices from 1 July 2017 to June 2022: Draft Report*, March 2017, p. 71; Essential Service Commission, *Water Price Review 2013: Greater Metropolitan Water Businesses: Draft Decision – Volume 1*, April 2013, p. 64; Economic Regulation Authority analysis.

The ERA recommends that the Water Corporation be set an efficiency target of reducing real operating costs per connection of 2.5 per cent per annum. This is equivalent to an efficiency target of 0.75 per cent per annum on real aggregate operating expenditure. As explained in further detail in appendix 8, the efficiency target would be applied to base operating expenditure per connection — base operating expenditure being the total of the actual operating expenditure from 2015-16:

- adjusted for non-recurring items in that year;
- uplifted for the step change in energy costs due to increased production at the Southern Seawater Desalination Plant;
- escalated by forecast inflation and connections growth; and
- excluding operating expenditure on agreements with private sector entities that incorporate efficiency targets and 'non-controllable' operating expenditure.

This recommended level of the target is based on the following considerations:

- Evidence suggests that the Water Corporation's metropolitan water and wastewater businesses are likely to be operating at or close to the Australian efficiency frontier. Nonetheless, efficiency gains should continue to be made, as should catch-up efficiency gains comparable to those expected of other water utilities operating at or close to the efficiency frontier:
    - A 1.0 – 1.5 per cent per annum efficiency target was applied to SA Water's aggregate operating expenditure when it was found to be operating amongst water businesses close to the efficiency frontier.[332] ESCOSA noted that, while SA Water had been benchmarked as being efficient compared to its peers, benchmarking does not address whether or not its peers are themselves

[332] Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016: Final Determination,* June 2016, p. 70.

efficient.[333] ESCOSA further considered that, even if SA Water was operating at the efficiency frontier, a 1.0 to 1.5 per cent ongoing efficiency target would be achievable.[334]

- A 1.0 per cent per annum total efficiency target was applied to all Victorian water businesses' aggregate operating expenditure. The relative efficiency of these businesses with respect to their peers has been found to range from being the least efficient to the most efficient.[335] In applying the 1.0 per cent target, the Essential Services Commission considered that all the Victorian water businesses should be disciplined by the need to improve their efficiency and manage their controllable costs.[336]
- The 0.75 per cent per annum target on aggregate operating expenditure recommended by the ERA is therefore lower than that applied by other regulators around the country to water utilities operating at or close to the efficiency frontier.

- At the same time, larger efficiencies appear to be available in the Water Corporation's lines of business outside of Perth, which account for just over 40 per cent of the Water Corporation's total operating expenditure. This is particularly the case when it comes to wastewater operating expenditure. As shown in Figure 74, operating costs per property for wastewater services are substantially higher outside of Perth, and performance is highly variable. Evidence points to operating costs around the average or greater than the average of operating costs per unit of output when compared to other Australian water utilities.

- The ERA considers that efficiencies driven by economies of scale of up to 1.1 per cent per annum per connection could be achievable with connections growth of 1.8 per cent per annum. As reported above, the Water Corporation states that historically it has achieved efficiencies driven by economies of scale of 1.2 – 1.5 per cent per connection per annum, when connections are growing at 2.5 per cent per annum. In an environment where connections are growing at 1.8 per cent per annum, efficiency gains driven purely by increasing scale should still be achievable, albeit at perhaps not quite the same level as before.

- The recommended target, which would be applied to 85 per cent of the Water Corporation's operating expenditure, is not substantially different to those applied by the Water Corporation internally. In its Macro Budget Model, the Water Corporation applies a 0.5 per cent per annum efficiency target to its base aggregate operating expenditure — which is over 97 per cent of its total operating expenditure each year.[337] Further, the Water Corporation's operating expenditure forecasts indicate that it will be able to achieve efficiencies of 2 per cent per annum per connection, in real terms, on non-level of service operating expenditure. Non-level

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[333] Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016: Final Determination,* June 2016, p. 70.

[334] Ibid, pp. 91-93.

[335] Economic Insights, *Victorian Urban Water Utility Benchmarking Report,* Report prepared for the Essential Services Commission, July 2014, pp. iii-iv.

[336] Essential Service Commission, *Water price review 2013: greater metropolitan water businesses — draft decision – volume 1*, April 2013, p. 61.

[337] Assuming inflation of 1.79 per cent, this allows nominal base operating expenditure to increase by around 1.3 per cent per year, and real operating expenditure is reduced by 0.5 per cent per year. With connections forecast to grow at 1.8 per cent per year, this implicitly suggests a reduction in real operating costs per connection of 2.25 per cent per annum, for the expenditures included prior to any additions. As the additions are not subject to efficiency targets, this reduces the Water Corporation's overall efficiency proposal on a per connection basis to below 2.25 per cent per annum.

of service operating expenditure makes up around 70 per cent of the Water Corporation's total operating expenditure over the review period.

Aqwest

Aqwest does not provide specific submissions in relation to operating efficiency targets. However, it requests that a framework be developed by the ERA to assist in times when material changes occur to operating or capital expenditure and revenue, including allowing for an impact on operating efficiency targets. This issue is considered in appendix 11.

Cardno advises the following:

- Aqwest's strategic management framework, including business planning and asset management/maintenance processes, is sound and appropriate for the organisation, and therefore likely to lead to expenditure that is prudent and efficient.[338]
- Aqwest has been continually improving its systems and processes since the previous price review in 2012, such that a PwC audit in 2013 found that all twelve elements of the asset management system reviewed were at the highest audit rating in relation to their adequacy and performance.[339]
- Since the 2012 review, Aqwest has introduced a comprehensive risk management approach, including the Asset Risk and Criticality Framework relating to asset condition, maintenance history and theoretical life, and can now schedule replacement and upgrades accordingly. The development of an online portal for risk management has also ensured the risk management approach is more accessible to staff and more easily implemented in the normal operations of the business.[340]
- These improvements have led to a strategic management framework that provides an internal control and review structure that should generate expenditure that is prudent, delivered in a timely fashion, and at an efficient cost.[341]

Cardno concludes that the systems and processes Aqwest uses for developing and assessing operating expenditure are robust and likely to lead to expenditure that is prudent and efficient.[342]

Cardno notes that Aqwest is operating at a relatively low cost already so a catch up efficiency target is not warranted, but that "work needs to be done to ensure that this low cost environment continues".[343] It notes that a continuing efficiency factor can be used to ensure that continued effort is placed on tight management of ongoing operating costs, and recommends a 0.25 per cent per annum efficiency target be applied to Aqwest's aggregate real operating costs.[344] Given Aqwest's projected connections growth of just over 1 per cent per annum, this translates to a real per annum per connection target of about 1.25 per cent.

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[338] Cardno, *Review of capital and operating expenditure plans for Aqwest,* Report prepared for the ERA, August 2017, p. 22.

[339] Ibid, p. 10.

[340] Ibid, p. 15.

[341] Ibid.

[342] Ibid, p. 22.

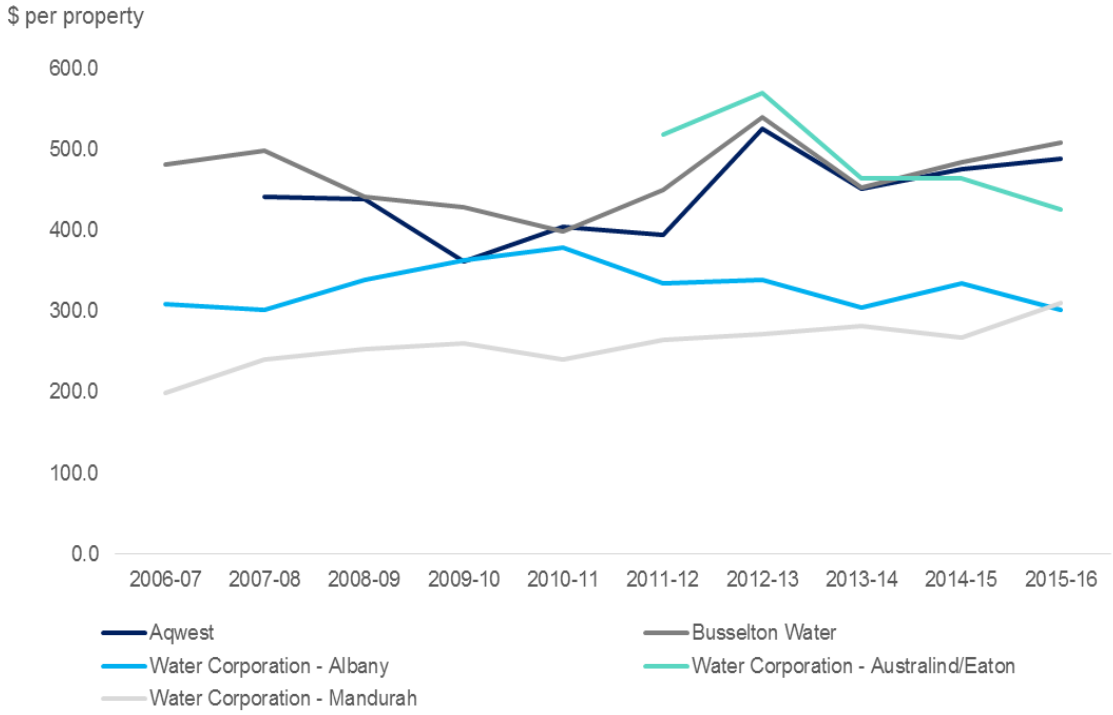
[343] Ibid.

[344] Ibid, p. 23.

The ERA notes the advice provided by Cardno, but considers that Aqwest is likely to no longer be operating as close to the efficiency frontier as found in previous inquiries.

Indeed Cardno finds that real operating costs increased from $404 per property in 2010-11 to $488 per property in 2015-16, which at 21 per cent, is a significant increase.[345] A comparison of Aqwest's real operating cost per property against Busselton Water's, and a selection of the Water Corporation's south western businesses (water operating costs only) from 2006-07 to 2015-16 is provided in Figure 78. It shows that, whereas the Water Corporation's real operating cost per property has generally been declining, Aqwest's has been increasing. While the real operating cost per property of the Water Corporation's Mandurah business has been increasing, Aqwest's real operating cost per property is substantially higher.

Figure 78 Real water operating cost per property: Aqwest, Busselton Water and the Water Corporation (2006-07 to 2015-16)

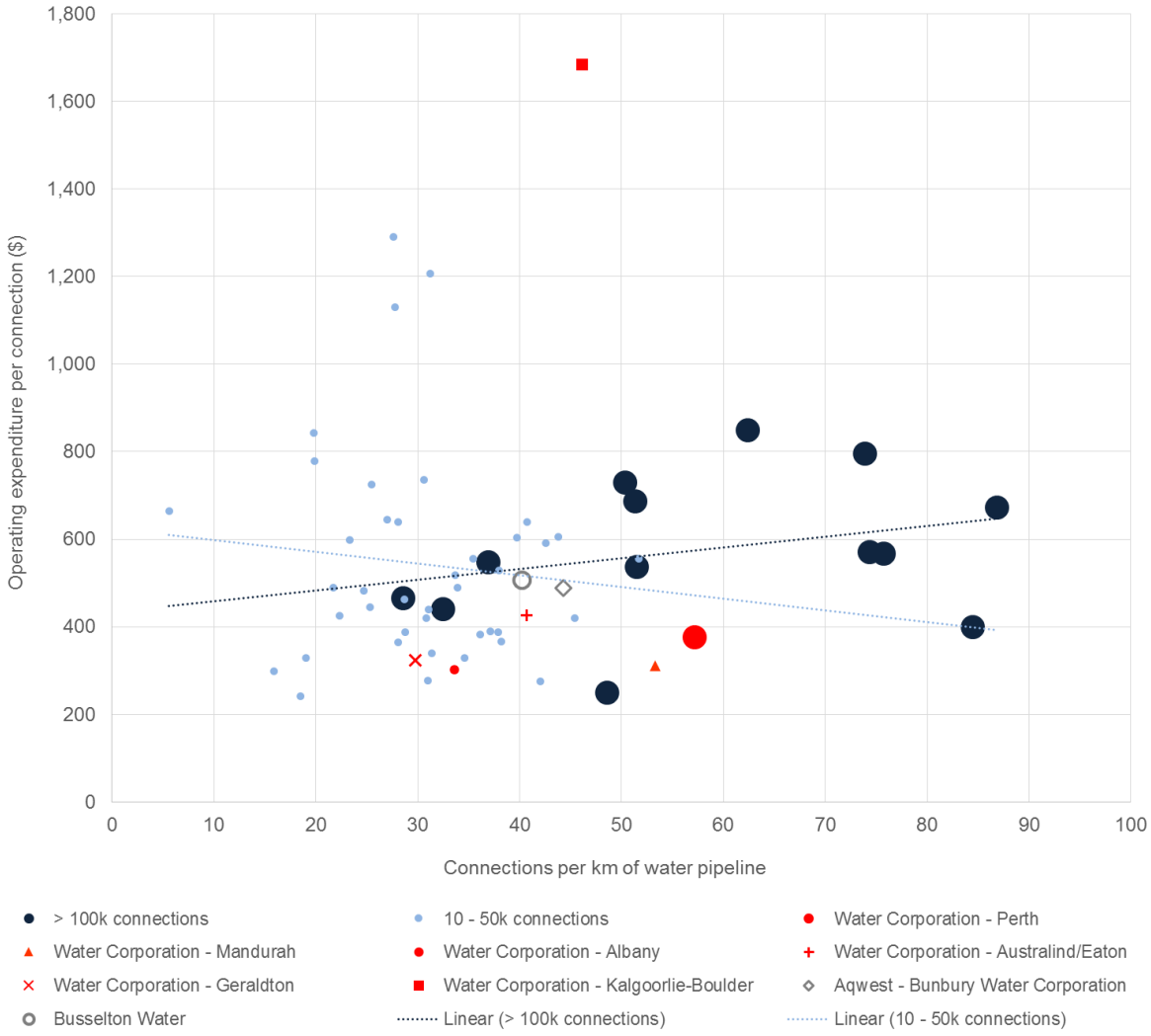


Source: Economic Regulation Authority analysis of Bureau of Meteorology, National Performance Report 2015–16: urban water utilities – Part B the complete data set, Urban National Performance Report series, 2016.

Further, as shown in Figure 79, Aqwest's operating cost per property sits at about the average level for smaller Australian water utilities, when population densities are taken into account.

[345] Cardno, *Review of capital and operating expenditure plans for Aqwest,* Report prepared for the ERA, August 2017, p. 8.

Figure 79 Water operating cost per property — Australian benchmarks, 2015-16



Note: *Data for Australian water utilities with between 50 and 100 thousand connections are excluded, as none of the Western Australian businesses are of this size.*

Source: Economic Regulation Authority analysis of Bureau of Meteorology, *National Performance Report 2015–16: urban water utilities – Part B the complete data set,* Urban National Performance Report series, 2017.

The ERA considers that there is sufficient evidence to warrant the application of a catch up efficiency target, in addition to Cardno's recommended continuing efficiency target.

Examining the efficiency targets that have been applied to smaller scale water utilities in Australia, as set out in Table 88, the ESC applies a 1 per cent per annum target to all of the Victorian water utilities' aggregate operating expenditure – this translates to a 2.7 per cent per annum per connection target.

The ERA therefore recommends that the same 2.5 per cent per connection efficiency target be applied to Aqwest's real base operating expenditure as is applied to the Water Corporation. Base operating expenditure is the total of Aqwest's actual operating expenditure from 2016-17.

The ERA notes Aqwest's request that a framework be developed to assist in times when material changes occur to operating or capital expenditure and revenue, including allowing

for an impact on operating efficiency targets. This issue is considered in appendix 11. Where the ERA's recommended efficiency target would preclude operating expenditure on unexpected events from being recovered, the ERA's recommended approach to managing material variations would allow for consideration of whether the additional unexpected costs can be recovered during the review period.

Busselton Water

Busselton Water did not provide any submissions about operating efficiency targets.

Cardno has found that Busselton Water's systems and processes for managing operating expenditure are likely to reliably result in expenditure that is prudent.[346] Its review found that significant work has been completed by Busselton Water since the 2012 review, including the corporatisation of the business, a subsequent restructure of the business, development of a comprehensive business planning system based on the Australian Business Excellence Framework, and significant restructuring of the asset management framework.[347] Cardno advises that these improvements have led to a strategic management framework that provides an internal control and review structure that should generate expenditure that is prudent, delivered in a timely fashion, and at an efficient cost.[348]

Cardno notes that Busselton Water has some of the lowest operating costs per property, and bill levels in Australia, but that its real operating costs increased from $399 per property in 2010-11 to $508 per property in 2015-16 — a 27 per cent increase.[349]

It identifies some opportunities for future efficiency gains with an expanded role in water resource management and stormwater, noting that integrated water management solutions and alternatives to hard engineering solutions could provide future efficiencies in operating costs.[350]

However, it also recommends continued assessment of administration costs, as these are expected to exceed the cost of water production in the medium term despite a stable operating environment and relatively stable staff numbers.[351] On this basis, Cardno recommends a 0.25 per cent per annum efficiency target be applied to Busselton Water's aggregate real operating costs.[352] Given Busselton Water's projected connections growth of 1.5 per cent per annum, this translates to a real per annum per connection target of about 1.75 per cent.

Given the significant deterioration in Busselton Water's real operating cost per property from 2010-11 to 2015-16, the ERA considers that Busselton Water is likely to no longer be operating as close to the efficiency frontier as found in previous inquiries. This is further demonstrated by Busselton Water's performance relative to the Water Corporation's south western business lines, in terms of real operating cost per property (Figure 80).

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[346] Cardno, *Review of capital and operating expenditure plans for Busselton Water*, Report prepared for the ERA, August 2017, pp. 14-15.

[347] Ibid, pp. pp. 14-15.

[348] Ibid, pp. pp. 14-15.

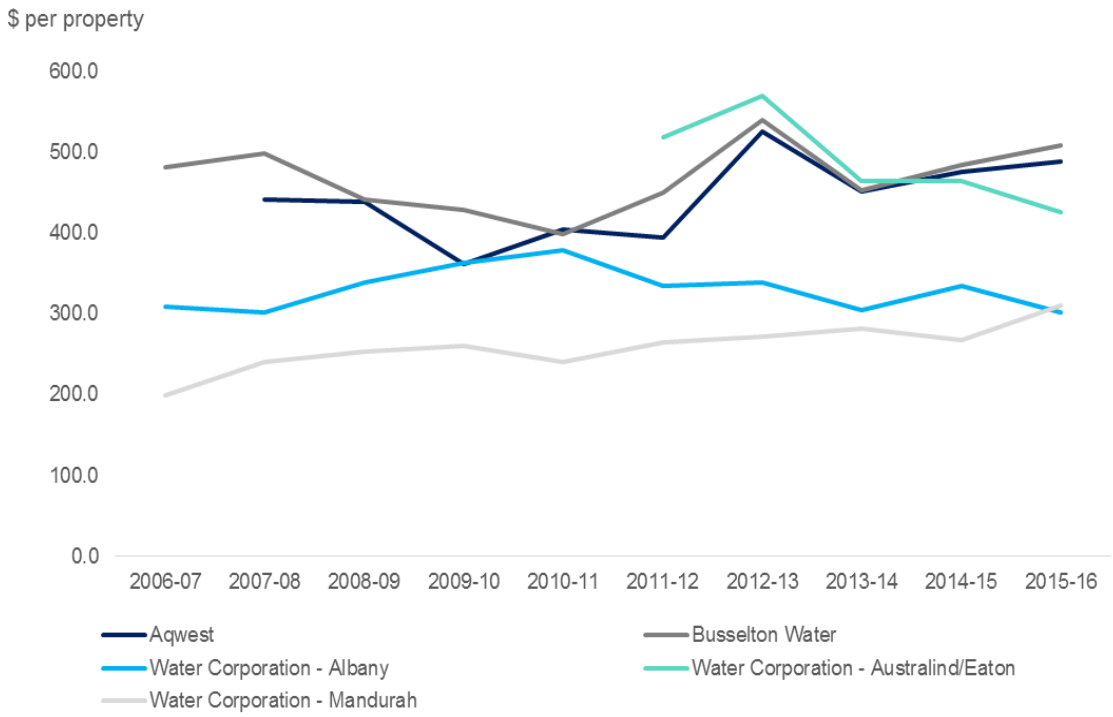
[349] Ibid, p. 9.

[350] Ibid, p. 24.

[351] Ibid.

[352] Ibid, p. 25.

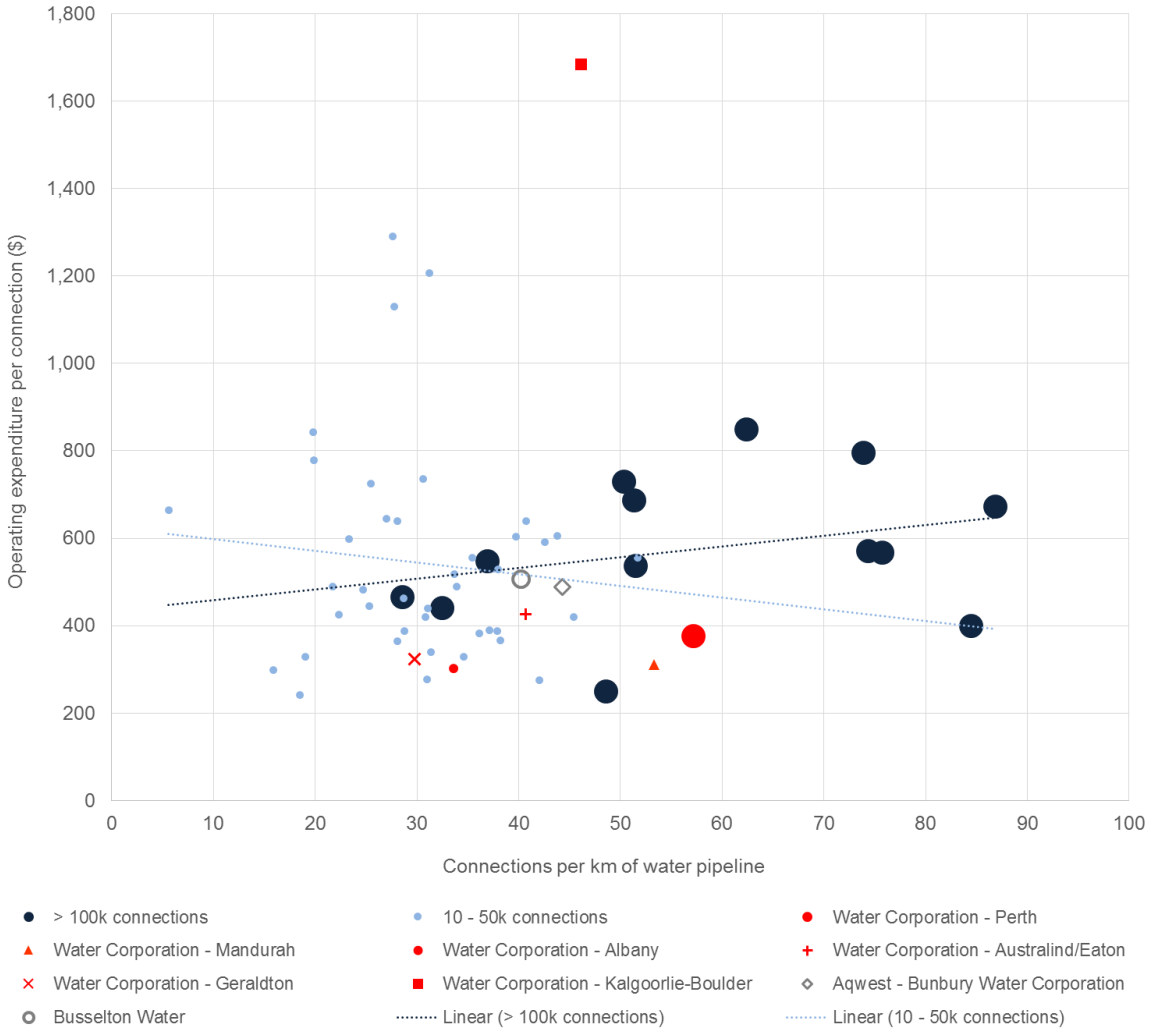
Figure 80 Real water operating cost per property: Aqwest, Busselton Water and the Water Corporation (2006-07 to 2015-16)



Source: Economic Regulation Authority analysis of Bureau of Meteorology, National Performance Report 2015–16: urban water utilities – Part B the complete data set, Urban National Performance Report series, 2016.

Further, as shown in Figure 81, Busselton Water's operating cost per property sits at about the average level for smaller Australian water utilities, when population densities are taken into account.

Figure 81 Water operating cost per property — Australian benchmarks, 2015-16



Note: *Data for Australian water utilities with between 50 and 100 thousand connections are excluded, as none of the Western Australian businesses are of this size.*

Source: Economic Regulation Authority analysis of Bureau of Meteorology, *National Performance Report 2015–16: urban water utilities – Part B the complete data set*, Urban National Performance Report series, 2017.

The ERA considers that there is sufficient evidence to warrant the application of a catch up efficiency target, in addition to Cardno's recommended continuing efficiency target.

Examining the efficiency targets that have been applied to smaller scale water utilities in Australia, as set out in Table 88, the ESC applies a 1 per cent per annum target to all of the Victorian water utilities' aggregate operating expenditure – this translates to a 2.7 per cent per annum per connection target.

In light of the above considerations, the ERA is recommending that the same 2.5 per cent per connection efficiency target be applied to Busselton Water's real base operating expenditure as is applied to the Water Corporation and Aqwest. Base operating expenditure is the total of Busselton Water's actual operating expenditure from 2016-17. Where the ERA's recommended efficiency target would preclude operating expenditure on unexpected events from being recovered, the ERA's recommended approach to managing

material variations would allow for consideration of whether the additional unexpected costs can be recovered during the review period.

Appendix 7 Capital expenditure

This appendix sets out the reasons for the ERA's recommended actual and forecast capital expenditure for the Water Corporation, Aqwest and Busselton Water.

The ERA's assessment of efficient and prudent capital expenditure is necessary to determine a regulatory asset base.[353] The regulatory asset base is used by the ERA to determine an efficient return on the assets and to provide for an allowance for depreciation of the asset to the water corporation.

The water corporations' capital expenditure is evaluated in three parts:

- The first part assesses the capital expenditure incurred since the ERA's last inquiry (that is, for the period 1 July 2011 to 30 June 2016).
- The second part assesses the capital expenditure expected to be incurred prior to the review period (that is, from 1 July 2016 to 30 June 2018). Only the capital expenditure deemed prudent and efficient is used to establish an opening capital base as at 1 July 2018.
- Finally, the ERA assesses the forecast capital expenditure expected to be incurred during the review period, from 1 July 2018 through to 30 June 2023.

Water Corporation

The Water Corporation's governance processes for undertaking capital expenditure planning and execution are reviewed, as a first step.

Actual and forecast capital expenditure are then evaluated.

Capital expenditure planning and execution process

The Water Corporation undertakes long-term strategic planning for its capital expenditure over a 20 year horizon. The Water Corporation then focusses on a five year period for budgeting purposes to underpin its Statement of Corporate Intent and Strategic Development Plan. The Water Corporation's five year asset investment formulation process involves three major steps:[354]

- The development of Strategic Investment Business Cases (**SIBCs**)
- Detailed review of all projects included into the five year investment program
- Top-down and bottom-up evaluation

The Water Corporation produces SIBCs for each key business portfolio, aligned to its line of business (water, wastewater and drainage) and networks (source, conveyance,

[353] The asset base used for determining efficient costs for this Inquiry is akin to the regulatory asset bases used for the ERA's access arrangement decisions. It only includes assets which should earn a return from the broad customer base through general tariffs. Other assets – such as those relating to contestable segments of the business, or which have been contributed – are omitted. The Inquiry regulatory asset base acronym is RAB.

[354] Water Corporation, *Water Corporation Submission to the Economic Regulation Authority - CONFIDENTIAL*, March 2017, pp. 22-23.

reticulation, treatment, reuse and discharge). The SIBCs are prepared for five, ten and 20 year investment horizons.

The Water Corporation considers that each SIBC outlines the preferred investment approach that will:[355]

- meet objectives for service levels, growth, asset stewardship, risk and cost into a combined portfolio investment strategy;
- maximise the utilisation of existing assets prior to recommending investment in new assets;
- determine the optimal mix of capital and operating expenditure; and
- explore the impact of key assumptions (sensitivity analysis).

The Water Corporation undertakes a review process for all projects included into the five year Asset Investment Program (**AIP**). The Water Corporation refers to this as the "select" process. The "select" process provides justification that the planning triggers have been met to warrant inclusion of the project into the five year AIP.

Following the "select" process, Water Corporation then undertake a top-down, bottom up evaluation to ensure that the detailed projects included in the five year AIP:[356]

- reflect the commitment to completed projects currently in progress;
- align to the longer term SIBC planning;
- optimise the level of service, risk, cost trade-offs;
- are consistent with external (e.g. customer or regulatory) commitments; and
- are deliverable, with regard to the requirement for external approvals and the currents status of the construction market and capacity.

The five year AIP is then subject to Board and Ministerial approval. Capital projects are then reviewed one and three years prior to construction to ensure that the project is still required and to lock the project into the next year's asset investment budget.

The Water Corporation uses a gateway approval process for delivery of capital projects, which have been selected as part of the AIP. The gateways include an approval to 'Activate'; to 'Scope'; and to 'Deliver'.

The Activate phase occurs when the project is assigned a project manager to deliver the project. A scoping phase for project delivery is then completed to set out the timeframes and costs. Once the scoping phase is completed the project proceeds to the approval to deliver gateway.

Water Corporation uses four project drivers for assessing and reporting the AIP:[357]

- Base Capital Maintenance – works required for renewal and, repair or improvement of assets to maintain condition or performance (e.g. Asset Replacement, Dam Safety).

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[355] Water Corporation, Water Corporation Submission to the Economic Regulation Authority - CONFIDENTIAL, March 2017, pp. 23-24.

[356] Ibid, p. 23.

[357] Ibid, p. 27.

- Enhanced Service – works that will enhance level of service being provided to existing customers (e.g. Customer Charter, Licences).
- Supply/Demand (Growth) – works required to increase capacity or satisfy demand.
- Quality & Standards – meet mandatory standards imposed by external regulators or Government.

The Water Corporation prepares Financial Impact Statements (**FIS**) for each project to provide:

- a summary of financial implications for the recommended project option
- operating and maintenance cost information to ensure adequate funds are provided in the operating budget
- financial information for regulated pricing and operating subsidies purposes
- a tool for preparing net present values for options and alternatives analysis during the development of the SIBC and approval processes.

The Water Corporation has developed its own 'Capital Cost Index' (**CCI**) to calculated cost inflation pressures on the asset investment program, the AIP. The CCI is a composite of indices published by the Australian Bureau of Statistics, selected to reflect the composition of the Corporation's capital programs.[358]

The Water Corporation's AIP is subject to internal and external approvals. Board approval is sought on an annual basis for the five year AIP. The AIP is also subject to approval by the Minister for Water and the Treasurer. Also, certain large capital projects require approval by the Minister for Water. The ERA also conducts periodic reviews of the Water Corporations asset management processes (Asset Management System Review).

While the Water Corporation's governance over its capital expenditure is reasonable, there are a number of issues that the Water Corporation should consider in future. The ERA asked Cardno to review the Water Corporation's governance arrangements. This is an important review to understand the process and basis of the Water Corporation's past and forecast capital expenditure.

Cardno noted that the Water Corporation's board approves the AIP. It found that while there appeared to be some governance over the program there did not appear to be any detailed rational or evidence of optimisation presented in the board papers. The projects also appeared to be developed in isolation, at a system level, using its System Risk Assessment tool and the AIP did not indicate evidence of program optimisation or rigorous justification of review. Cardno expected to see evidence of scenario testing that would be carried out to test the robustness of the overall program. Cardno saw no evidence of a rational testing of scenarios, including the impact of service to customers, level of risk or asset performance/serviceability.[359]

Cardno reviewed Water Corporation's asset management framework which is based around Water Corporation's 'Line of Sight' concept. The 'Line of Sight' explains the relationship between Customers, strategic and corporate objectives, business services and relating corporate risk drivers to the various investment categories. The Water Corporation's Asset Management Strategy translates corporate objectives in to asset

[358] In developing the asset base for this review, the ERA has backed this index out and replaced it with the eight cities CPI – see Appendix 9.

[359] Cardno, *Review of capital and operating expenditure plans for the Water Corporation, Report prepared for the ERA*, August 2017, p. 12.

management objectives. During its review, Cardno was informed that the Water Corporation's strategies inform the asset management planning through defining level of services and associated decision making criteria. However, Cardno noted that it has not been provided evidence of how the asset management plan informs scheme planning and investment decisions based on defining service levels. Cardno considers that there is no clear link between the asset management framework and the AIP, especially with respect to how that plan is integrated and optimised.[360]

Cardno reviewed the Water Corporation's cost estimating process. It found that the Water Corporation has built a comprehensive cost estimation system which draws on unit rates received in tender processes to produce scheme estimates. The system also provides a framework for generating schedule of prices for tender processes and for settlement to the Fixed Asset Register and Fixed Location Register at Project Practical Completion stage in a consistent manner.[361]

Actual capital expenditure

The Water Corporation's capital additions increased through to 2013-14, but then decreased in the following two years to 2015-16 (Table 89).[362]

Table 89 Water Corporation's capital additions for 2011-12 to 2015-16 ($ million, nominal)

	2011-12	2012-13	2013-14	2014-15	2015-16
Actual capital expenditure	903.0	967.3	984.2	765.9	578.4

Source: Water Corporation Confidential Submission to the ERA

The Water Corporation has noted key factors contributing to the reduced capital requirement in the two latter years:[363]

- demand management – deferral of upgrades originally planned due to lower per capita water demand;
- economic and social environment – slowing growth across the State has enabled projects to be rescheduled and expenditure re-profiled. Also, step change in capacity provided by recently constructed assets enabled the Water Corporation to absorb additional demand without the need for further upgrades;
- risk profiling – a change to the risk profile has enabled expenditure to be deferred whilst maintaining acceptable risk levels; and
- productivity – improvements made to operational workflows are delivering greater capacity for asset optimisation, delaying the need for capital investment.

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[360] Cardno, *Review of capital and operating expenditure plans for the Water Corporation, Report prepared for the ERA*, August 2017, pp. 20-21.

[361] Ibid, p. 21.

[362] The ERA's review of actual capital expenditure includes 2011-12 to 2015-16. The last inquiry period was 2012-13 to 2015-16. However, the 2011-12 capital expenditure used for the purpose of this inquiry was based on a forecast value. The ERA has assessed the actual capital expenditure for 2011-12 for the purposes of rolling forward that asset base to ensure it reflects actual expenditure.

[363] Water Corporation, *Water Corporation Submission to the Economic Regulation Authority - CONFIDENTIAL*, March 2017, p. 30.

The Water Corporation's capital additions include capitalised interest and the Standard Infrastructure Charge (**SIC**) expenditure. The ERA excludes both of these items for the purpose of determining capital expenditure for Water Corporation's review asset base. The ERA:

- excludes capitalised interest, because its methodology for estimating efficient costs provides a separate return to compensate for the interest costs on borrowing; and
- does not include SIC expenditure, as the expenditure is funded from third party contributions.[364]

Water Corporation's resulting capital expenditure for 2011-12 to 2015-16 – excluding capitalised interest and SIC (Table 90) – follows a similar overall pattern to the total capital additions (Table 89).[365]

Table 90 Water Corporation's capital expenditure (excluding capitalised interest and SIC) for 2011-12 to 2015-16 ($ million, nominal)

	2011-12	2012-13	2013-14	2014-15	2015-16
Actual capital expenditure	758.6	815.0	833.8	649.4	451.0

Source: Water Corporation Confidential Submission to the ERA; Water Corporation file 'PM-#16652717-v1-WC14_-_Capital_Expenditure_Projects'; ERA Calculations

The ERA has converted Water Corporation's forecast capital expenditure to 2015-16 dollars for the purpose of reviewing the expenditure on a consistent price basis. The Water Corporation's capital expenditure by line of business in real dollar millions at 30 June 2016 is provided in Table 91.

Table 91 Water Corporation's capital expenditure by line of business for 2011-12 to 2015-16 (real $ million at 30 June 2016)

Line of Business	2011-12	2012-13	2013-14	2014-15	2015-16
Common	95.7	102.2	89.0	87.8	72.6
Water	532.6	512.7	502.4	260.8	242.9
Wastewater	133.0	192.7	233.2	197.1	130.9
Drainage	1.7	9.4	6.3	2.9	4.1
Irrigation	3.9	3.4	4.0	99.8	0.5
Total	**766.8**	**820.4**	**835.0**	**648.3**	**451.0**

[364] The ERA's treatment of 'capital contributions' is discussed in detail in Appendix 9.

[365] The ERA estimated the value of SIC contributions between 2011-12 to 2014-15 by multiplying the total capital additions, over the period, by the 2015-16 proportion of SIC capital to total capital additions reported in the Water Corporation's 2015-16 AIP.

This capital expenditure, where deemed prudent and efficient, plus prudent and efficient forecast capital expenditure over the period 2016-17 and 2017-18, is used by the ERA to inform the opening capital base as at 1 July 2018.

As noted above, Water Corporation uses four cost drivers to justify capital expenditure. Supply/Demand and Base Capital drivers represent nearly 80 per cent of recent capital expenditure.

Figure 82 Water Corporation's Actual and Forecast Expenditure by Cost Driver for 2011-12 to 2022-23

As shown in Figure 82 above, capital expenditure driven by Supply/Demand has reduced significantly over recent years. In contrast, Base Capital expenditure has been increasing, with the 2016-17 and 2017-18 expenditure significantly higher than the amounts expended in previous years. Cardno has noted that many existing Base Capital projects, including a set of water mains renewals projects/programs, are entering the most expensive part of the delivery phase during 2016-17.[366]

Cardno also noted that the level of Quality & Standards capital expenditure spiked in 2013-14 due to the Mundaring WTP water service project.[367]

Overview of Performance to KPIs

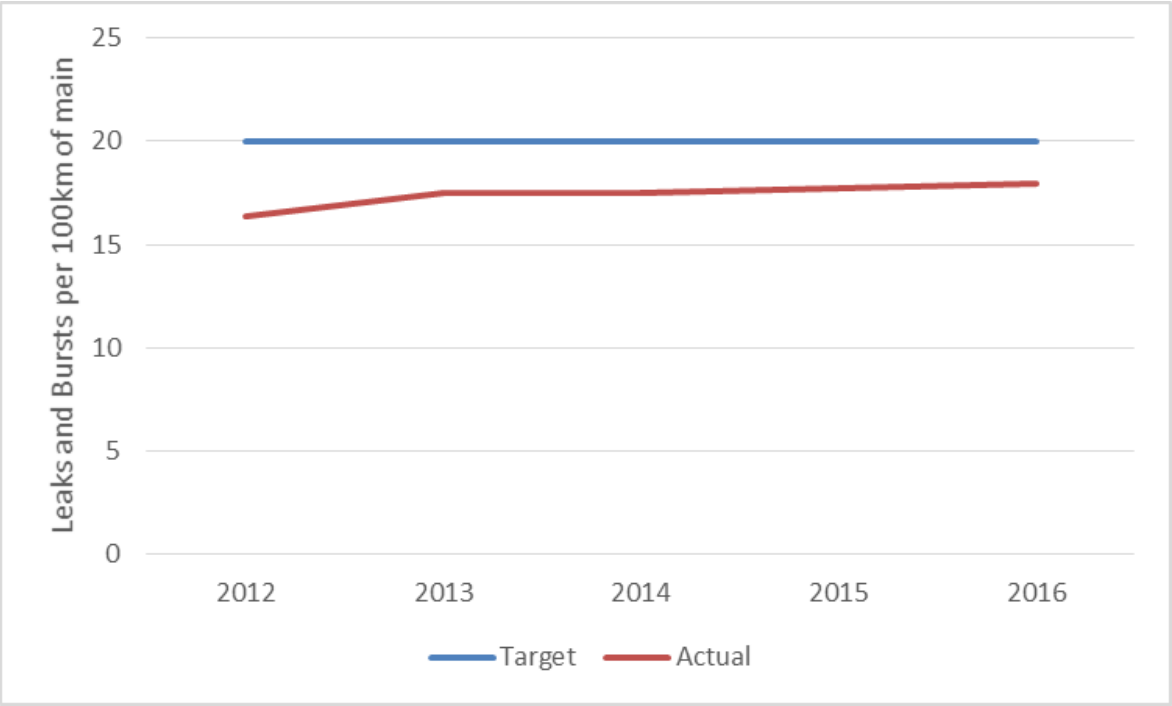
The Water Corporation provided its performance against its Key Performance Indicators (**KPIs**) relating to delivery of services and management of infrastructure assets for its water and wastewater businesses. The Water Corporation's performance based on these

[366] Cardno, *Review of capital and operating expenditure plans for the Water Corporation, Report prepared for the ERA*, August 2017, p. 50.

[367] Ibid, p. 50.

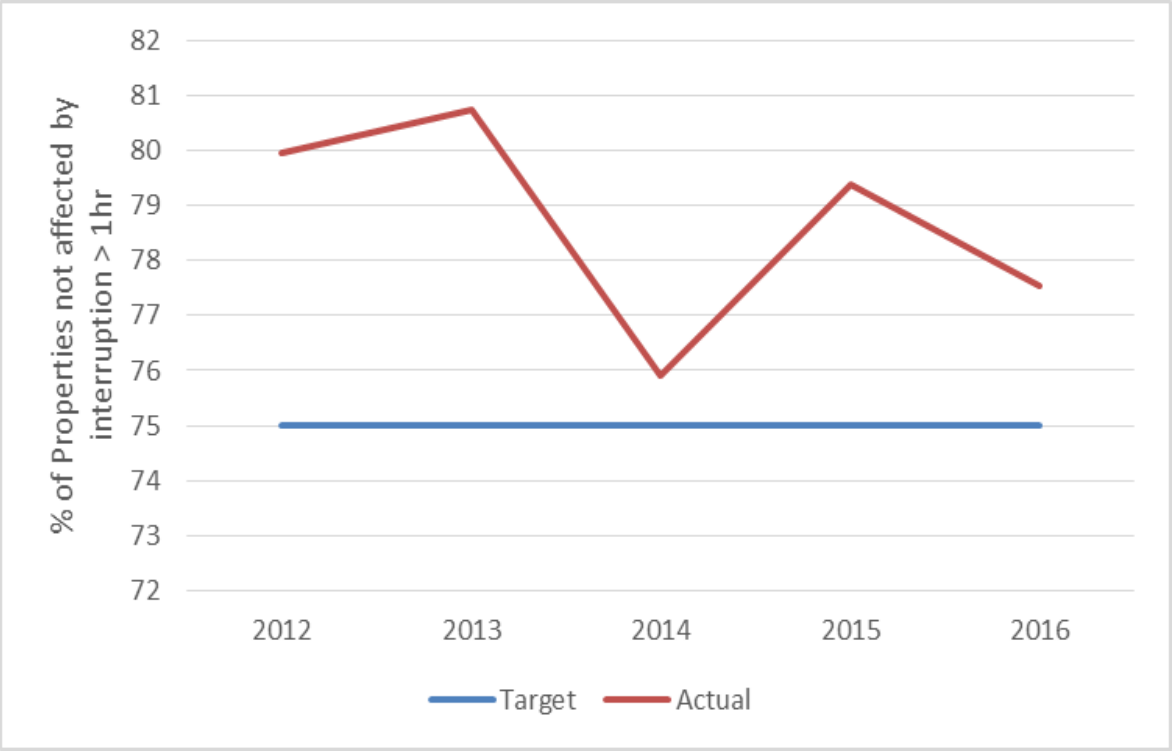
indicators is broadly stable and is exceeding its KPI targets. The following charts show the Water Corporation's service performance against its target for some KPIs.

Figure 83 Water Corporation's Water Leaks and Bursts Performance



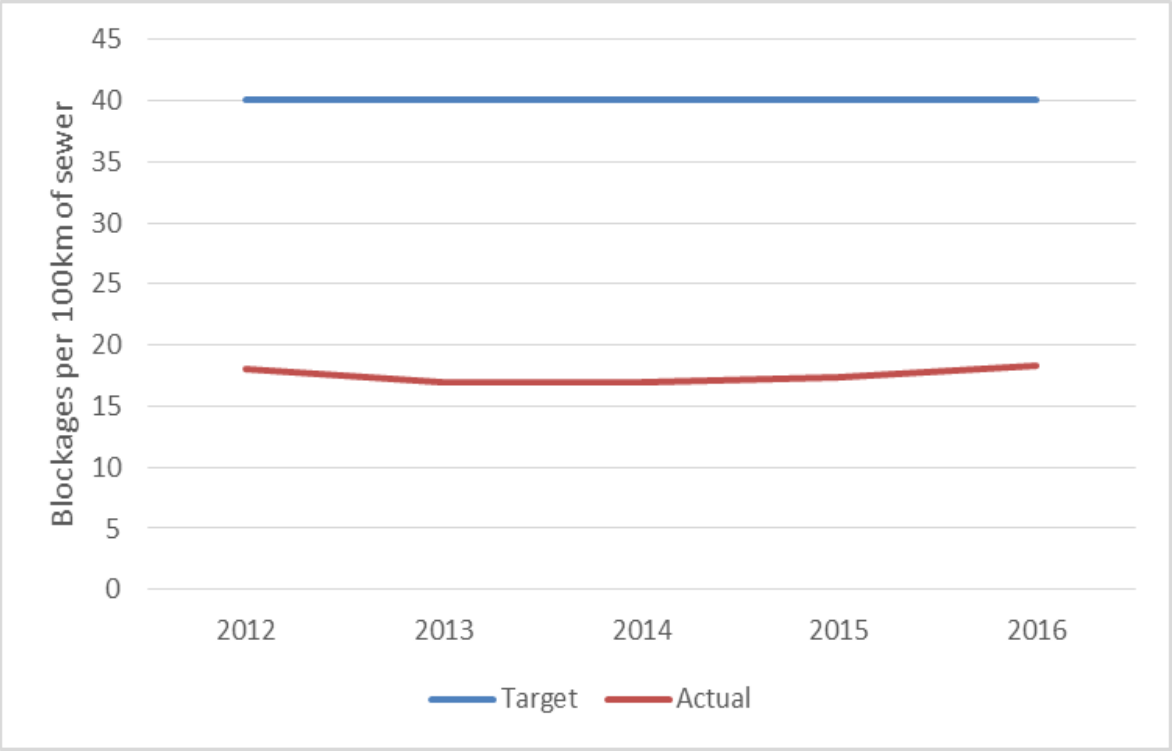
Source: ERA; Water Corporation file 'DS MI #16826553-_Performance_information)_for _the_ERA_(based _on_PM-#16824158)_XLS'

Figure 84 Water Corporation's Water Continuity of Supply Performance



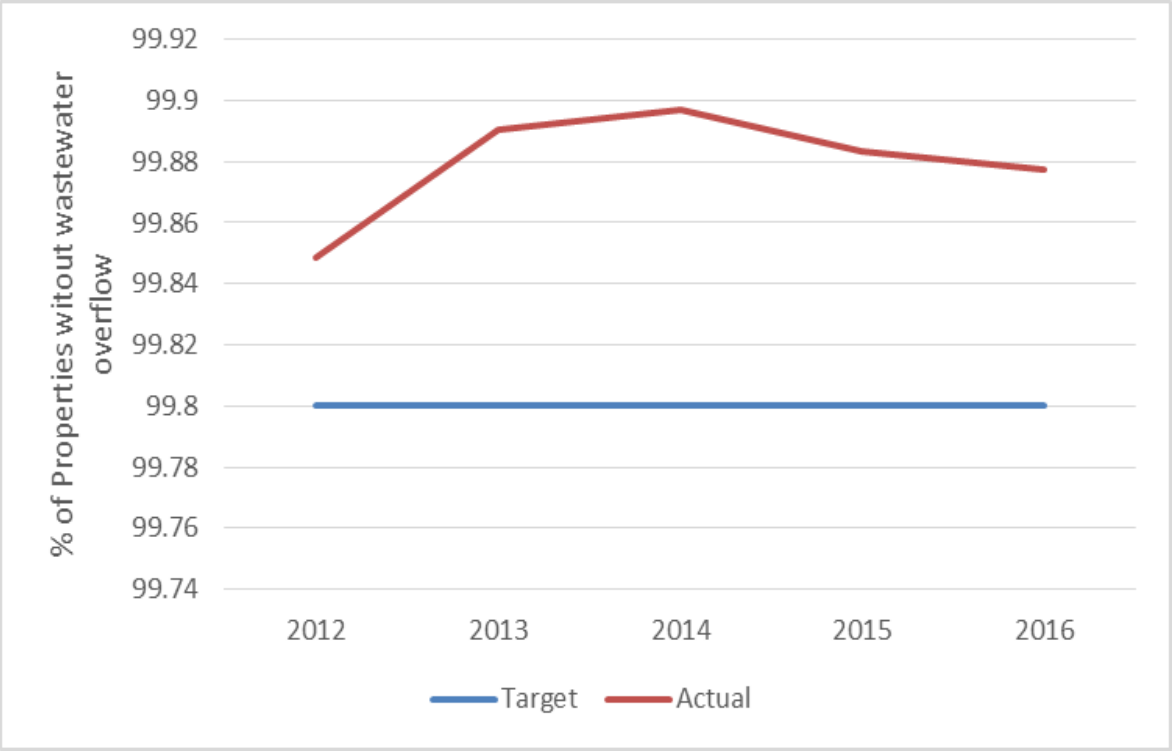
Source: ERA; Water Corporation file 'DS MI #16826553-_Performance_information)_for _the_ERA_(based _on_PM-#16824158)_XLS'

Figure 85 Water Corporation's Sewer Blockages Performance



Source: ERA; Water Corporation file 'DS MI #16826553-_Performance_information)_for _the_ERA_(based _on_PM-#16824158)_XLS'

Figure 86 Water Corporation's Wastewater Overflow Performance



Source: ERA; Water Corporation file 'DS MI #16826553-_Performance_information)_for _the_ERA_(based _on_PM-#16824158)_XLS'

The ERA has not considered whether the Water Corporation's targets are reasonable or whether it meets customer expectations. This would be an extensive exercise and is not possible in the time allowed for this inquiry. For the purposes of this inquiry the ERA assumes that the Water Corporation's KPI targets are reasonable. These are also the same targets that the Water Corporation's management uses to understand its asset performance and presumably gauge whether overall base capital investment[368] should be increased to address performance that is failing its targets. The ERA considers base capital investment for water and wastewater services further below.

Individual Project Reviews

The ERA appointed Cardno to review the Water Corporation's past and forecast capital expenditure. As part of this review, Cardno was required to review a number of projects to assess the efficiency and prudency of these capital projects. The ERA requested that Cardno review 30 capital projects with approximately a third of these to have commenced prior to 2017-18. The ERA and Cardno developed a diversified sample of past and forecast projects across lines of business, cost driver and regions. The sample was limited to projects with a value of greater than $5 million.

Cardno reviewed the following projects with actual expenditure only and not forecast expenditure listed in Table 92.

[368] Base capital investment is expenditure that is not related to growth investment, providing enhanced services or investment related to changing quality and standards.

Table 92 Capital expenditure projects reviewed ($ million, nominal)[369]

Title	Line of Business	Cost Driver	Region/ Group	Cost to end 2015-16
Mundaring WTP & PS C	Water	QS	MWP	276.5
Ord River Irrigation Channel Stage 2	Irrigation	SD	NWR	97.5

Mundaring WTP & PS C

The Water Corporation implemented this project to improve compliance with Australian Drinking Water Guidelines. The water produced from this site was not meeting the guidelines. Cardno reviewed this project, and whilst it did not see a copy of the options appraisal document, it understood that the Water Corporation compared four technology options and selected the least whole life cost option. The $276.5 million project was delivered under a 35 year Design, Build, Operate model following public sector comparison and open market competition. The Mundaring Water Treatment Plant commenced operation in 2013. Cardno noted that this project appears to be prudent and efficient. The ERA is satisfied that this project was prudent in order to ensure this water source met Australian Drinking Water Guidelines. Based on Cardno's understanding that the Water Corporation selected the least whole life cost option; the ERA considers that this project's cost should be efficient.[370]

Ord River Irrigation Channel Stage 2

The ownership of this asset was transferred to the Water Corporation in 2014-15 for $97.5 million. The Water Corporation did not undertake any of the planning, design or construction. It is unclear to the ERA whether this purchase price was reasonable and whether it reflected the economic value of the asset. However, the ERA has not made an adjustment to this value as at this stage, as it does not have a better estimate of the value of this asset.

Capital Expenditure 2011-12 to 2015-16

The ERA has reviewed the Water Corporation's actual capital expenditure based on a sample of projects. The ERA has not recommended any adjustments to the value of capital expenditure based on the sample projects. The ERA recommends accepting the Water Corporation's actual capital expenditure for the period 2011-12 to 2015-16, as shown in Table 93.

[369] QS – Quality & Standards; SD – Supply Demand; MWP – Metro Water Program; NWR – North West Region.

[370] Cardno, *Review of capital and operating expenditure plans for the Water Corporation, Report prepared for the ERA*, August 2017, pp. 54-55.

Table 93 ERA's recommended capital expenditure for 2011-12 to 2015-16 (real $ million at 30 June 2016)

Line of Business	2011-12	2012-13	2013-14	2014-15	2015-16
Common	95.7	102.2	89.0	87.8	72.6
Water	532.6	512.7	502.4	260.8	242.9
Wastewater	133.0	192.7	233.2	197.1	130.9
Drainage	1.7	9.4	6.3	2.9	4.1
Irrigation	3.9	3.4	4.0	99.8	0.5
Total	**766.8**	**820.4**	**835.0**	**648.3**	**451.0**

Forecast Capital Expenditure

The Water Corporation has identified the following four drivers for capital expenditure over the period 2017-18 to 2022-23:[371]

- The ageing asset base and the need for renewal capital expenditure
- The impact of the drying climate and expenditure related to new water sources that are climate independent.
- Required upgrades to wastewater treatment plants and networks to cater for Metropolitan growth, regulatory requirements and alignment with community needs.
- The state of the WA economy and the reduced inflationary impact.

The Water Corporation's estimated capital additions for the period 2016-17 to 2022-23 are reported in Table 94.

Table 94 Water Corporation's estimated capital additions for 2016-17 to 2022-23 ($ million, nominal)[372]

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Forecast capital expenditure	771.9	784.3	769.5	843.4	702.5	734.9	834.9

Source: Water Corporation's Revenue Requirement Model (April 2017) to the ERA; ERA Calculations

As noted above, the ERA excludes capitalised interest and SIC expenditure from the capital expenditure to be added to the capital base. The Water Corporation's estimated capital

[371] The Water Corporation separately reported capital expenditure for 2022-23 (the final year of the inquiry period) but did not include this year when listing drivers of expenditure in its submission.

[372] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

expenditure for the period 2016-17 to 2022-23 – excluding capitalised interest and SIC – is shown in Table 95.

Table 95 Water Corporation's capital expenditure (excluding capitalised interest and SIC) for 2016-17 to 2022-23 ($ million, nominal)[373]

	2016-17	2018-19	2018-19	2019-20	2020-21	2021-22	2022-23
Forecast capital expenditure	679.7	689.5	659.3	718.6	602.2	619.1	645.3

Source: Water Corporation's Revenue Requirement Model (April 2017) to the ERA; ERA Calculations

The ERA has converted Water Corporation's forecast capital expenditure to 2015-16 dollars for the purpose of reviewing the expenditure on a consistent price basis. The Water Corporation's estimated capital expenditure by line of business in real dollar millions at 30 June 2016 is provided in Table 96.

Table 96 Water Corporation's capital expenditure by line of business for 2016-17 to 2022-23 (real $ million at 30 June 2016)[374]

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Common	93.7	76.4	81.6	94.3	94.0	92.5	55.1
Water	390.9	342.1	337.3	388.3	293.8	308.7	355.7
Wastewater	175.1	250.6	225.4	187.0	161.8	135.3	170.3
Drainage	16.4	12.3	7.2	36.7	35.0	37.7	16.0
Irrigation	3.6	8.2	7.8	8.7	8.7	26.8	20.0
Total	**679.7**	**689.5**	**659.3**	**715.1**	**593.3**	**600.9**	**617.1**

The ERA has reviewed Water Corporation's capital expenditure at an individual project level, program level and assessed whether any efficiencies are available.

Individual Project Reviews

The ERA's technical consultant was asked to review a sample of the Water Corporation's estimated capital projects, as discussed under the review of past capital projects. Cardno reviewed the following estimated capital expenditure projects in Table 97.

[373] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

[374] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

Table 97 Capital expenditure projects reviewed ($ million, nominal)[375]

Title	Line of Business	Cost Driver	Region/ Group	Cost to end 2015-16	Forecast from 2016-17 to 2022-23
Woodman Pt WWTP Upgrade to 180 MLD	Wastewater	SD	MWWT	3.5	151.1
IWSS SSDP Expansion to 114 GL/yr	Water	SD	MWP	-	145.8
Perth GWR Stage 2 Plant	Water	SD	MWP	-	114.1
Grange Enhance/Replacement	Common	BC	BATS	-	75.0
Ord Dam Spillway Upgrade	Irrigation	QS	NWR	-	47.1
MC Moorine-Southrn Cross 304.938-326.014	Water	BC	GAR	-	43.4
Perth GWR Stage 2 Recharge Bores	Water	SD	MWP	-	35.4
Quinns MS L-M 1900m of DN1800	Wastewater	SD	PR	-	32.3
SWR Long Term Sludge Treatment Facility	Wastewater	BC	SWR	-	28.9
SSDP Plant Asset Replacement 2020-2024	Water	BC	MWP	-	19.2
Exmouth North 2.5MLD WWTP & TWWM	Wastewater	SD	MWR	1.4	22.9
ARC Flash Mitigation Plan	Common	BC	PR	-	24.0
DN600 Yule Collector Main Renewal 2km	Water	BC	NWR	0.4	19.7
Walpole: New Source	Water	SD	GSR	0.6	17.5
NK Extension Upgrade Stage 3	Water	QS	GSR	-	18.9
Broome South WWTP & TWWM Upgrade	Wastewater	QS	NWR	-	15.9
NK Extension Upgrade Stage 2	Water	BC	GSR	3.9	11.9
Busselton Upgrade Vasse Diversion Drain	Drainage	QS	SWR	1.0	12.7

[375] Cost Drivers: BC – Base Capital; ES – Enhanced Services; QS – Quality & Standards; SD – Supply Demand.

Region: FIN – Finance & Corporate Services Group; MWP - Metro Water Program; MWR – Mid-west region; BATS – Business and Technology Solutions; OG – Operations Group; PR – Perth Region; CCG – Customers and Community Group; SWR – South West Region; NWR – North West Region; MWWT – Metro Wastewater Treatment; GAR – Goldfields Agriculture Region; GSR – Great Southern Region.

Title	Line of Business	Cost Driver	Region/ Group	Cost to end 2015-16	Forecast from 2016-17 to 2022-23
City of Vincent CI Retic Renewals 18-19	Water	BC	PR	-	14.1
Tank sealing 2019FY-2023FY	Water	BC	OG	-	6.0
Bassendean Design Block 7	Water	ES	PR	-	8.6
IMAS Program	Common	BC	BATS	-	7.0
Metro Water Main Renewals 19-20	Water	BC	PR	-	7.0
Gnangara Branch Sewer Section 2	Wastewater	SD	PR	-	7.0
Broome South WWTP Holding Pond Lining	Wastewater	ES	NWR	0.2	5.3
Kununurra New Storage Tank	Water	SD	NWR	-	3.1
Digital Integration	Common	ES	CCG	-	5.0
Vehicle Tool Modules for Leased Vehicles	Common	ES	FIN	-	6.4

Source Water Corporation file PM-#16652717-v1-WC14_-_Capital_Expenditure_Projects

Further detail on scope of each capital project is provided in Cardno's report 'Review of capital and operating expenditure plans for the Water Corporation'. The following provides an assessment of the reasonableness of including each project into the asset base for the purposes of this Inquiry.[376]

Woodman Pt WWTP Upgrade to 180 MLD

Woodman Point is the Water Corporation's largest wastewater treatment plant (**WWTP**). The treatment plant currently receives an average of 141 ML/d which is over its nominal capacity of 120 ML/d. Water Corporation is upgrading the treatment plant to 180 ML/d. Water Corporation has estimated that the cost for the upgrade is nearly $155 million with the majority ($138 million) of the expenditure occurring between 2017-18 and 2019-20.

Water Corporation is using its competitively contracted alliance partners to undertake the upgrade to the Woodman Point WWTP. In its review, Cardno noted that the works are currently running to program and no variation order requests have been issued to date which suggests that the alliance agreement clearly sets out the scope and performance. The upgrade works are also subject to pain/gain sharing arrangement which should be a strong incentive to the constructor to deliver the project efficiently. Cardno considers that it is good practice to work up and compare the cost implications of options in some detail, especially considering the scale of this investment. Cardno noted that this analysis may exist but was not evident from the documentation it reviewed. However, in the absence of

[376] Cardno, *Review of capital and operating expenditure plans for the Water Corporation, Report prepared for the ERA*, August 2017, pp. 61-68.

this documentation, Cardno considered that it was likely this project was prudent and efficient.[377]

The ERA has reviewed Cardno's analysis and considers that no adjustment should be made to the Water Corporation's project expenditure for the Woodman Point WWTP upgrade to 180 ML/d.

IWSS SSDP Expansion to 114 GL/yr

The Integrated Water Supply Scheme covers the south-west of the State. It is currently supplied by a mix of groundwater, desalination, and dams.

To secure the next tranche of water supply, Water Corporation want to expand the Southern Seawater Desalination Plant (SSDP) by 12 GL/yr through capacity enhancements at the plant and in the network. Water Corporation has estimated that the cost of the expansion is nearly $146 million. The main construction phase is expected to occur between 2018-19 and 2019-20. This expansion would increase the nameplate capacity of the SSDP to 114 GL/yr. Cardno has noted that the scope for this project is not yet well defined and is subject to pilots being undertaken and regulatory requirements affecting ocean works. As a result, the cost estimate is at a very early stage. The Water Corporation will need to demonstrate that this was the optimal solution using least cost and that it ensured efficiency in procurement and delivery.[378]

The ERA has reviewed Cardno's analysis and considers that no adjustment should be made to the Water Corporation's project expenditure for the IWSS SSDP Expansion to 114GL per year. However, the Water Corporation should ensure that this expansion to water supply is required and that it is efficient and was the optimal solution before undertaking the investment. There is potential that this type of project could be deferred if dam storage levels increased or customers used less water.

Perth GWR

On 14 July 2016, the previous State Government announced Australia's first Groundwater Replenishment (**GWR**) Scheme will be expanded from 14 GL to 28 GL per year. The first stage of the scheme is in its final stages of commissioning and will recharge 14 GL of recycled water each year into Perth's groundwater supplies through the Leederville and Yarragadee Aquifers. Cardno reviewed the GWR Stage 2 Expansion of the Plant and the Recharge Bores to the North.

Stage 2 Plant

The Water Corporation's second stage of an additional 14 GL per year of GWR is being procured as a Design/Construct contract. As part of the tender process, the Water Corporation shortlisted the contractors to two final contenders, and then seconded Water Corporation staff to both the contractor teams developing the design.

The Water Corporation has recently awarded the contract and now is working through the necessary environmental approvals and early stage engineering of the project.

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[377] Ibid, pp. 63.

[378] Ibid.

Cardno did not review the contract as it was still being finalised. However, following a review of the Water Corporation's procurement approach, it considers the process to be reasonable.[379] The ERA has reviewed the $114 million project and has considered Cardno's advice regarding the procurement. Based on Cardno's review, the ERA considers that the procurement for the contract is reasonable.

Stage 2 Recharge Bores

The Water Corporation has identified four deep bore sites with additional well monitoring around Lake Joondalup to recharge the aquifer from the GWR plant. The project is being competitively tendered and procured under separate packages of work.

Cardno considers that the project is prudent and considers that efficiencies should be realised through the procurement process and economies of scale.[380] The ERA considered whether to adjust this specific project for an expected realisation of cost efficiencies. However, the ERA has considered efficiencies at an aggregate level across the organisation (see further below)

Grange Enhance/Replacement

Cardno noted that in its meetings with the Water Corporation, it was informed that there is no existing business case or identified need to replace its 'Grange' billing system during the inquiry period.[381] There is currently a project underway to make Grange more robust by moving the system to a new platform and rewriting the code. The Water Corporation expects that this expenditure would be sufficient to maintain the system through the inquiry period. During the inquiry period, the Water Corporation will develop a strategy for replacement or renewal of Grange aligned with its wider ICT strategy. Based on the advice of the Water Corporation, the ERA has removed the $75 million of capital expenditure for the Grange Enhance/Replacement project.

Ord Dam Spillway Upgrade

The Ord Dam has been identified [redacted] The Water Corporation has adopted the Australian National Committee on Large Dams guidelines and is tackling the highest risk first. This is tempered by staging remedial works where feasible and using benefit/cost ratios and 'cost to save a statistical life' to evaluate staging options. Cardno considers that the Dam Safety SIBC demonstrates that the Water Corporation are managing dam risk similar to other Australian water providers. Cardno considers that the forecast expenditure is prudent based on the risk profile. However, Cardno couldn't comment on whether the forecast expenditure was efficient, as only a feasibility study has been undertaken. In Cardno's view, it seems reasonable that an amount of expenditure should be allocated for this forward work but that these estimates should be refined as further scoping and investigative studies are undertaken.[382]

The ERA notes Cardno's statements that the project is prudent and agrees that Water Corporation's estimated expenditure for the Ord Dam Spillway upgrade should be included in forecast capital expenditure. The ERA is concerned that Cardno was not in a position to

[379] Ibid.

[380] Cardno, *Review of capital and operating expenditure plans for the Water Corporation, Report prepared for the ERA*, August 2017, pp. 63-64.

[381] Ibid, p. 64.

[382] Ibid.

comment on the efficiency of the forecast capital expenditure. The ERA considers that it efficiency recommendations (set out below) should ensure that this project is delivered efficiently.

MC Moorine-Southern Cross 304.938-326.014

The Water Corporation has estimated that it will spend $43.4 million to rehabilitate part of the Kalgoorlie pipeline between Merredin and Southern Cross. This section of the pipeline was identified due to significant number or repairs over the past five to ten years. Cardno has noted that the project appeared to be prudent and was going out to open tender to best ensure it is procured efficiently. Cardno has found that the Water Corporation has included a contingency of ten per cent of base costs.[383]

The ERA considers that this project is prudent and that the procurement practice of going out to open tender should help to ensure that the project is procured efficiently. While it should be procured efficiently, the ERA is concerned that the overall cost estimate includes a contingency and likely over estimates the cost of the project. As a result, the ERA has removed ten percent from the forecast project to remove the contingency for this project. As with any cost estimate, the actual expenditure may be higher or lower than anticipated. If every project incorporated an additional 10 per cent of the base cost estimate for a contingency, then it is likely that the overall capital program would be overestimated. As the ERA determines efficient revenue based on efficient costs, then the ERA would be overestimating the efficient revenue that should be allowed to the Water Corporation.

Quinns MS L-M 1900m of DN1800

This project is part of a broader program to serve significant greenfield developments with sewage. The $32.3 million project will connect a pressure sewer to the existing Quinns mains sewer so that sewage from new developments can reach Alkimos WWTP. Cardno has noted significant tunnelling is required for this project which a driver for the relatively high cost of this project. Cardno noted that this project is less costly than alternatives examined. Cardno considered that while savings may emerge as the scope is firmed up, the project appeared to be prudent and efficient.[384] The ERA considers that based on Cardno's advice, the project is prudent. The ERA recommends that once efficiency adjustments are made to the aggregate capital expenditure forecast this project will be efficient. As a result, no separate efficiency adjustment is made to this project.

SWR Long Term Sludge Treatment Facility

The Water Corporation has forecast to spend $28.9 million developing a regional wastewater sludge facility for the South West region of Western Australia. The sludge from this area is currently disposed of to landfill or composters, who collect the sludge from the Water Corporation. In Cardno's review, it noted that the project appears to be a contingency plan if the current disposal routes are no longer available. It noted that this project is more costly than the current situation. In Cardno's views it would not be prudent to undertake the project unless the current disposal routes become unavailable. Cardno recommended the deferral of this project beyond the inquiry period.[385] The ERA has considered Cardno's advice and agrees that the project should be deferred.

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[383] Ibid.

[384] Ibid.

[385] Ibid, pp. 64-65.

SSDP Plant Asset Replacement 2020-2024

The SSDP was procured as a Design Build Operate contract with a 25 year operating period. This project line related to replacement of SSDP assets between 2020 to 2024. Cardno has noted that the Design Build Operate contract was chosen from a competitive tender based on whole of life costs (including asset replacement) and with pain/gain share. As a result, Cardno considers that the expenditure appears to be prudent and efficient, subject to ex-post review.[386] The ERA considers that the project expenditure appears to be prudent and is a reasonable estimate of the forecast efficient costs.

Exmouth North 2.5MLD WWTP & TWWM

Exmouth WWTP is in the centre of town in a tourist location. The population of Exmouth doubles in the tourist season. Water Corporation is relocating the WWTP to reduce odour problems and allow development. Cardno noted that the cost estimate appears to be conservative as a 37 per cent contingency has been included, in addition to a 40 per cent regional uplift for some costs. Cardno considered that it was not unreasonable to assume that the benefits do indeed outweigh the costs for this project and therefore is a prudent project.[387]

The ERA notes Cardno's observation that the cost forecast for this project was conservatively estimated. As noted in the MC Moorine-Southern Cross 304.938-326.014 project assessment above, the ERA is concerned that the overall cost estimate includes a contingency and likely over estimates the cost of the project. As a result, the ERA has removed the 37 per cent contingency included in the forecast project costs. The ERA has not adjusted the actual expenditure for this project prior to 2016-17.

As with any cost estimate, the actual expenditure may be higher or lower than anticipated. If every project incorporated an additional 37 per cent of the base cost estimate for a contingency, then it is likely that the overall capital program would be overestimated. As the ERA determines efficient revenue based on efficient costs, then the ERA would be overestimating the efficient revenue that should be allowed to the Water Corporation.

ARC Flash Mitigation Plan

The driver of this expenditure is a management of a health and safety and damage risk associated with switchboard electrical arc flashes. The $24 million project covers mitigation measures from a risk assessment. Cardno notes that based on discussions with Water Corporation staff, the expenditure appears prudent. However, Cardno's review found that the project is double counted in the AIP.[388] The ERA considers that the double count should be excluded and as a result makes an adjustment to the AIP.

DN600 Yule Collector Main Renewal 2km

The Yule collector main is approximately 16 km in length and has had numerous failures along the collector main the supplied the Yule river storage tanks. Cardno has observed that a 2 km section of the collector main has experienced 37 pipe failures between 2013 and 2016.[389] The total budget for this project was originally $24 million but it is now expected

[386] Ibid, p. 65.

[387] Ibid.

[388] Ibid.

[389] Ibid.

to cost $20 million. The ERA considers that this project appears prudent and that revised cost is reasonable.

Walpole: New Source

Walpole's water supply has been unable to meet full summer demand periods. The peak demand is being met by carting at present. The Water Corporations is still undertaking investigations for a new water source for Walpole. Water Corporation's cost estimate in its AIP assumes offline storage from Walpole River. Cardno has noted that the Water Corporation hopes that the solution will be much cheaper than the AIP figure.[390] However, the Water Corporation is not confident this will be the case so has not changed the AIP.

Cardno does not consider that it would be prudent to spend this much money ($19.1 million, including investigations etc) on avoiding seasonal carting for approximately 300 connections. Cardno has not recommended adjusting expenditure up to 2017-18 as it primarily relates to investigations. However, it has recommended a reduction of the majority of the expenditure forecast in 2018-19 and 2019-20 ($17 million) to only $3 million in 2018-19.[391]

The ERA has reviewed Cardno's advice and considers that the level of expenditure has not been justified for this investment. The ERA has made the adjustment recommended by Cardno.

NK Extension Upgrade Stage 2

The NK (Narrogin to Katanning) extension is part of the Great Southern Towns Water Supply Scheme. The main driver of this project is water quality. There was previously a local source and treatment but over time the catchment degradation has increased the risk of abandoning local water sources. To cater for the future growth in towns downstream of Katanning, the NK extension needs to be upgraded under three different stages. Cardno was provided with evidence of extensive optioneering on this project with a variety of options considered. Cardno considered that, based on the information it has reviewed, the project appears prudent and efficient.[392] The ERA has considered Cardno's advice and considers that this project is reasonable.

NK Extension Upgrade Stage 3

As noted above, the NK Extension needs to be upgraded under three different stages. Stage 3 relates to a further 14 km of 350mm steel main. Cardno has noted that the project is at planning phased and may need to be re-scoped as it is linked to a number of other projects which may reduce the size of those projects.

Cardno considers that project to be prudent but has expressed concerns at the cost projection in the AIP of $18.9 million. Cardno suggests that the ERA should use the planning estimate of $12 million and noted that the AIP value seemed high and that there was a need to reflect the stages of projects against current estimates which were forecast during boom times.[393] The ERA agrees with the advice from Cardno and has pro-rated the

[390] Ibid.

[391] Ibid.

[392] Ibid, pp. 65-66.

[393] Ibid, p. 66.

forecast AIP values to reflect a $12 million cost for the NK Extension Upgrade Stage 3 project.

Broome South WWTP & TWWM Upgrade

The Water Corporation is undertaking an investigation and will make a proposal to reduce the nutrient load being discharged to the golf course/Roebuck Bay which is classified as a RAMSAR site, i.e. a wetland of international importance under the RAMSAR convention. Cardno has noted that his project is at a very early stage with no options appraisal carried out yet. The cost allowance is based on an early view of the likely outcome of the investigations and negotiations with the Department of Environment Regulation. Water Corporation's internal timeframe is aiming for practical completion by December 2021 (2021-22 financial year). This is later than that assumed in Water Corporation's AIP (completion by 2020-21). Cardno has recommended a re-profiling of expenditure to reflect the expected later completion date.[394]

The ERA notes that there is still some uncertainty regarding cost estimation given the early stages of this project. However, the cost estimate appears to be a best estimate at this time. The ERA considers that it is reasonable to re-profile the expenditure to align it with internal assumed completion date. The re-profile assumes the same overall cost of $15.9 million for the project but has assumed that the early costs for 2017-18 continue for 2018-19 and the remaining expenditure is divided equally between 2019-20 to 2021-22.

Busselton Upgrade Vasse Diversion Drain

This project relates to the diversion drain for Vasse River which was built in the 1920s to protect Busselton from flooding. It was upgraded in 1993 but floods in 1997 and 1999 caused the drain to overtop. Water Corporation's project envisages reinforcing the existing structure (a 6 km drain with 12 km of 2 m high levy banks). The objective of the project is to manage overtopping, provide adequate capacity and rectify structural defects in the levies. Cardno noted that although designing for a 1 in 100 year event is conservative, the cost analysis carried out suggest that the project is economically justified and the cost estimate appears reasonable. Cardno noted that open tender should allow for efficient procurement.[395]

The ERA considers that it is not unreasonable for the Water Corporation to undertake this project to mitigate for the 1 in 100 year event so long as the costs don't outweigh the costs of the event actually occurring over the period. The ERA has not had the time in this inquiry to investigate this cost of the event occurring versus the cost of the project but considers that it would likely be above the $15.4 million project. The ERA considers that the open tender approach should provide an efficient procurement and had not adjusted the actual or forecast expenditure for this project.

City of Vincent CI Retic Renewals 18-19

The City of Vincent Cast Iron (CI) pipe replacement project is part of a wider program of cast iron replacement which arose subsequent to a review following a catastrophic failure in a pipe in Wellington Street in the CBD. The Water Corporation had thought the pipes were not as old as they actually were as its records on age were based on the 'date of refurbishment' not the actual lay date as it previously thought. The refurbishment dates

[394] Ibid.

[395] Ibid.

were in the 1930s. The Water Corporation's review discovered that there were many pipes that were actual laid in the 1890s.

Cardno reviewed this project but considered that it had not been provided with enough evidence to indicate that levels of service have deteriorated significantly or bursts have risen significantly to justify the levels of expenditure in the program to comment appropriately on the prudence or efficiency of this expenditure. Cardno has recommended an adjustment to the base water capital expenditure SIBC instead of just for this project.[396]

The ERA considers that spending of any amount on replacement of water pipes, not just for this project but similar projects, requires evidence the levels of service have deteriorated significantly, or that some other significant risk may materialise without undertaking replacement. As noted above, Water Corporation's KPIs do not show that the levels of service have deteriorated significantly.

The ERA has not made an adjustment to this project, as it has wider implications for the base water capital expenditure SIBC, which is discussed below in program-specific capital expenditure adjustments.

Tank sealing 2019FY-2023FY

This project is driven by the Water Quality SIBC. Cardno considers that the Water Corporation's cost estimates for this project are not sophisticated but simply comprise limited information from regional managers with very indicative prices. These are placeholder values and deemed to be a 'bucket project'. Cardno considers that it is hard to judge whether this expenditure is prudent or efficient. As a result, it has recommended an adjustment to the base water capital expenditure SIBC discussed below.[397]

The ERA has not made an adjustment to this project. Rather, it has assessed this project at the base water capital expenditure program level (discussed further below).

Bassendean Design Block 7

Water Corporation's Bassendean Design Block 7 project is part of a broader pressure management program to help balance supply and demand in the IWSS. This project has just moved into the scoping phase and the cost estimate is at the preliminary phase. The project will be delivered by the Perth Regional Alliance.

Cardno considers that the project appears to be prudent given its cost effectiveness in the context of the IWSS supply-demand situation and the procurement route appears to be efficient.[398]

The ERA has reviewed this project and considers that the project appears to be prudent and should be delivered efficiently. Once the ERA's recommended efficiency adjustments have been made, the cost allowed should be reasonable for this project.

IMAS Program

Water Corporation's Information Management and Analytics Strategy is a program of initiatives the address the ICT needs identified by the business. The Water Corporation has

[396] Ibid.

[397] Ibid, pp. 66-67.

[398] Ibid, p. 67.

forecast capital expenditure of $7 million over 2016-17 and 2017-18 but has not committed to the total expenditure. Instead, the Water Corporation will commit to small elements of the program as each is demonstrated to be cost beneficial.

Cardno challenged the Water Corporation on the governance over this decision making and was satisfied that the Water Corporation has an appropriate approach to ensure that money is spend prudently and efficiently.[399]

Based on Cardno assessment and the challenge of the governance for this program, the ERA is satisfied that this project is prudent and the cost estimate is reasonable.

Metro Water Main Renewals 19-20

The Water Corporation has instigated this project to take a more planned approach to renewals. In the past, renewals were undertaken on a reactive basis.

Cardno noted that it was unclear from its review how this program of works and allocated money is treated. It appears there is additional money for other reactive works, even though this project is supposed to provide for a more planned approach than reactive works.[400]

The ERA notes that while the Water Corporation is trying to take a more preventative maintenance approach, it is seeking to spend more on reactive works. The ERA has not adjusted this project, but has considered the expenditure at the base water capital expenditure program level (discussed further below).

Gnangara Branch Sewer Section 2

This project involves construction of a gravity sewer as part of investment to connect the sewage from large development taking place rapidly at Ellenbrook to Alkimos WWTP. Cardno reviewed this project and noted that it is currently in planning stage and there was no reason to consider this project imprudent or inefficient.[401] The ERA notes that this project is funded from the Standard Infrastructure Charge, so in any event the expenditure will not be included in the asset base in order to derive network tariffs. This is to ensure the assets directly funded by third parties are not also recouped twice, through network tariffs.

Broome South WWTP Holding Pond Lining

This project involves lining the holding ponds at Broome South WWTP to help to protect Roebuck Bay, a RAMSAR site for migratory birds. It is in delivery stage and is expected to be finished by August 2017. Cardno has noted that procurement was through a 'select tender' process and the out-turn cost should be approximately $4.8 million, lower than the AIP figure of $5.5 million, and lower than the actual to deliver budget request of $7.3 million. The lower cost has been attributed to lower priced tenders than anticipated.[402] The ERA notes that according to the AIP this project commenced in 2015-16 and was expected to be completed in 2018-19, so delivery has been brought forward.

399 Ibid.

400 Ibid.

401 Ibid.

402 Ibid.

Cardno has advised that the expenditure appears to be prudent and efficient. Cardno has recommended an adjustment to take account of the earlier delivery and lower expected outturn cost of $4.8 million instead of $5.5 million.[403]

The ERA considers that the adjustment should be made to reflect the best estimate of forecast outturn cost and earlier delivery of the project. The ERA has adjusted the capital expenditure for this project in 2017-18, so as to reflect the difference between the $4.8 million actual expenditure and the Water Corporation's estimated expenditure for 2015-16 and 2016-17. The ERA has removed the estimated expenditure in 2018-19.

Kununurra New Storage Tank

The Water Corporation is looking to increase existing water storage capacity in Kununurra through a new storage tank. Kununurra is an isolated small town close to the Northern Territory border. This project is within the regional water networks SIBC and covers capacity and renewals. Most of the expenditure falls outside the inquiry period, with the project running until 2024. Cardno noted that it might be possible to push this project back but the Water Corporation seems to have relatively robust demand forecast projects which support the project.[404] The ERA has reviewed the project and considers that it is reasonable.

Digital Integration

Water Corporation's $5 million Digital Integration project is planned to commence from 2017-18 and is one of 51 initiatives in the retail SIBC. Cardno notes that this project is still being defined as to exactly what it is, although expected to include a marketing cloud and customer journey automated software. Cardno noted that there are potential operating expenditure benefits such as reduced cost to serve customers through automation and reducing calls into the contact centre. Cardno considers that there is certainly a need for this type of software so it seems prudent to invest. However, as the exact nature and quantum of licences are not known, Cardno was not able to comment on how efficient the $5 million forecast expenditure is.[405]

The ERA notes that this project may help to deliver the operating expenditure efficiencies recommended in this review. The ERA considers that while there is uncertainty as to the exact nature of how this project will operate, the Water Corporation will still need adequate IT related expenditure. The ERA has not made an adjustment to this project and has considered the quantum of the Retail SIBC below.

Program Vehicle Tool Modules for Leased Vehicles

The Water Corporation refinanced tool modules used on light vehicles. The vehicle tool modules were financed by State Fleet, a government owned financing entity. These tool modules were fully deprecated in parallel with the life of the vehicle. However, the tool modules would often outlast the vehicle lifespan. As a result, the Water Corporation now owns these assets and is able to align the functional asset life. Cardno has noted that these estimated savings are $12,000 per year. Cardno has recommended that the purchase of

[403] Ibid.

[404] Ibid, pp. 67-68.

[405] Ibid, p. 68.

the vehicle tool modules is prudent and efficient.[406] The ERA considers the refinancing and purchase of the light vehicle tool modules was prudent and efficient.

Capital Program Review

The ERA has assessed the Water Corporation's estimated capital expenditure at a program level. As noted earlier, the Water Corporation prepares SIBCs for each key business portfolio, aligned to its line of business (water, wastewater and drainage) and networks (source, conveyance, reticulation, treatment, reuse and discharge). The ERA has assessed the level of expenditure at this level and at cost driver level.

IT & Retail SIBCs

Cardno reviewed the IT & Retail SIBCs together given the similarity of expenditure items. Cardno considers that two projects should be adjusted to form forecast capital expenditure.

The first project is the Grange Enhance/Replacement project which has been discussed above.

The second project relates to IT capex for a project called 'ODSS replacement'. Cardno considers that the $16.7 million ODSS project should be deferred and removed from the expenditure forecast to 2022-23. Cardno noted that it would be prudent to defer major IT capital expenditure until such time as there is a clear roadmap in place to ensure that it is part of an integrated strategy and does not risk creating stranded assets. Cardno recommended that the ODSS replacement project is deferred from 2017-2019 to 2021-23.[407]

Cardno observed that there is significant cross-over between the retail and IT SIBCs, as evidence by the classification of projects such as 'Billing Reform Stage 2" under the IT SIBC and 'Digital Integration' under the retail SIBC. Cardno therefore examined the SIBC balancing adjustments applied to IT and retail in combination.[408]

The Water Corporation makes adjustments to its AIP to align it with expenditure listed in its SIBCs. In some instances, the Water Corporation will make a negative adjustment to remove an amount from its expenditure forecast where projects for that SIBC are above the SIBC amount. In the other case, the Water Corporation makes a positive adjustment to increase the AIP to its SIBC amounts. These adjustments are referred to as SIBC balancing adjustments.

[406] Ibid, p. 55.

[407] Ibid, p. 70.

[408] Ibid, p. 71.

Table 98 ERA's Adjustments to the IT & Retail SIBC Programs (real $ million at 30 June 2016)

Project/Program	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
IT & Retail SIBC Projection **before** Water Corporation balancing	52.4	82.5	40.0	25.32	48.1	59.7	0.0
Water Corporation balancing amount	0.0	(44.7)	2.8	30.2	6.9	(5.5)	28.0
IT & Retail SIBC Projection **after** Water Corporation balancing	52.4	37.8	42.8	55.5	55.0	54.2	28.0
Defer 'Grange Enhancement'	0.0	0.0	0.0	(5.0)	(34.5)	(34.0)	0.0
Defer major IT capital expenditure until roadmap (defer 'ODSS replacement')	(3.0)	(9.7)	(7.0)	0.0	6.6	6.6	6.6
IT & Retail SIBC Projection with ERA adjustments	**49.4**	**28.1**	**35.8**	**50.5**	**27.1**	**26.8**	**34.6**

ARC Flash double counting

As noted above in the individual project review for forecast capital expenditure, the ERA has made an adjustment to remove what appears to be a double count of the expenditure for the ARC Flash Mitigation Plan in the AIP. Cardno estimated that $23.6 million (real dollars at 30 June 2016) had been double counted and should be removed.

Cardno noted that the ARC Flash projects had been allocated to a mix of SIBCs including 'Regional Water Networks', 'Regional Wastewater Treatment, Disposal & Re-use' and 'Metropolitan Wastewater Networks'. It is not allocated to the 'Occupational Safety and Health' SIBC even though the driver of this expenditure is for health and safety. Cardno considered too difficult to robustly link its estimated adjustment for the ARC Flash Mitigation Plan to the balancing adjustments made by the Water Corporation. As a result, Cardno recommended reducing $23.6 million from the 'Common' base capital expenditure driver to which the project line is assigned in the AIP.[409]

The ERA considers that it is too difficult to understand the interaction with the SIBC balancing adjustments made by the Water Corporation and has removed $23.6 million in total from the 'Common' line of business in the relevant years of the ARC Flash Mitigation project.

[409] Ibid, p. 72.

Regional Wastewater Treatment, Disposal & Re-use

Cardno reviewed the interaction between this SIBC and other recommended project level adjustments so as not to double-count SIBC balancing adjustments made by the Water Corporation and the adjustments Cardno proposed. For 2017-18 to 2022-23, the Water Corporation applied a positive balancing adjustment of $86.8 million, or 28 per cent to its 'Regional Wastewater Treatment, Disposal & Re-use' SIBC program.[410]

The ERA has assessed the interaction of the 'Regional Wastewater Treatment, Disposal & Re-use' SIBC with the adjustments to projects assigned to this SIBC.

Table 99 ERA's Adjustments to the Regional Wastewater Treatment, Disposal & Re-use SIBC Program (real $ million at 30 June 2016)

Project/Program	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Regional WWTDR SIBC Projection **before** Water Corporation balancing	38.0	60.4	50.9	46.9	27.8	42.8	0.0
Water Corporation balancing amount	0.0	(9.5)	(0.6)	12.1	30.6	14.8	39.4
Regional WWTDR SIBC Projection **after** Water Corporation balancing	38.0	50.8	50.3	59.0	58.4	57.5	39.4
Defer 'SWR Long Term Sludge Treatment Facility'	0.0	0.0	0.0	(0.2)	(2.1)	(17.7)	(8.4)
Reprofile spend on 'Broome South WWTP & TWWM Upgrade'	0.0	0.0	(0.9)	(4.0)	0.0.	4.9	0.0
Reduce and reprofile 'Broome South WWTP Holding Pond Lining' costs	0.0	1.1	(1.8)	0.0	0.0	0.0	0.0
Remove contingency 'Exmouth North 2.5MLD WWTP & TWWM'	(0.1)	(0.1)	(0.4)	(5.7)	(2.4)	0.0	0.0
Regional WWTDR SIBC Projection with ERA adjustments	**37.8**	**51.6**	**46.6**	**39.8**	**50.1**	**44.8**	**31.0**

[410] Ibid, pp. 72-73.

Water base capital expenditure

The ERA has reviewed the level of Water Corporation's estimated water base capital expenditure. The level of water base capital expenditure is projected to increase significantly in 2016-17. Cardno has noted that this appears to be largely driven by a ramp up in spending on a number of significant mains renewals/projects. This expenditure is then projected to remain at higher level than recent levels.

Cardno has noted that recent performance trends suggest that the Water Corporation's performance is broadly stable and the Water Corporation is exceeding its KPI targets. Cardno considers that given the average remaining asset lives and lack of robust compelling case for an increase in expenditure during the inquiry period, Cardno considers that there is no justification for increasing expenditure above recent levels.[411]

As a result, Cardno has recommended phasing in by 2018-19, an adjustment to maintain water base capital expenditure equal to the average level of spend between 2011-12 and 2015-16.[412]

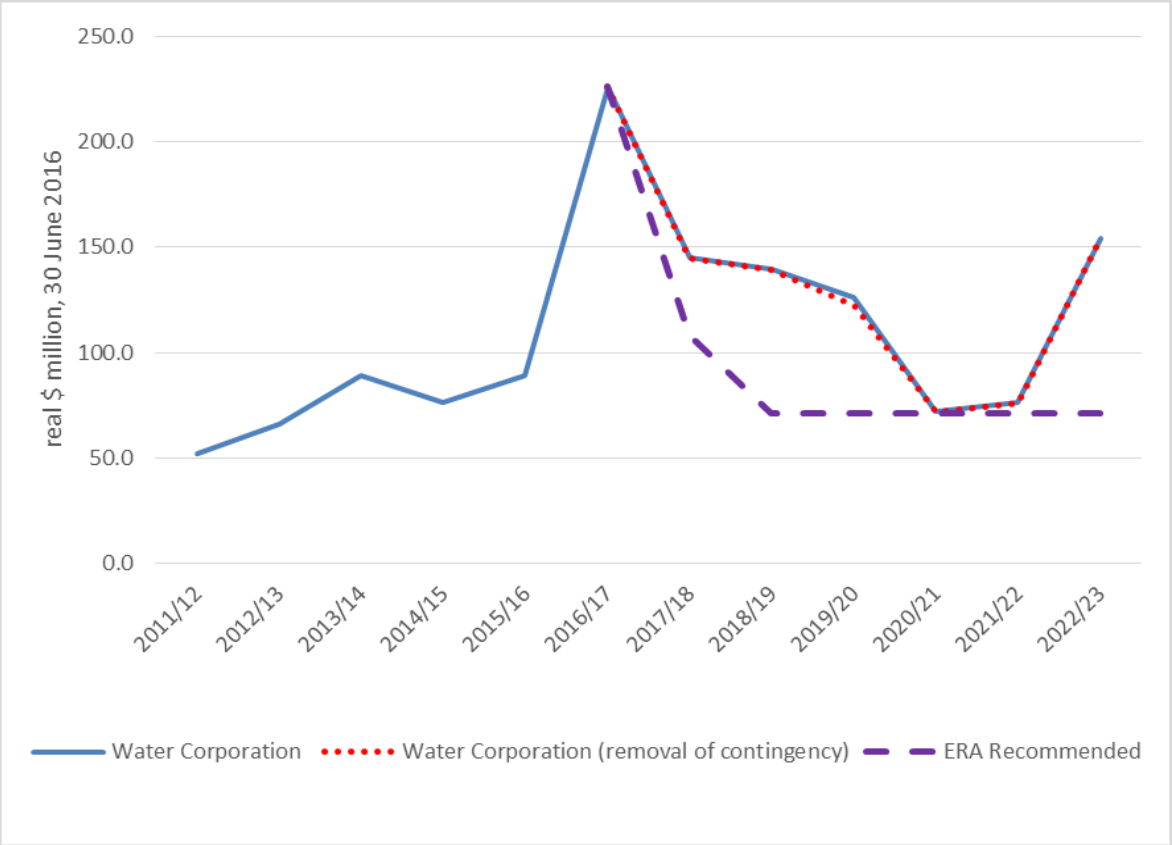
The ERA has considered Cardno's advice and agrees that the Water Corporation's performance at an aggregated level appears to be broadly stable and that the Water Corporation is exceeding its own KPI targets. The ERA also notes Cardno's assessment that the average remaining asset lives do not provide justification for an increase of expenditure over recent levels.

As a result, the ERA has recommended an adjustment to the Water Corporation's estimated expenditure on water base capital. The ERA recommends that this adjustment be phased in by 2018-19 to maintain water base capital expenditure equal to the average level of spend between 2011-12 and 2015-16 ($71.6 million). The net reduction to water base capital expenditure is $249.2 million from 2017-18 to 2022-23. The Water Corporation's actual and estimated water base capital expenditure and the ERA's recommended water base capital expenditure is shown in Figure 87.

[411] Ibid, p. 74.

[412] Ibid.

Figure 87 Water Base Capital Expenditure (real $ million at 30 June 2016)[413]



The ERA reviewed the interaction between its recommended adjustment to this cost driver and other recommended project level adjustments for this cost driver so as not to double-count adjustments.

For 2018-19 to 2019-20, the ERA recommended a reduction to forecast capital expenditure of $4.5 million for the "MC Moorine-Southern Cross 304.938-326.014' project which is part of base water capital expenditure. The ERA's adjustment to water base capital expenditure has not double counted this reduction.

Wastewater base capital expenditure

The ERA has reviewed the level of Water Corporation's estimated wastewater base capital expenditure. The level of wastewater base capital expenditure is projected to increase significantly in 2016-17. Cardno has noted that this appears to be largely driven by a ramp up in spending on a number of significant mains renewals/projects. This expenditure is then projected to remain at higher level than recent levels, with a spike in 2018-19.

Cardno has noted that recent performance trends suggest that the Water Corporation's wastewater service performance is better than the Water Corporation's KPI targets and shows no significant deterioration trend. Also, Cardno considers that given the average remaining asset lives and lack of a robust compelling case for an increase in expenditure

[413] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

during the inquiry period, there is no justification for increasing expenditure above recent levels.[414]

Based on the wastewater base capital expenditure numbers provided to Cardno, Cardno recommended phasing in by 2018-19, an adjustment to maintain wastewater base capital expenditure equal to the average level of spend between 2011-12 and 2015-16.[415]

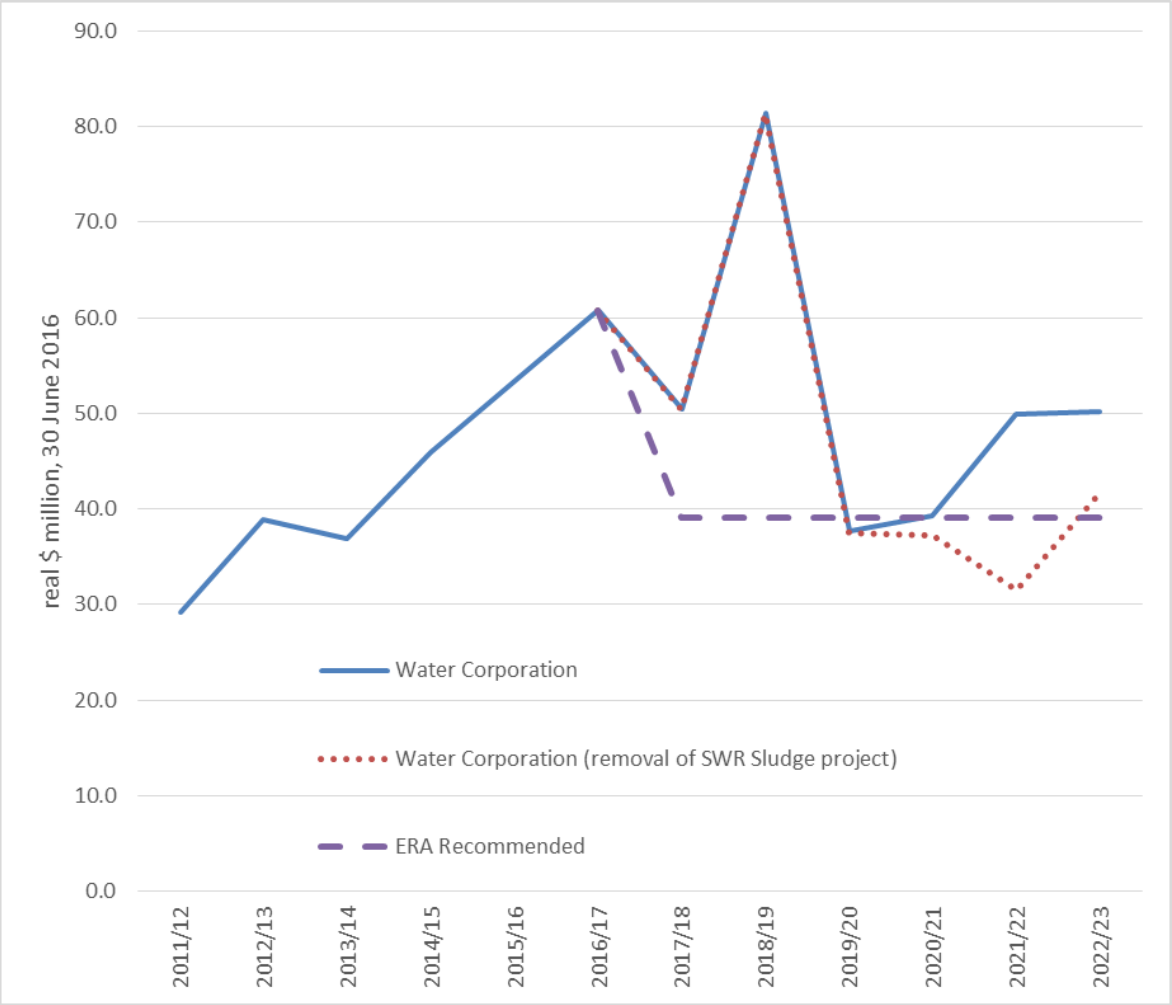
The ERA has considered Cardno's advice and agrees that the Water Corporation's performance at an aggregated level appears to be broadly stable and that the Water Corporation is exceeding its own KPI targets. The ERA also notes Cardno's assessment that the average remaining asset lives do not provide justification for an increase of expenditure over recent levels.

As a result, the ERA has recommended an adjustment to the Water Corporation's estimated expenditure on wastewater base capital. The ERA recommends that this adjustment be made in 2017-18 to maintain wastewater base capital expenditure equal to the average level of spend between 2011-12 and 2015-16 ($39.1 million). The ERA did not adopt Cardno's recommended phase in of the adjustment by 2018-19, as the ERA has based its adjustment on a different wastewater base capital expenditure forecast provided by the Water Corporation. The difference between Water Corporation's estimated wastewater base capital expenditure for 2017-18 is closer to the recent historical average. As a result, the ERA considers that the Water Corporation can reasonably make this adjustment in 2017-18. The ERA makes a positive adjustment in 2019-20 and 2020-21 to maintain the average level of spend between 2011-12 and 2015-16. The net reduction to wastewater base capital expenditure is $20.4 million from 2017-18 to 2022-23. The Water Corporation's actual and estimated wastewater base capital expenditure and the ERA's recommended wastewater base capital expenditure is shown in Figure 88.

[414] Cardno, *Review of capital and operating expenditure plans for the Water Corporation, Report prepared for the ERA*, August 2017, p. 74.

[415] Ibid.

Figure 88 Wastewater Base Capital Expenditure (real $ million at 30 June 2016)[416]



The ERA reviewed the interaction between its recommended adjustment to this cost driver and other recommended project level adjustments for this cost driver so as not to double-count adjustments.

For 2019-20 to 2022-23, the ERA recommended a reduction to forecast capital expenditure of $29.1 million for the "SWR Long Term Sludge Treatment Facility' which is part of base wastewater capital expenditure. The ERA's adjustment to wastewater base capital expenditure has not double counted this reduction.

Regional Water Networks

The ERA has assessed the interaction of the 'Regional Water Networks' SIBC with the adjustments to projects assigned to this SIBC in Table 100.

[416] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

Table 100 ERA's Adjustments to the Regional Water Networks SIBC Program (real $ million at 30 June 2016)

Project/Program	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Regional Water Network SIBC Projection **before** Water Corporation balancing	122.4	85.2	47.8	87.3	37.7	29.4	0.0
Water Corporation balancing amount	0.0	(26.1)	5.1	(40.4)	(4.1)	4.6	99.2
Regional Water Networks SIBC Projection **after** Water Corporation balancing	122.4	59.0	53.0	46.9	33.7	34.0	99.2
Removal of 'MC Moorine-Southern Cross 304.938-326.014	0.0	0.0	(0.3)	(4.0)	0.0	0.0	0.0
NK Extension Upgrade Stage 3	0.0	0.0	(0.4)	(8.6)	(1.3)	(0.2)	0.0
Regional Water Supply & Demand SIBC Projection with ERA adjustments	**122.4**	**59.0**	**52.7**	**42.9**	**33.7**	**34.0**	**99.2**

Regional Water Supply and Demand

The ERA has assessed the interaction of the 'Regional Water Supply and Demand' SIBC with the adjustments to projects assigned to this SIBC in Table 101.

Table 101 ERA's Adjustments to the Regional Water Supply and Demand SIBC Program (real $ million at 30 June 2016)

Project/Program	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Regional Water Supply & Demand SIBC Projection **before** Water Corporation balancing	55.7	62.2	62.7	25.0	23.8	34.3	0.0
Water Corporation balancing amount	0.0	(4.5)	(45.2)	15.7	16.5	5.4	43.4
Regional Water Supply & Demand SIBC Projection **after** Water Corporation balancing	55.7	57.7	17.6	40.7	40.3	39.7	43.4
Walpole New Source Project	0.0	0.0	(13.0)	(1.0)	0.0	0.0	0.0
Regional Water Supply & Demand SIBC Projection with ERA adjustments	**55.7**	**57.7**	**4.5**	**39.7**	**40.3**	**39.7**	**43.4**

Summary of Project and Program Adjustments to Water Corporation Forecast Capital Expenditure

As noted in the previous sub-sections, the ERA has decided that Water Corporation's estimated capital expenditure should be adjusted on a project and program specific basis. The ERA adjustments, converted to real dollars million at 30 June 2016, are listed below in Table 102.

Table 102 Summary of ERA Project and Program-specific Adjustments (real $ million at 30 June 2016)

Project/Program	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Defer Grange Enhancement	-	-	-	(5.1)	(35.8)	(35.2)	-
Defer major IT capital expenditure until roadmap (defer ODDS)	(3.1)	(10.0)	(7.3)	0.0	6.8	6.8	6.8
Removal of contingency from MC Moorine-Southern Cross 304.938-326.014	-	-	(0.3)	(4.1)	-	-	-
Removal of contingency from Exmouth North 2.5MLD WWTP & TWWM	(0.1)	(0.1)	(0.4)	(5.7)	(2.4)	0.0	0.0
Double counting of ARC Flash project	-	(4.1)	(4.1)	(4.1)	(4.1)	(4.0)	(4.0)
NK Extension Upgrade Stage 3	-	-	0.0	(2.6)	(4.1)	0.0	0.0
Defer SWR Long Term Sludge Treatment Facility	-	-	-	(0.2)	(2.1)	(18.3)	(8.4)
Wastewater base capital expenditure adjustment	-	(7.1)	(38.1)	5.8	6.1	11.6	1.4)
Re-profile spend on Broome South WWTP & TWWM Upgrade	-	-	(0.9)	(4.1)	0.0	5.1	-
Reduce and re-profile Broome South WWTP Holding Pond Lining costs	-	1.0	(1.8)	-	-	-	-
Water base capital expenditure adjustment	-	(36.6)	(68.0)	(50.6)	(0.6)	(4.7)	(82.5)
Prudent capital expenditure for Walpole New Source	-	-	(13.6)	(1.0)	-	-	-
Total	**(3.2)**	**(57.1)**	**(134.6)**	**(71.8)**	**(36.3)**	**(38.8)**	**(86.7)**

Source: ERA Calculations

Efficiency Adjustments

In its review of the Water Corporation's capital expenditure, Cardno found a number of areas where it should be possible for the Water Corporation to achieve efficiencies beyond the project and program-specific adjustments noted above.

Cardno, considers that there are four areas for cost efficiency:[417]

- cost estimation;
- benefits case challenge and program optimisation;
- competitive supplier environment; and
- continuing efficiency.

The ERA considers each area below in deciding the general cost efficiencies that Water Corporation should be able to achieve.

Cost estimation

Cardno found that despite the Water Corporation having a comprehensive cost estimation system, there was significant subjectivity in the contingency allowances and regional adjustments. Cardno considered that there was probably some subjectivity applied to the cost escalation factor applied. Cardno understands that there is an incentive built in the cost estimating team's KPI to forecast conservatively and that this team's aggregate estimates have generally been higher than outturn costs.[418]

Cardno considers it likely that there is a systematic over-estimation of capital expenditure. As a result, Cardno recommended a five per cent adjustment from 2017-18, across the capital expenditure program, to take account of the over-estimation. This adjustment is consistent with the KPI target of the cost estimation team.[419]

The ERA considers that this adjustment to remove a systematic bias in capital expenditure is necessary to determine the efficient costs for the Water Corporation. The ERA seeks to calculate an amount that would financially compensate the Water Corporation for a best forecast of expenditure to be incurred, not an inflated estimate. The ERA recommends that this adjustment should commence from capital expenditure forecast from 2016-17, instead of 2017-18. The ERA does not see a reason why this adjustment should not occur sooner, given the adjustment is to happen to a 2016-17 forecast level of expenditure, and not to actual expenditure.

Benefits case challenge and program optimisation

Cardno found that the Water Corporation was not able to demonstrate evidence, upon firm challenge, of the urgency, need and scope of expenditure required for many of the projects it reviewed. Cardno noted that when it challenged 'why now, why not defer' in its meetings with the Water Corporation, the answer was quite often 'we could defer this if needed'.

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[417] Cardno, Review of capital and operating expenditure plans for the Water Corporation, August 2017, pp. 78-79.

[418] Ibid, p. 78.

[419] Ibid.

Cardno considered that this impression was further strengthened by the size of the balancing adjustments applied over time at SIBC program level. This suggested that the Water Corporation had limited confidence in the justification, timing and/or scale of expenditure required at project level.[420]

The ERA shares Cardno's concerns regarding the lack of supporting evidence for the Water Corporation's project level expenditure, or of any strong internal benefits challenge. A strong internal challenge process should occur to ensure that only reasonable estimates of efficient and prudent expenditure should be allowed into forecast capital expenditure.

Accordingly, Cardno has recommended a one percent decrease to annual capital expenditure, occurring from 2018-19, and cumulating over the inquiry period.[421]

It will take some time for the Water Corporation to realise the benefits from a stronger internal challenge process. As a result, the ERA recommends that an adjustment for a stronger internal challenge process should commence from 2018-19.

Competitive supplier environment

Cardno noted that in addition to the systemic cost over-estimation, it heard from many project managers that recent tenders were coming in at a lower rate than previously, because of excess supply in the construction sector. Water Corporation's Construction Cost Index (**CCI**) forecast does reflect low growth over the inquiry period, but does not point to a reduction in capital costs. Cardno recommended that an adjustment of two per cent from 2018-19 should be applied, in order to reflect the difference between the CCI forecast applied and the anecdotal stories of recent tenders received.[422]

The ERA has considered Cardno's recommendation and the current state of Western Australian construction sector, and recommends that a two per cent adjustment should be applied from 2018-19.

Continuing efficiencies

Cardno notes that there is are ongoing efforts in the Australian water industry, the wider Australian economy and internationally to pursue innovation. This will reduce the unit cost of service delivery. Cardno considered that, based on its review, the Water Corporation was well placed to drive and benefit from innovation in the water sector and wider economy. As a result, Cardno has recommended that the Water Corporation be set a capital expenditure continuing efficiency target of 0.25 per cent per year to reflect capital savings which can be made through innovation and continuous improvement. Cardno considers that this continuing efficiency is conservative and achievable by the Water Corporation during the inquiry period. Cardno noted that this target was consistent with other recent regulatory decisions in Australia (e.g. Sydney Water, SA Water).[423]

The ERA notes that ESCOSA applied a continuing efficiency factor of 0.4 per cent per year in its SA Water Regulatory Determination 2016.[424] IPART applied a continuing efficiency

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[420] Ibid.

[421] Ibid.

[422] Ibid., p. 79.

[423] Ibid.

[424] Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 – Final determination*, June 2016, p. 110.

factor of 0.25 per cent per year in its 'Review of prices for Sydney Water Corporation' completed in 2016.[425]

In past inquiries, the ERA has not applied a continuing efficiency target on the Water Corporation's capital expenditure. However, given the construction of the Water Corporation's capital expenditure forecast for this inquiry and reliance on SIBC balancing items, it is appropriate to assess continuing efficiencies at an overall level, rather than a project by project level.

It is reasonable to expect that innovation and continuous improvement will occur during the forecast period. The ERA endorses Cardno's recommended continuous efficiency adjustment and therefore applies a 0.25 per cent per year efficiency for continuous improvement.

Efficiency factors

The ERA's recommended efficiency factors to be applied are shown in Table 103. These factors have been applied to the adjusted capital expenditure following the ERA's project and program specific adjustments (in real dollars at 30 June 2016). The ERA has allowed for inflation based on its estimate of CPI to determine capital expenditure in nominal amounts.

Table 103 ERA's recommended efficiency factors for 2016-17 to 2022-23

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Cost – estimation contingency	5%	-	-	-	-	-	-
Benefits case challenge and program optimisation	-	-	1%	1%	1%	1%	1%
Competitive supplier environment	-	-	2%	-	-	-	-
Continuing efficiency	-	-	0.25%	0.25%	0.25%	0.25%	0.25%
Efficiency factor to apply	**0.95**	**0.95**	**0.92**	**0.91**	**0.90**	**0.89**	**0.87**

Source ERA

Recommended Capital Expenditure – 2016-17 to 2022-23

The resulting prudent and efficient capital expenditure recommended for the Water Corporation's asset base for the 2016-17 to 2022-23 period is set out in Table 104. The ERA's justification for adjustments is detailed above.

[425] Independent Pricing and Regulatory Tribunal of New South Wales, *Review of prices for Sydney Water Corporation – from 1 July 2016 to 30 June 2020 – Final Report*, June 2016, p. 111.

Table 104 ERA's recommended capital expenditure for 2016-17 to 2022-23 (real $ million at 30 June 2016)[426]

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Common	86.0	63.0	68.4	80.9	58.2	56.6	54.1
Water	371.4	290.2	234.7	299.6	259.1	269.0	238.8
Wastewater	166.3	228.1	165.4	162.1	142.7	114.7	139.1
Drainage	15.6	11.7	6.7	33.3	31.3	33.4	14.0
Irrigation	3.4	7.8	7.2	7.9	7.8	23.7	17.5
Total	**642.7**	**600.8**	**482.3**	**583.9**	**499.2**	**497.5**	**463.5**

The ERA's recommended appropriate level of capital expenditure is $795.2 million lower than the Water Corporation's estimated capital expenditure. The ERA's recommended appropriate level of capital expenditure and Water Corporation's estimated capital expenditure is shown in Table 105.

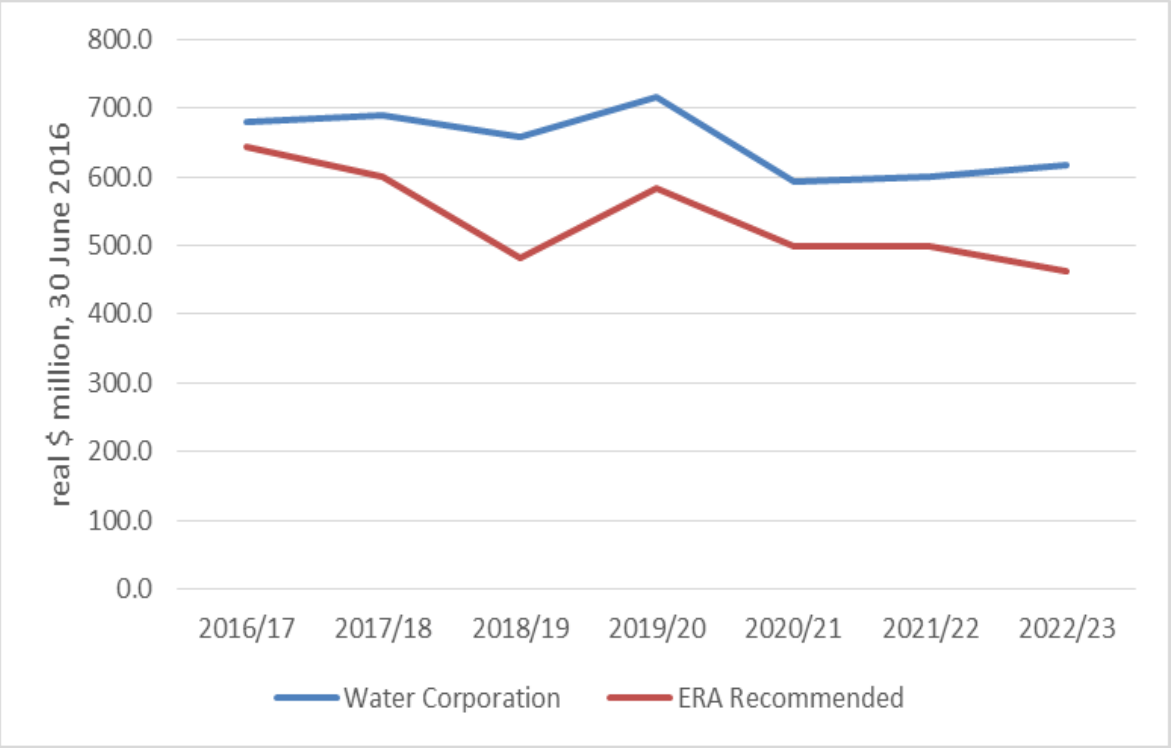
Table 105 Water Corporation's estimated and ERA's recommended capital expenditure for 2016-17 to 2022-23 (real $ million at 30 June 2016)[427]

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Water Corporation estimated capital expenditure	679.7	689.5	659.3	715.1	593.3	600.9	617.1
ERA recommended capital expenditure	642.7	600.8	482.3	583.9	499.2	497.5	463.5

[426] The ERA's recommended capital expenditure includes $3.1 million for contestable business capital expenditure which is excluded in the roll-forward of the asset base tables in section 3 of the report for determining total revenue. This estimate was provided by the Water Corporation in its modelling sent to the ERA.

[427] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

Figure 89 Comparison of Water Corporation's estimated and ERA's recommended capital expenditure for 2016-17 to 2022-23 (real $ million at 30 June 2016)[428]



The ERA considers that an aggregate level, the ERA's recommended capital expenditure is appropriate and reflects the current economic situation in Western Australia. The ERA also considers that the Water Corporation has provided a lack of justification for its estimated increase in base capital expenditure.

Aqwest

Aqwest's governance processes for undertaking capital expenditure planning and execution are reviewed, as a first step.

Actual and forecast capital expenditure are then evaluated.

Capital expenditure planning and execution process

To assist with the review of capital expenditure, the ERA's technical consultant, Cardno, has undertaken a review of Aqwest's main systems and processes used to budget, monitor and report capital expenditure. The ERA notes Cardno's overall findings that Aqwest has continually improved its systems and processes since the previous 2012 inquiry, such that all 12 elements of its asset management system were last audited[429] with the highest rating for adequacy and performance.[430] Specific findings include the following.

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[428] Water Corporation's 2022-23 estimated capital and operating expenditure information is indicative and provided only for the purpose of the ERA's Inquiry.

[429] Aqwest's asset management system was last independently audited in 2013 by PricewaterhouseCoopers.

[430] Cardno, *Review of capital and operating expenditure plans for Aqwest, Report prepared for the ERA*, August, pp. 10-15.

- Aqwest's business planning processes include a five-year strategic development plan and statement of corporate intent. These documents, which are endorsed by Aqwest's Board and executive team, set the strategic direction of the business and are the basis on which management decisions are made.
- Corporate governance principles are set out in Aqwest's strategic management plan, while governance arrangements for projects are documented in the asset management plan. Approvals for specific expenditure levels are contained with Aqwest's financial management manual.
- Aqwest employs staff that are categorised into one of three categories for financial purposes: 1) finance and administration; 2) water services administration or 3) distribution and treatment operations. Aqwest allocates overheads to service tasks and capital works as a proportion of the direct labour charged. As of 2015-16, the allocation method for overheads was modified so that the number of overheads directly attributed to works was reduced, and remaining expenses previously allocated as overheads are separately identified in 'other costs of services'.
- Aqwest has a comprehensive asset management framework. The introduction of an asset risk and criticality framework and compliance with the international asset management standard series (ISO 55000) has improved this framework.
- Aqwest does not have a formal policy for cost estimation. Cost estimates produced by consultants are often used. Aqwest's capital and operating expenditure programs are relatively small and because of this cost estimation is undertaken on a case-by-case basis.
- Aqwest's procurement approach generally follows the State Government's procurement practice guide. A contract management manual requires all acquired assets to follow Aqwest's tender policies.
- A new corporate risk management system was introduced in 2015-16, which better integrates information on risks, compliance obligations, strategies, controls, actions, incidents and hazards. Aqwest has a risk management committee. The committee takes a business wide strategic approach to risk management and maintain a risk management charter. Oversight of the entire risk framework is undertaken by the Aqwest Board.

Considering Cardno's findings, the ERA is satisfied that Aqwest has appropriate processes and governance arrangements in place for capital expenditure projects.

Actual capital expenditure

The ERA has considered Aqwest's actual capital expenditure in previous years that will establish the opening capital base as at 1 July 2018. Aqwest spent $16.362 million in total over the period 2011-12 to 2015-16 and is expected to incur $3.689 million in 2016-17 and $10.261 million in 2017-18 (see Table 106).

Aqwest has a relatively constant capital works program which can be significantly affected by large projects. The proposed Glen Iris Water Treatment Plant represents over 70 per cent of the total capital expenditure estimated for 2017-18.[431]

[431] At the date of release of this report formal approval for the construction of the Glen Iris Water Treatment Plant has not been obtained by Aqwest.

Table 106 Aqwest actual capital expenditure for 2011-12 to 2017-18 (real $ millions at 30 June 2016)[432]

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17*	2017-18*
Actual capital expenditure	4.280	3.779	3.070	2.766	2.468	3.689	10.261

* forecast

Source: ERA Calculations

As part of this review, Cardno was required to review five capital projects (historical and forecast) to assess the efficiency and prudency of these capital projects. The ERA and Cardno developed the sample of past and forecast projects to as much as possible, represent the capital program.

In considering Aqwest's actual capital expenditure, the ERA notes Cardno's findings from a review of two major capital expenditure projects.[433] In summary, Cardno's assessment concludes that Aqwest's capital expenditure program is relatively small, with one or two larger capital projects comprising the majority of the program.[434] Cardno did not identify any areas of concern related to the projects reviewed. On this basis, Cardno recommends that no adjustments be made to Aqwest's actual capital expenditure as incurred.

The ERA has confirmed with Aqwest that its reported capital expenditure for the period 2011-12 to 2017-18 includes expenditure for capital assets that have been funded by cash contributions.[435] For this inquiry, and to determine Aqwest's opening capital base, the ERA has deducted cash contributions from Aqwest's capital expenditure (see Table 107). Cash contributions should not form part of Aqwest's capital base as discussed elsewhere in this report (refer to appendix 13).

The ERA has removed cash contributions at the asset category level based on Aqwest's methodology for calculating its headworks charge. Where capital expenditure for an asset category is lower than the cash contribution value for that asset category in a particular year, the remaining cash contribution value is carried over to future years until it is removed.

[432] Aqwest has planned for the construction of the Glen Iris Water Treatment Plant to commence in 2017-18. The project is discussed further below. As a result, the capital expenditure in 2017-18 and 2018-19 is higher than other years. At the date of release of this report formal approval for the construction of the Glen Iris Water Treatment Plant has not been obtained by Aqwest.

[433] Project 3691 – Tech School Reservoir Remediation and Project 3650 – Water Quality Centre and Storage Facility.

[434] Cardno, *Review of capital and operating expenditure plans for Aqwest, Report prepared for the ERA*, August 2017, p. 28.

[435] Correspondence from Aqwest, 'Re: Water Inquiry 2016 – Aqwest – BW4 – Capex/Opex', received 14 June 2017.

Table 107 Aqwest actual capital expenditure net of cash contributions (real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17*	2017-18*
Actual capital expenditure	4.280	3.779	3.070	2.766	2.468	3.689	10.261
Less: Actual cash contributions	0.382	0.254	0.326	0.771	0.638	0.158	0.097
Actual capital expenditure net of cash contributions	3.897	3.525	2.743	1.995	1.830	3.531	10.165

* forecast

Source: Aqwest

The ERA considers Aqwest's actual capital expenditure incurred to be prudent and efficient. The ERA's approved capital expenditure recommended to establish Aqwest's opening capital base for review period is shown in Table 108.

Table 108 ERA's recommended capital expenditure for 2011-12 to 2017-18 (real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17*	2017-18*
ERA recommended capital expenditure	3.897	3.525	2.743	1.995	1.830	3.531	10.165

* forecast

Source: ERA Calculations

Forecast capital expenditure

Aqwest proposes to spend a total of $26.391 million on capital expenditure items over the review period 2018-19 to 2022-23. Table 109 contains a breakdown of Aqwest's forecasts for each year within the review period. As noted above, the Aqwest capital expenditure is relatively constant and affected by large capital projects. The spike in expenditure for 2018-19 is a result of the continuation of the Glen Iris Water Treatment Plant.[436] The spike in 2021-22 expenditure reflects a proposed upgrade at the Roberson Water Treatment Plant.

As noted above, the ERA has excluded cash contributions from the forecast capital expenditure for the purposes of determining the asset base for this inquiry. An amount of $48,267.50 for cash contributions for Reservoirs assets is to be carried forward and is to be removed from Reservoir assets in 2023-23 and beyond.

[436] At the date of release of this report formal approval for the construction of the Glen Iris Water Treatment Plant has not been obtained by Aqwest.

Table 109 Aqwest forecast capital expenditure for 2018-19 to 2022-23 (real $ millions at 30 June 2016)

	2018-19	2019-20	2020-21	2021-22	2022-23
Forecast capital expenditure	11.146	3.853	3.272	6.021	2.100
Less: Forecast cash contributions	0.097	0.097	0.097	0.097	0.048
Forecast capital expenditure net of cash contributions	**11.049**	**3.756**	**3.175**	**5.924**	**2.051**

Source: ERA Calculations

The ERA has considered Cardno's assessment of Aqwest's forecast capital expenditure. The ERA notes that Aqwest's capital expenditure program is affected by individual capital projects and the timing of these projects. Variances between individual projects may also be significant. Cardno's review of three proposed capital expenditure projects demonstrates this variance, with the variance between two projects (project number 3021 and 3659) being more than $13 million.[437]

- Project 3021 – Plant and motor vehicles (total cost $1,644,804)
- Project 3161 – Mains replacement (total cost $2,719,700)
- Project 3659 – Design/construct Glen Iris WTP[438] (total cost $15,197,854)

Cardno's assessment of the above capital projects does not identify any areas of concern and no recommendations are made to adjust Aqwest's forecast capital expenditure at the project level. Cardno does however recommend an overall adjustment to capital expenditure based on an efficiency factor (discussed below).

Cardno is of the view that there are opportunities for Aqwest to improve its practices and realise efficiencies in future expenditure delivery. Cardno has recommended that a continuing efficiency factor of 0.25 per cent be set for each year of Aqwest's capital expenditure program over the review period. Cardno consider that this relatively small continuing efficiency target is achievable for Aqwest as it continues to improve in the delivery of its services and implement innovative ideas and practices.[439]

The ERA notes that ESCOSA applied a continuing efficiency factor of 0.4 per cent per year in its SA Water Regulatory Determination 2016.[440] IPART applied a continuing efficiency factor of 0.25 per cent per year in its 'Review of prices for Sydney Water Corporation' completed in 2016.[441]

It is reasonable to expect that innovation and continuous improvement will occur during the forecast period. The ERA endorses Cardno's recommended continuous efficiency adjustment and therefore applies a 0.25 per cent per year efficiency for continuous

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[437] Cardno, *Review of capital and operating expenditure plans for Aqwest, Report prepared for the ERA*, August 2017, p. 28.

[438] At the date of release of this report formal approval for the construction of the Glen Iris Water Treatment Plant has not been obtained by Aqwest.

[439] Cardno, *Review of capital and operating expenditure plans for Aqwest, Report prepared for the ERA*, August 2017, p. 30.

[440] Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 – Final determination*, June 2016, p. 110.

[441] Independent Pricing and Regulatory Tribunal of New South Wales, *Review of prices for Sydney Water Corporation – from 1 July 2016 to 30 June 2020 – Final Report*, June 2016, p. 111.

improvement. The efficiency factor is applied to Aqwest's capital expenditure net of cash contributions. The efficiency factors applied are shown in Table 110.

Table 110 ERA's recommended efficiency factors for 2018-19 to 2022-23

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Continuing efficiency	-	0.25%	0.25%	0.25%	0.25%	0.25%
Efficiency factor to apply	**1.0000**	**0.9975**	**0.9950**	**0.9925**	**0.9901**	**0.9876**

Source ERA

The ERA's recommended capital expenditure for 2018-19 to 2022-23 is shown in Table 111.

Table 111 ERA's recommended capital expenditure for 2018-19 to 2022-23 (real $ millions at 30 June 2016)

	2018-19	2019-20	2020-21	2021-22	2022-23
Forecast capital expenditure net of cash contributions	11.049	3.756	3.175	5.924	2.051
Continuing Efficiency Adjustment	(0.028)	(0.019)	(0.024)	(0.059)	(0.025)
Recommended capital expenditure net of cash contributions	**11.022**	**3.738**	**3.152**	**5.865**	**2.026**

Source ERA

Busselton Water

Busselton Water's governance processes for undertaking capital expenditure planning and execution are reviewed, as a first step.

Actual and forecast capital expenditure are then evaluated.

Capital expenditure planning and execution process

To assist with the review of capital expenditure, ERA's technical consultant, Cardno, has undertaken a review of Busselton Water's main systems and processes used to budget, monitor and report capital expenditure. The ERA notes Cardno's summary of findings that Busselton Water has a strategic management framework that:[442]

- Sets strategic priorities / objectives and outlines the policies, procedures and work instructions required to achieve these objectives.
- Provides integration and consistency of procedures and policies as linked to the strategic priorities.

[442] Cardno, *Review of capital and operating expenditure plans for Busselton Water, Report prepared for the ERA*, August 2017, p. 6.

- Provides an internal control and review structure that should generate expenditure that is prudent, delivered in a timely fashion, and at an efficient cost.
- Provides clear processes that can be internally and externally audited.

Considering Cardno's findings, the ERA is satisfied that Busselton Water has appropriate processes and governance arrangements in place for capital expenditure projects.

Actual capital expenditure

The ERA has considered Busselton Water's actual capital expenditure incurred in previous years that will establish the opening capital base as at 1 July 2018. Busselton Water spent $16.643 million over the period 2011-12 to 2015-16 and is expected to incur $3.961 million in 2016-17 and $2.596 million in 2017-18 (see Table 106).

Table 112 Busselton Water actual capital expenditure for 2011-12 to 2017-18 (real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17*	2017-18*
Actual capital expenditure	6.464	1.634	1.385	3.374	3.786	2.961	2.596

* forecast

Source: ERA Analysis

In considering Busselton Water's actual capital expenditure, the ERA notes Cardno's findings that Busselton Water's capital expenditure program is relatively small and is significantly influenced by major capital projects. This is evident in 2011-12 where Busselton Water undertook three significant projects[443] and spent $6 million on capital expenditure – the highest capital expenditure incurred. There are three key drivers for capital expenditure projects – administration, infrastructure and works plant.[444]

- Administration capital expenditure includes expenditure related to motor vehicles, administration building and Busselton Water's ICT strategic development plan.
- Infrastructure capital expenditure includes water plant replacements and new major water mains that are required because of development growth. This type of capital expenditure is the largest component of actual expenditure (comprising 71 per cent).
- Works plant capital expenditure includes the purchase of light vehicles, the replacement of construction equipment (including vehicles) and tools and other equipment.

Cardno's assessment of the above key drivers and a review of actual capital expenditure concludes that Busselton Water's systems and processes used to develop and manage expenditure is appropriate. While no areas of concern were identified to recommend capital expenditure adjustments, Cardno did note some general concerns over the timing of some

[443] In 2011-12 Busselton Water constructed the bulk supply to Dunsborough, introduced chlorination and increased supply capacity.

[444] Cardno, *Review of capital and operating expenditure plans for Busselton Water*, *Report prepared for the ERA*, August 2017, pp. 20-21.

expenditure and lack of supporting documentation provided by Busselton Water as part of the assessment process.[445]

The ERA has confirmed with Busselton Water that its reported capital expenditure for the period 2011-12 to 2017-18 includes expenditure for capital assets that have been funded by cash contributions.[446] For this inquiry, and to determine Busselton Water's opening capital base, the ERA has deducted cash contributions from Busselton Water's capital expenditure (see Table 113). Cash contributions should not form part of Busselton Water's capital base as discussed elsewhere in this report (refer to appendix 13).

The ERA has removed cash contributions at the asset category level. Where capital expenditure for an asset category is lower than the cash contribution value for that asset category in a particular year, the remaining cash contribution value is carried over to future years until it is removed.

Table 113 Busselton Water's capital expenditure for 2011-12 to 2017-18 (real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17*	2017-18*
Forecast capital expenditure	6.464	1.634	1.385	3.374	3.786	2.961	2.596
Less: Forecast cash contributions	1.540	1.065	0.958	2.095	2.810	1.533	1.467
Forecast capital expenditure net of cash contributions	**4.924**	**0.569**	**0.427**	**1.279**	**0.977**	**1.428**	**1.129**

* forecast

The ERA considers Busselton Water's actual capital expenditure incurred to be prudent and efficient. The ERA's approved capital expenditure recommended to establish Busselton Water's opening capital base for review period is shown in Table 114.

Table 114 ERA's recommended capital expenditure for 2011-12 to 2017-18 (real $ millions at 30 June 2016)

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17*	2017-18*
ERA recommended capital expenditure	4.924	0.569	0.427	1.279	0.977	1.428	1.129

* forecast

Source: ERA Calculations

Forecast capital expenditure

Busselton Water proposes to spend a total of $16.953 million on capital expenditure items over the review period 2018-19 to 2022-23. Table 115 contains a breakdown of Aqwest's forecasts for each year within the review period. As noted above, the ERA has excluded cash contributions from the forecast capital expenditure for the purposes of determining the asset base for this inquiry.

[445] Ibid, p. 22.

[446] Correspondence from Busselton Water, 'RE: ERA-BW3 Capex and Opex Data Requirement', received 2 August 2017.

Table 115 Busselton Water forecast capital expenditure for 2018-19 to 2022-23 (real $ millions at 30 June 2016)

	2018-19	2019-20	2020-21	2021-22	2022-23
Forecast capital expenditure	2.529	3.019	3.804	3.875	3.726
Less: Forecast cash contributions	1.250	1.204	1.246	1.201	1.186
Forecast capital expenditure net of cash contributions	**1.279**	**1.816**	**2.558**	**2.674**	**2.540**

Source: ERA Calculations

The ERA has considered Cardno's assessment of Busselton Water's forecast capital expenditure. Cardno notes that the expenditure drivers for Busselton Water's forecast capital expenditure are the same historical drivers (that is, administration, infrastructure and works plant). Infrastructure capital expenditure is the largest component of forecast capital expenditure (at 88 per cent) and includes expenditure relating to:[447]

- water plant replacements (51 per cent);
- meter replacements (17 per cent)
- upgrades to existing mains and services (10 per cent); and
- new service connections (10 per cent).

Cardno's assessment of four proposed capital projects[448] does not identify any areas of concern and no recommendations are made to adjust Busselton Water's forecast capital expenditure at the project level. Cardno does however recommend an overall adjustment to capital expenditure based on an efficiency factor (discussed below).

Cardno is of the view that there are opportunities for Busselton Water to improve its practices and realise efficiencies in future expenditure delivery. Cardno has recommended that a continuing efficiency factor of 0.25 per cent be set for each year of Busselton Water's capital expenditure program over the review period.[449]

The ERA notes that ESCOSA applied a continuing efficiency factor of 0.4 per cent per year in its SA Water Regulatory Determination 2016.[450] IPART applied a continuing efficiency factor of 0.25 per cent per year in its 'Review of prices for Sydney Water Corporation' completed in 2016.[451]

It is reasonable to expect that innovation and continuous improvement will occur during the forecast period. The ERA endorses Cardno's recommended continuous efficiency adjustment and therefore applies a 0.25 per cent per year efficiency for continuous

[447] Cardno, *Review of capital and operating expenditure plans for Busselton Water, Report prepared for the ERA*, August 2017, p. 23.

[448] Cardno reviewed the following four projects: bore 19 relining; meter replacements; light vehicle replacement; and new service connections.

[449] Cardno, *Review of capital and operating expenditure plans for Busselton Water*, *Report prepared for the ERA*, August 2017, p. 26.

[450] Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 – Final determination*, June 2016, p. 110.

[451] Independent Pricing and Regulatory Tribunal of New South Wales, *Review of prices for Sydney Water Corporation – from 1 July 2016 to 30 June 2020 – Final Report*, June 2016, p. 111.

improvement. The efficiency factor is applied to Busselton Water's capital expenditure net of cash contributions. The efficiency factors applied are shown in Table 116.

Table 116 ERA's recommended efficiency factors for 2018-19 to 2022-23

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Continuing efficiency	-	0.25%	0.25%	0.25%	0.25%	0.25%
Efficiency factor to apply	**1.0000**	**0.9975**	**0.9950**	**0.9925**	**0.9901**	**0.9876**

Source ERA

The ERA's recommended capital expenditure for 2018-19 to 2022-23 is shown in Table 117.

Table 117 ERA's recommended capital expenditure for 2018-19 to 2022-23 (real $ millions at 30 June 2016)

	2018-19	2019-20	2020-21	2021-22	2022-23
Forecast capital expenditure net of cash contributions	1.279	1.816	2.558	2.674	2.540
Continuing Efficiency Adjustment	(0.003)	(0.009)	(0.019)	(0.027)	(0.032)
Recommended capital expenditure net of cash contributions	**1.276**	**1.807**	**2.539**	**2.648**	**2.508**

Appendix 8 Operating expenditure

This appendix provides further information to support the ERA's consideration of the efficient operating expenditure forecasts in chapters 3 to 6.

The Water Corporation

Historic and forecast operating expenditure

The Water Corporation's historic actual operating expenditure (in real, 2005 dollars) compared with that recommended by the ERA in each inquiry, is set out in Figure 90. The Water Corporation's actual operating expenditure over the period of the first two inquiries was higher than the ERA's recommended operating expenditure.

For the first period, this was in part because at the time of 2004 inquiry, the Water Corporation had not planned for development of the Perth Seawater Desalination Plant.[452] Other drivers for operating expenditure being higher than projected over the period 2005-06 to 2008-09 were:

- unforeseen changes in health, environmental or economic regulations — for example, rolling out a drinking water quality improvement program in country regions;[453]
- initiatives introduced by the Water Corporation that it considered would benefit customers — for example, water mains cleaning and projects related to the water cycle, sustainability strategy and climate/drought response;[454]
- unforeseen cost escalation — for labour, energy, and hired/contracted services in particular;[455] and
- higher than expected property growth.[456]

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[452] Economic Regulation Authority, *Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, p. 82; Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water, 14 August 2009, p. 133.

[453] See Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 134 and Halcrow Pacific, *Report on the Efficiency of Capital and Operating Expenditure – the Water Corporation, Aqwest and Busselton Water*, April 2009, p. 68.

[454] Ibid.

[455] Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 136 and Halcrow Pacific, *Report on the Efficiency of Capital and Operating Expenditure – the Water Corporation, Aqwest and Busselton Water*, April 2009, p. 64 and pp. 68-69. For labour costs, this was due to adjustments to superannuation provisions, wages and salary pressures, higher use of agency labour and higher than expected activity levels for external contracts. Hired and contracted services were higher than anticipated due to increased reactive maintenance, greater mechanical and electrical maintenance at Woodman Point wastewater treatment plant, increased consultancies relating to research and development, and additional operating activities due to the continuing dry climate. In addition, a number of projects that were initially expected to be capitalized were expensed over the period.

[456] Halcrow Pacific, *Report on the Efficiency of Capital and Operating Expenditure – the Water Corporation, Aqwest and Busselton Water,* April 2009, p. 64 and pp. 68-69. At the 2008 review, Halcrow Pacific noted that: 'We would have expected the Corporation's actual operation expenditure performance against budgets to be better given the relative sophistication and robustness of the capital and operational processes in place. Going forward, we believe that the Corporation should be able to consistently achieve actual expenditure within a target range of plus/minus of five percent.' Halcrow Pacific, *Report on the Efficiency of Capital and Operating Expenditure – the Water Corporation, Aqwest and Busselton Water,* April 2009, p. 70.

For the second period, 2009-10 to 2012-13, the main drivers for operating expenditure being higher than projected were higher than expected labour and Alliance Contract costs.[457]

Figure 90 Water Corporation and ERA recommended operating expenditure, 2005-06 to 2015-16 ($2005 million)

Note: The ERA accepted the Water Corporation's proposed operating expenditure in the 2012 inquiry.

Source: Economic Regulation Authority, *Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, pp. 75 and 92; Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 170; Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, p. 51; [redacted] Halcrow Pacific, *Report on the Efficiency of Capital and Operating Expenditure – the Water Corporation, Aqwest and Busselton Water*, April 2009, p. 71.

Information about forecast operating expenditure provided by the Water Corporation in its written submission is summarised in Table 118 below, in nominal terms.

[457] Cardno, *Review of Water Corporation's Capital and Operating Expenditure Report*, August 2012, p. 50. Alliance Contracts are the Water Corporation's partnerships with the private sector, specifically, the Operations and Maintenance Integrated Alliances for metropolitan service delivery; the Operations and Maintenance Non-Integrated Alliances for operation of metropolitan desalination plants; Capital Alliances for the delivery of capital projects; and the Public Private Partnership for the finance, design, build and operation of the Mundaring Water Treatment Plant. Water Corporation, *Water Corporation Submission to the Economic Regulation Authority*, March 2017, p. 45.

Table 118 Operating expenditure included in Water Corporation's written submission ($ million, nominal)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Total	927.2	954.2	965.9	986.1	998.9	1,014.9	1,021.3

Note: Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period.

Source: Water Corporation, *Submission to the Economic Regulation Authority,* March 2017, p. 43.

The Water Corporation states that:[458]

- The proposed five-year budget from 2017-18 to 2021-22 aligns to the Water Corporation's most recent draft Strategic Development Plan and will be submitted to the State Government as part of the 2017-18 State Budget.
- The budget was developed using the Macro Budget process.[459]
- The forecast is predicated on the following assumptions:
  - An increase to the operating budget to accommodate an additional 22 gigalitres per annum of desalinated water production from the Southern Seawater Desalination Plant.
  - A reduction in inflationary pressures and a slowdown in population growth resulting from the weaker economy.
  - Delivery of ground water replenishment to 28 gigalitres.
  - Additional demand management, water loss management and water efficiency initiatives.
- The estimate for 2022-23 is indicative and subject to change. It was not developed using the Macro Budget process and has not been approved by the Water Corporation's Board.

The ERA has considered the following issues in its assessment of the Water Corporation's proposed operating expenditure forecast:

- The approach used to generate the forecast.
- The assumptions and inputs underlying the forecast.

Approaches used to forecast operating expenditure

As set out in Box 7, there are two models underlying the Water Corporation's forecast of operating expenditure. Each model has a different purpose, and in turn adopts a different approach (summarised in Figure 91). In short:

[458] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 34-44.

[459] The Macro Budget process is the Water Corporation's annual budgeting process. A 'budget-on-budget' approach is adopted, where budgets for the next year are based on 'base' budget costs from the previous year (after removal of non-recurring items that received temporary funding), adjusted for inflation and efficiency targets. Additional items in the form of impacts from the capital program together with operating business cases for new programs are then added to the extent that they are affordable, i.e. allow for efficiency targets to bet met. Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 36.

- The Macro Budget Model is used for generating the operating expenditure forecast considered by the State Government in the Whole of Government budget cycle. The previous year's operating expenditure is adjusted for operating expenditure on temporary 'Operating Implementation Business Cases' and non-recurring 'Financial Impact Statements'.[460] This is then inflated by the increase in costs that the Water Corporation expects to face and reduced by an efficiency target that requires a 0.5 per cent per annum reduction in aggregate operating expenditure. Expected increases in operating expenditure due to Operating Implementation Business Cases and Financial Impact Statements are then added to generate the coming year's operating expenditure forecast.[461]

- The Economic Efficiency Model is used to cross-check whether the operating expenditure forecast developed by the Macro Budget Model is consistent with the required per connection efficiency targets. It takes the forecast of operating expenditure from the Macro Budget Model, then subtracts the forecasts of operating expenditure allocated to the level of service, 're-imbursements' and 'contestable' categories, to generate a forecast of non-level of service operating expenditure.[462] The forecast of non-level of service operating expenditure is then adjusted to 2010-11 dollars and for growth in connections since 2010-11 so that the forecast can be compared against the relevant per connection efficiency target.[463]

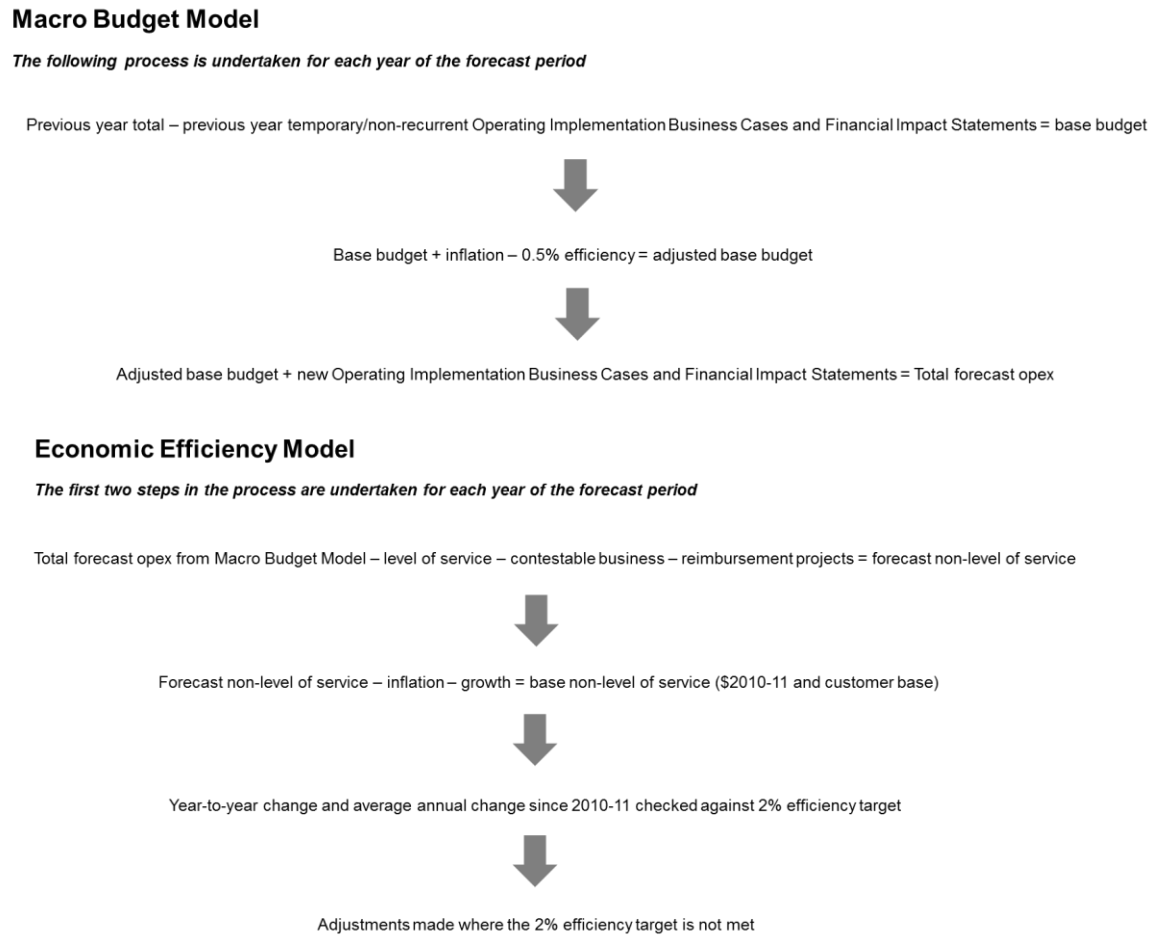
[460] Financial Impact Statement operating expenditure captures the impact of capital investment; and Operating Implementation Business Case operating expenditure is expenditure due to a specific project or activity, or due to changes in circumstances – it may fall under the categories 'regulatory', 'growth in service levels', 'non-standard business' or 'other'. Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 37-38; 40.

[461] [redacted]

[462] Level of service operating expenditure is defined by the Water Corporation as including expenditure on improving service levels, regulatory or externally imposed requirements, expenditure driven by Ministerial requirements or expenditure justified by Net Present Value considerations. See appendix 5 for more detailed explanations of each of these categories. Non-level of service operating expenditure is defined by the Water Corporation as covering 'business-as-usual expenditure that maintains existing service levels to our customers'. Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 34.

[463] [redacted]

Figure 91 Overview of the Water Corporation's operating expenditure models



Source: [redacted]

The Water Corporation has provided a range of quantitative information to the ERA, including the Economic Efficiency Model[464] and the Macro Budget Model.[465] There are differences in the operating expenditure forecasts across the models (set out in [redacted]), not all of which the ERA has been able to reconcile. [redacted]

464 [redacted]

465 [redacted]

[redacted] The ERA has not been able to reconcile the differences in forecasts across the Economic Efficiency Model and the Macro Budget Model(s). The ERA notes that the operating expenditure forecast in the Water Corporation's written submission is based on the forecast included in the Economic Efficiency Model. [redacted]

[redacted]

[redacted]								
[redacted]								
[redacted]								

[redacted]

The ERA has relied more heavily on information included in the Macro Budget Model than information included in the Economic Efficiency Model in considering the operating expenditure forecast for the Water Corporation. This is because:

- The Economic Efficiency Model does not forecast operating expenditure. Rather, it takes the operating expenditure forecast generated by the Macro Budget Model and allocates it to various categories of operating expenditure to establish the proportion of level of service versus non-level of service operating expenditure. However, as noted above, the ERA has not been able to reconcile the difference in the operating expenditure forecast generated by the Macro Budget Model(s) and that included in the Economic Efficiency Model.

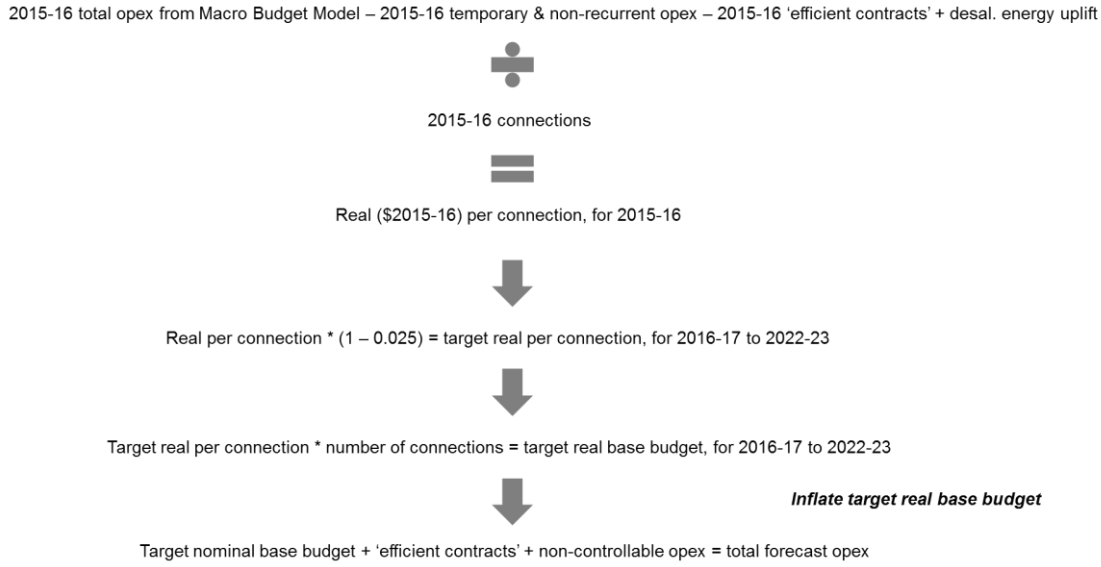
- The Macro Budget Model does forecast operating expenditure, and includes the type of information typically required by a regulator to assess the efficiency of a proposed operating expenditure forecast. The ERA has therefore drawn heavily on information included in that model in considering the efficiency of the proposed operating expenditure forecast.

The approach that the ERA has used in considering the efficiency of the Water Corporation's proposed operating expenditure forecast is shown in Figure 92.

[466] ERA analysis of [redacted]

[467] [redacted]

Figure 92 Approach adopted by the ERA in considering the Water Corporation's operating expenditure forecast



Source: Economic Regulation Authority

Assumptions and inputs underlying the forecast

Operating expenditure excluded from the cost base

The Economic Efficiency Model, and the operating expenditure forecast included in the Water Corporation's written submission, include operating expenditure in two categories described as 'Reimbursement Projects' and 'Contestable Business'.[468] Combined, these categories make up around 4 per cent of the total operating expenditure forecast from 2018-19 to 2021-22.

In a regulatory context, operating expenditure associated with supplying non-regulated services — and which is therefore recovered in revenues earned outside of the regulatory pricing framework — is typically excluded from the regulatory cost base. If it is included in the regulatory cost base, a corresponding amount is excluded from allowable revenues.

To the extent that operating expenditure in the Reimbursement Projects and Contestable Business categories is recovered by the Water Corporation in 'non-regulated revenues', this operating expenditure should therefore either be excluded from the cost base, or an adjustment made to recommended allowable revenues.

It is not clear whether operating expenditure on 'Reimbursement Projects' and 'Contestable Business' is included in the operating expenditure figures in the Macro Budget Model(s), on which the ERA has based its analysis.

The Water Corporation does however include a 'Contestable Expense Adjustment' in the model it uses to generate its forecast total revenue requirement. This amounts to an [redacted] downward adjustment in nominal

468 [redacted]

terms to the operating expenditure forecast included in the Economic Efficiency Model and written submission.

The ERA has therefore also subtracted a corresponding amount from its total operating expenditure forecast, prior to including it in the revenue requirement model.

The base year

The ERA has adopted 2015-16 as the base year for its assessment of the Water Corporation's operating expenditure forecast. The Water Corporation's 2015-16 actual operating expenditure was below the level of operating expenditure that the ERA recommended as being efficient in the 2012 inquiry, suggesting the 2015-16 actual operating expenditure figure is likely to be efficient. As shown in appendix 5, Figure 72, real operating expenditure in 2015-16 exhibited no significant peak or trough relative to previous years.

The Water Corporation's Macro Budget Model also uses 2015-16 as the base year, adjusted for temporary Operating Implementation Business Case operating expenditure and non-recurring Financial Impact Statement operating expenditure, to generate its operating expenditure forecast for 2016-17.[469] The 2016-17 operating expenditure is then used as the base year for 2017-18, and so forth, to generate forecast operating expenditure over the forward period.

The ERA has similarly made adjustments to the operating expenditure incurred in 2015-16 to account for both temporary Operating Implementation Business Case and non-recurrent Financial Impact Statement operating expenditure. In doing so, the ERA has subtracted the same temporary Operating Implementation Business Case and non-recurring Financial Impact Statement operating expenditure as has the Water Corporation.[470] The ERA has at this time been unable to assess whether the temporary Operating Implementation Business Case and non-recurring Financial Impact Statement operating expenditure subtracted from the 2015-16 base year by the Water Corporation is appropriate. However, these equate to around only 2 per cent of 2015-16 total operating expenditure,[471] so the impact of any one individual project is unlikely to have a material effect on the total operating expenditure forecast.

Further, 2015-16 operating expenditure on Alliance Contracts is excluded from the 2015-16 base year.[472] As outlined in appendix 5, the ERA recommends that operating expenditure on agreements with private sector entities that incorporate efficiency targets should not be subject to an additional efficiency target. The Water Corporation's nominal forecast operating expenditure on Alliance Contracts is therefore passed directly through to the total operating expenditure forecast, rather than being recovered from base operating expenditure.[473]

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469 [redacted]

470 Ibid.

471 Ibid.

472 Ibid.

473 The Water Corporation has not forecasted the value of operating expenditure on Alliance Contracts out to 2022-23. The Authority adopts the average forecast operating expenditure since 2016-17 to estimate operating expenditure for the years where the Water Corporation has not provided a forecast.

Finally, the ERA understands that since 2015-16, there has been a step change in energy consumption due to increased operation of the Southern Seawater Desalination Plant from 80GL per annum to 102GL per annum. The ERA has included an uplift of $22 million to the 2015-16 base year to reflect this. This is based on information provided by the Water Corporation which suggests that:

- its 2016-17 operating expenditure will be [redacted] higher than budgeted due to Southern Seawater Desalination Plant operation increasing from 80GL to 102GL;[474] and
- the difference in annual energy costs across the Water Corporation's initial and revised Macro Budget Models is on average [redacted] per annum — the earlier Macro Budget Model did not include an assumption about increased operation of the Southern Seawater Desalination Plant.[475]

The resulting base year operating expenditure adopted by the ERA is set out in Table 120.

Table 120 Base year operating expenditure adopted by the ERA ($ million, nominal)

Item	$ million
Actual 2015-16	885.0
Less temporary Operating Implementation Business Case and non-recurrent Financial Impact Statement operating expenditure	[redacted]
Less "efficient contracts"	[redacted]
Add step change energy costs	[redacted]
Base year operating expenditure	**758.6**

Note: Total not sum due to rounding.

Source: [redacted]

The Water Corporation states that: [redacted]

[redacted]

For the draft inquiry report, the ERA has not included an uplift to the 2015-16 base year to account for any "right-sizing" of the Water Corporation's labour force, because it is not satisfied that an uplift is warranted.

474 [redacted]

475 [redacted]

476 [redacted]

Unit cost inflation

The ERA has adopted the CPI to account for the expected increase in unit costs that the Water Corporation will face on its base operating expenditure. As noted in appendix 5:

- The CPI is readily available, widely understood and sufficiently broadly based that the actions of any regulated business cannot affect it.
- The ERA applies the CPI consistently elsewhere in this inquiry for use in its real revenue modelling approach — this ensures that the resulting revenue is made on a consistent basis with regard to the weighted average cost of capital.

Further, the ERA considers that its forecast of the CPI (1.79 per cent per annum) reasonably approximates the increase in unit costs that the Water Corporation expects to face. The cost inflation that the Water Corporation expects to face — and which is applied in the 2016-17 Macro Budget Model — is summarised in Table 121. As noted in appendix 5, the weighted average of the escalation factors set out in Table 121 over the period 2016-17 to 2020-21 is 1.75 per cent per annum.[477]

Table 121 Water Corporation's cost inflation assumptions, 2016-17 to 2021-22

Cardno questioned why the Macro Budget Model's operating expenditure forecast allows for labour cost increases above general inflation given that the Western Australia economy is contracting.[478] It states that the Water Corporation argues that having a multiple year

[477] If the Water Corporation's 2016-17 Macro Budget Model assumptions are used. The 2016-17 Macro Budget Model only forecasts expenditure out to 2020-21.

[478] Cardno, *Review of capital and operating expenditure plans for the Water Corporation,* Report prepared for the ERA, August 2017, pp. 35-36.

Enterprise Agreement leads to more moderated peaks in labour costs and therefore also more moderated troughs in labour costs during downturns, as there is an element of 'catch-up' to the rises experienced outside the Enterprise Agreement.[479] In response, Cardno observes that:[480]

- public sector wages do move separately to private sector wages in Western Australia, but that wage growth in the public sector has been above that in the private sector since 2013 and there is no reason for this trend to continue in the current economic circumstances;
- in recent years wage growth in selected relevant industries around Australia has been below 1.0 per cent per annum with a generally declining trend – an uptick in wage growth in the public utilities sector has been a notable exception, but the latest change observed is still less than 1.0 per cent per annum;
- the Western Australian Premier has stated that the State Government expects all comparable positions to those covered by the Salaries and Allowances Tribunal will have a wage freeze imposed for four years;
- making specific adjustments for labour costs removes an incentive for the Water Corporation to manage its labour expenditure — in the UK the regulator generally does not accept labour cost escalators, on the basis that labour costs should be managed within the RPI envelope; and
- it expects that the Water Corporation will realise efficiencies in total labour expenditure through productivity improvements.

Cardno concludes that the Water Corporation's total expenditure on labour should be held constant in real terms for the review period. The ERA agrees with Cardno's view, and is therefore recommending that labour related operating expenditure be escalated by the forecast CPI. The ERA understands that the Water Corporation has also reduced its forecast of labour costs (including in the 2017-18 Macro Budget process), in response to restrictions the State Government has placed on labour cost increases for Government agencies.[481]

The ERA has assumed that internal charges and support allocated to capital are labour related operating expenditure, and is therefore recommending that they also remain flat in real terms (i.e. be escalated by the forecast CPI).

The above recommendations result in lower cost inflation being applied to operating expenditure on labour than assumed in the 2016-17 Macro Budget Model. However, applying the CPI also results in the remaining operating expenditure categories being escalated at a higher rate than adopted in the Macro Budget Model. The net effect over the period 2018-19 to 2020-21[482] is that the ERA's forecast allows for around $3.2 million less operating expenditure driven by inflation than does the Water Corporation's Macro Budget Model.

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[479] Cardno, *Review of capital and operating expenditure plans for the Water Corporation,* Report prepared for the ERA, August 2017, pp. 35-36.

[480] Ibid, pp. 36-37.

[481] [redacted]

[482] The ERA has not had access to information setting out the impact of inflation in the Macro Budget Model for the years 2021-22 and 2022-23.

In light of the above considerations, the ERA considers that use of the CPI to escalate the Water Corporation's unit costs for operating expenditure is reasonable.[483]

Operating expenditure driven by growth in connections

The Water Corporation's Macro Budget Model does not explicitly adjust base operating expenditure for growth in connections. Rather, the previous year's actual operating expenditure is adjusted for temporary Operating Implementation Business Case operating expenditure and non-recurring Financial Impact Statement operating expenditure, before unit cost inflation and the efficiency target are applied.[484] However once this adjusted base operating expenditure is forecast, step changes can be made via:[485]

- new Financial Impact Statement operating expenditure — Financial Impact Statement operating expenditure captures the impact of capital investment; and
- new Operating Implementation Business Case operating expenditure — Operating Implementation Business Case operating expenditure is due to a specific project or activity, or due to changes in circumstances.

New Financial Impact Statement operating expenditure is categorised as being driven by one of four factors:[486]

- base capital maintenance — defined by the Water Corporation as works required for renewal, repair or improvement of assets to maintain condition or performance;
- enhanced service — defined by the Water Corporation as works that will enhance the level of service being provided to existing customers;
- supply/demand — defined by the Water Corporation as works required to increase capacity or satisfy demand; or
- quality and standards — defined by the Water Corporation as works required to meet mandatory standards imposed by external regulators or Government.

New Financial Impact Statement operating expenditure is also categorised as being either a permanent change to base operating expenditure, non-recurring maintenance or due to decommissioning assets.[487]

New Operating Implementation Business Case operating expenditure is categorised as being driven by one of four factors:[488]

- regulatory — defined by the Water Corporation as mandatory costs imposed by regulatory bodies;

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[483] The other index that could be applied is the OCI. The Water Corporation applies the OCI in the Economic Efficiency Model to deflate non-LOS operating expenditure for testing whether its forecast is consistent with efficiency targets. While the OCI exceeded the 8-cities CPI during the mining construction boom, in recent years the two indices have begun to converge, and the ERA's forecast of the CPI is expected to be above the OCI over the forward period. The ERA's forecast CPI is therefore expected to be more in line with the cost indices that the Water Corporation adopts in its Macro Budget Model than the OCI is.

[484] [redacted]

[485] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 36-40.

[486] Ibid, p. 27.

[487] Ibid, p. 40.

[488] Ibid, p. 38.

- growth — defined by the Water Corporation as growth in direct operating costs as a result of growth in the customer base;
- non-standard business — defined by the Water Corporation as being operating expenditure where the funding request is essentially self-funded, that is, it is offset by additional revenue or cost savings; or
- 'other' — for requests that do not fit into the previous categories.

New Operating Implementation Business Case operating expenditure is also categorised as being either a permanent change to base operating expenditure, or a temporary change.[489]

As shown in [redacted], over the period 2016-17 to 2020-21, a moderate (albeit varying) proportion of Financial Impact Statement operating expenditure is driven by growth (the 'supply/demand' category). In contrast, only a small proportion of Operating Implementation Business Case operating expenditure is driven by growth. Most Operating Implementation Business Case operating expenditure falls into the 'other' category. [redacted]

[redacted]

[redacted]

[489] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, p. 37.

[redacted]

In contrast to the approach adopted in the Macro Budget Model, in developing its operating expenditure forecast the ERA has grown the 2016-17 base budget by the connections growth rates outlined in Table 122.

Table 122 Growth rates applied by the ERA

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
% increase per annum	1.80	1.68	1.64	1.69	1.78	1.85	1.85

Source: *Water Corporation,* Submission to the Economic Regulation Authority, *March 2017, p. 42; and* [redacted]

This connections growth is consistent with that adopted by the Water Corporation in its Economic Efficiency Model when it adjusts its forecast operating expenditure back to a 2010-11 customer base. The growth rates reflect the Water Corporation's expectations of the weighted average growth in water, wastewater and drainage connections over the review period. The Water Corporation states that growth in connections is forecast using a combination of historical and forward looking information including on:[490]

- population growth, business investment, State Final Demand, Gross State Product, Wage Price Index growth, and the unemployment rate;
- detailed, localised population growth forecasts provided by consultants '.id', who specialise in providing population forecasts using information from local councils, the WA Planning Commission, the Department of State Development, and development organisations;
- any specific growth areas or transient populations across the State identified through engagement with State Government agencies such as the Department of State Development and local councils; and
- trends in household demographics, for example number of occupants per property.

The ERA considers the Water Corporation's forecast of connections growth to be reasonable, considering current forecasts of population growth and dwelling commencements.[491]

[490] Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 41-42.

[491] For example, the WA Treasury forecasts population growth of 1.3 per cent in 2017-18, 1.6 per cent in 2018-19 and 1.8 per cent in 2019-20. The HIA forecasts dwelling starts will increase by 3.1 per cent in 2017-18, 6.3 per cent in 2018-19 and 3.7 per cent in 2019-20; and the Housing Industry Forecasting Group forecasts dwelling starts will increase by 11 per cent in 2017-18, between 4.8 and 14.3 per cent in 2018-19, and then remain flat in 2019-20. See *Government of Western Australia Department of Treasury, 'Economic Forecasts – Major Economic Aggregates'*, [website], 2017, http://www.treasury.wa.gov.au/Treasury/Economic_Data/Economic_Forecasts/, (accessed on 26 June 2017), HIA Economics, *New Housing Outlook*, March 2017 and Housing Industry Forecasting Group, *Forecasting Dwelling Commencements in Western Australia: 2016-17*, November 2016, p. 25.

Applying these forecasts generates the following forecast of operating expenditure driven by growth. This allows for around $38.4 million more growth driven operating expenditure over the period 2018-19 to 2020-21[492] than the Water Corporation's combined forecasts of growth driven Operating Implementation Business Case operating expenditure and supply/demand driven Financial Impact Statement operating expenditure. (The ERA's treatment of the other categories of forecast Financial Impact Statement and Operating Implementation Business Case operating expenditure is outlined below in the discussion about efficiency targets.)

Table 123 Value of operating expenditure driven by growth ($ million, nominal)

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	Total
$ million	13.9	13.4	13.6	14.5	15.8	17.0	17.6	78.5

Note: *Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period, and the 'Total' figure in the above table. Total for 2018-19 to 2022-23 may not sum due to rounding.*

Source: Economic Regulation Authority.

Efficiency target

The ERA has considered which operating expenditure categories included in the Macro Budget Model should not be subject to the efficiency target, and which should instead be passed directly through to the revenue requirement.[493] The ERA considers that the following categories of operating expenditure should not be subject to the efficiency target:

- Forecast operating expenditure on Alliance Contracts — this should be passed directly through to the revenue requirement, because the Alliance Contracts already include provisions requiring the counter party to meet efficiency targets.[494]
- Forecast Operating Implementation Business Case operating expenditure driven by regulatory circumstances[495] — this is because it falls into the category of 'non-controllable' operating expenditure, and because a large proportion of regulatory

[492] The ERA has not had access to information setting out forecast Operating Implementation Business Case and Financial Impact Statement operating expenditure in the Macro Budget Model for the years 2021-22 and 2022-23.

[493]

[494]

[495] The Water Corporation has not forecasted the value of operating expenditure on regulatory Operating Implementation Business Case out to 2022-23. The ERA adopts the average forecast operating expenditure on regulatory Operating Implementation Business Case since 2016-17 to estimate operating expenditure for the years where the Water Corporation has not provided a forecast.

Operating Implementation Business Case projects are classified by the Water Corporation as level of service projects.

The ERA considers that the following categories of operating expenditure included in the Macro Budget Model should be accounted for in base operating expenditure, and therefore be subject to the efficiency target:

- The ERA expects growth driven operating expenditure ('the 'growth' category for Operating Implementation Business Case and the 'supply/demand' category for Financial Impact Statement operating expenditure) to be accounted for in the ERA's application of growth rates to base operating expenditure.
- Similarly, the ERA expects Financial Impact Statement operating expenditure on base capital maintenance to be accounted for in the ERA's escalation of base operating expenditure. Previous years' operating expenditure includes an allowance for base capital maintenance — the ERA's approach means that this amount is escalated by inflation and growth for the review period. The ERA sees no reason why operating expenditure on base capital maintenance should not be expected to become more efficient over time, and therefore be subject to the efficiency target.

The ERA has also considered whether the remaining types of forecast Operating Implementation Business Case and Financial Impact Statement operating expenditure included in the Macro Budget Model should be recovered within forecast base operating expenditure (and therefore be subject to the efficiency target) or passed directly through to the revenue requirement. For these remaining types of operating expenditure, it is not clear whether they are fully outside of the Water Corporation's control, and therefore fit the definition of 'non-controllable' operating expenditure:[496]

- That proportion of Financial Impact Statement operating expenditure which is stated by the Water Corporation as being driven by enhanced service, and quality and standards.
- That proportion of Operating Implementation Business Case operating expenditure driven by regulatory, non-standard business or 'other' circumstances.

However:[497]

- The Water Corporation classifies around [redacted] of the 'enhanced service' Financial Impact Statement projects as non-level of service projects, and around [redacted] of the 'quality and standards' Financial Impact Statement projects as non-level of service projects.
- The Water Corporation classifies around [redacted] of the 'regulatory' Operating Implementation Business Case initiatives as non-level of service projects, around [redacted] of the 'non-standard business' Operating Implementation Business Case initiatives as non-level of service projects, and [redacted] 'other' Operating Implementation Business Case initiatives as non-level of service projects.

496 [redacted]

497 [redacted]

This suggests that a large proportion of the above projects and initiatives are included in the non-level of service category in the Water Corporation's Economic Efficiency Model — non- level of service operating expenditure is subject to the efficiency target in that model.

In light of these observations, the ERA is at this stage recommending that:

- forecast Financial Impact Statement operating expenditure categorised by the Water Corporation as relating to enhanced service levels and quality and standards; and
- forecast Operating Implementation Business Case operating expenditure categorised by the Water Corporation as non-standard business and other circumstances,

be recovered via the ERA's escalation of base operating expenditure. As noted, forecast Operating Implementation Business Case operating expenditure driven by regulatory circumstances is passed directly through to the revenue requirement.

In effect, the ERA expects that the Water Corporation will recover most of its forecast Financial Impact Statement and Operating Implementation Business Case operating expenditure via the ERA's escalation of base operating expenditure by forecast connections growth. The ERA's model allows for $43.8 million of growth driven operating expenditure over the period 2018-19 to 2020-21.[498] The Water Corporation's forecast of Financial Impact Statement and Operating Implementation Business Case operating expenditure in the Macro Budget Model (excluding that driven by regulatory circumstances) over the same period is [redacted][499]

Aqwest

Aqwest's historic actual operating expenditure (in real, 2015-16 dollars) compared with that recommended by the ERA in the previous inquiry, is set out in Figure 94. Aqwest's actual operating expenditure in 2012-13 was substantially higher than the ERA's recommended operating expenditure. Cardno explains that this was due to:[500]

- significant unexpected water storage asset repairs;
- changes to capitalisation limits; and
- a larger than expected increase in electricity costs associated with a new contract.

Aqwest's actual operating expenditure for the rest of the review period was broadly in line with the ERA's recommended operating expenditure.

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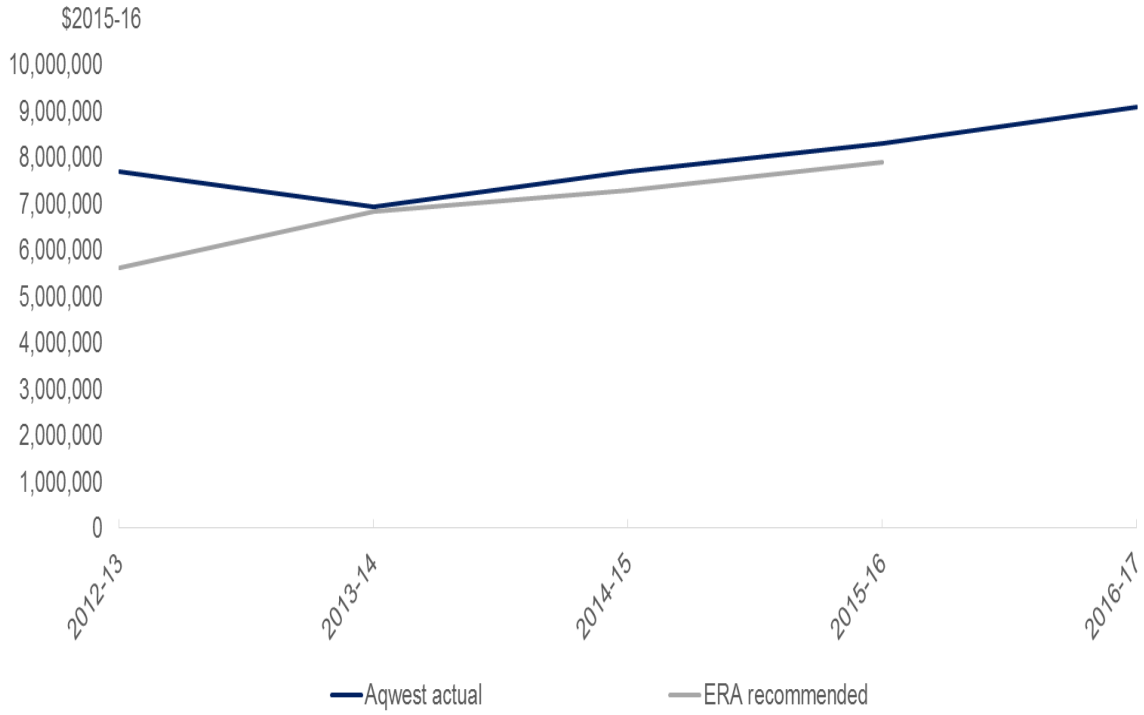
[498] Calculated as the sum of base operating expenditure multiplied by percentage connections growth for each year from 2018-19 to 2020-21. The ERA has not had access to information setting out forecast Operating Implementation Business Case and Financial Impact Statement operating expenditure in the Macro Budget Model for the years 2021-22 and 2022-23. In the ERA's modelling process, the ERA has assumed that the average of Financial Impact Statement and Operating Implementation Business Case operating expenditure from 2016-17 to 2020-21 will be incurred in 2021-22 and 2022-23. For the purposes of the analysis in the text, the ERA has only assessed the period 2018-19 to 2020-21.

[499] The ERA has not had access to information setting out forecast Operating Implementation Business Case and Financial Impact Statement operating expenditure in the Macro Budget Model for the years 2021-22 and 2022-23. For the purposes of the analysis in the text, the ERA has only assessed the period 2018-19 to 2020-21.

[500] Cardno, *Review of capital and operating expenditure plans for Aqwest,* Report prepared for the ERA, August 2017, p. 19.

Figure 94 Aqwest and ERA recommended operating expenditure, 2012-13 to 2016-17 ($2015-16 million)



Note: Previous review period finished at 2015-16, hence there was no ERA recommended operating expenditure for 2016-17.

Source: Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board,* 23 March 2013, p. 108; [redacted]

Aqwest's forecast operating expenditure for the coming review period is summarised in Table 124 below, in nominal terms.

Table 124 Aqwest's forecast operating expenditure ($ million, nominal)

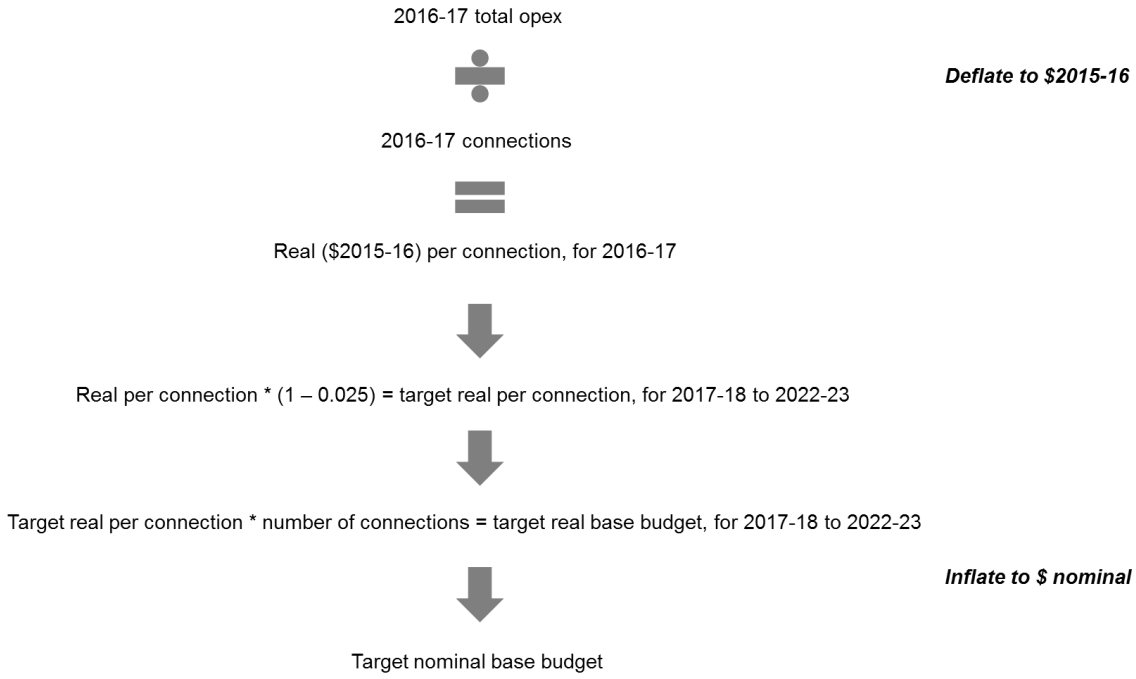
	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Total	9.277	9.749	9.784	9.947	9.856	10.025	10.021

Note: Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period.

Source: [redacted]

The ERA has adopted broadly the same approach as for the Water Corporation in considering Aqwest's forecast efficient operating expenditure, displayed in Figure 95.

Figure 95 Approach adopted by the ERA in considering Aqwest's operating expenditure forecast



Source: Economic Regulation Authority

Assumptions and inputs underlying the forecast

Operating expenditure excluded from the cost base

As noted for the Water Corporation, in a regulatory context, operating expenditure associated with supplying non-regulated services — and which is therefore recovered in revenues earned outside of the regulatory pricing framework — is typically excluded from the regulatory cost base. If it is included in the regulatory cost base, a corresponding amount is excluded from allowable revenues.

The operating expenditure forecast provided by Aqwest excludes non-regulatory components. The ERA has therefore not subtracted any further amounts from Aqwest's operating expenditure forecast for this purpose.

The base year

The ERA has adopted 2016-17 as the base year for its assessment of Aqwest's operating expenditure forecast. Cardno advises that its review of Aqwest's historical operating expenditure at an aggregate level and for specific items of importance did not identify any project level opportunities for efficiency gains.[501]

[501] Cardno, *Review of capital and operating expenditure plans for Aqwest,* Report prepared for the ERA, Auust 2017, p. 22.

Total operating expenditure in 2016-17 was $9.3 million.[502]

Unit cost inflation

Aqwest adopts a wages index of [redacted] per annum to escalate operating expenditure on labour, and an annual CPI index rate of [redacted] for other categories of operating expenditure.[503]

The ERA has adopted its forecast CPI of 1.79 per cent per annum to account for the expected increase in unit costs that Aqwest will face on its base operating expenditure. The reasons for adopting this forecast of the CPI are set out in the ERA's considerations of the Water Corporation's operating expenditure above.

The ERA therefore allows for slightly higher operating expenditure based on increasing costs than does Aqwest.

Operating expenditure driven by growth in connections

The ERA has grown the 2016-17 base budget by 1.54 per cent per annum for each year of the review period. This is based on the ERA's forecast of connections growth, set out in Appendix 5.[504]

Busselton Water

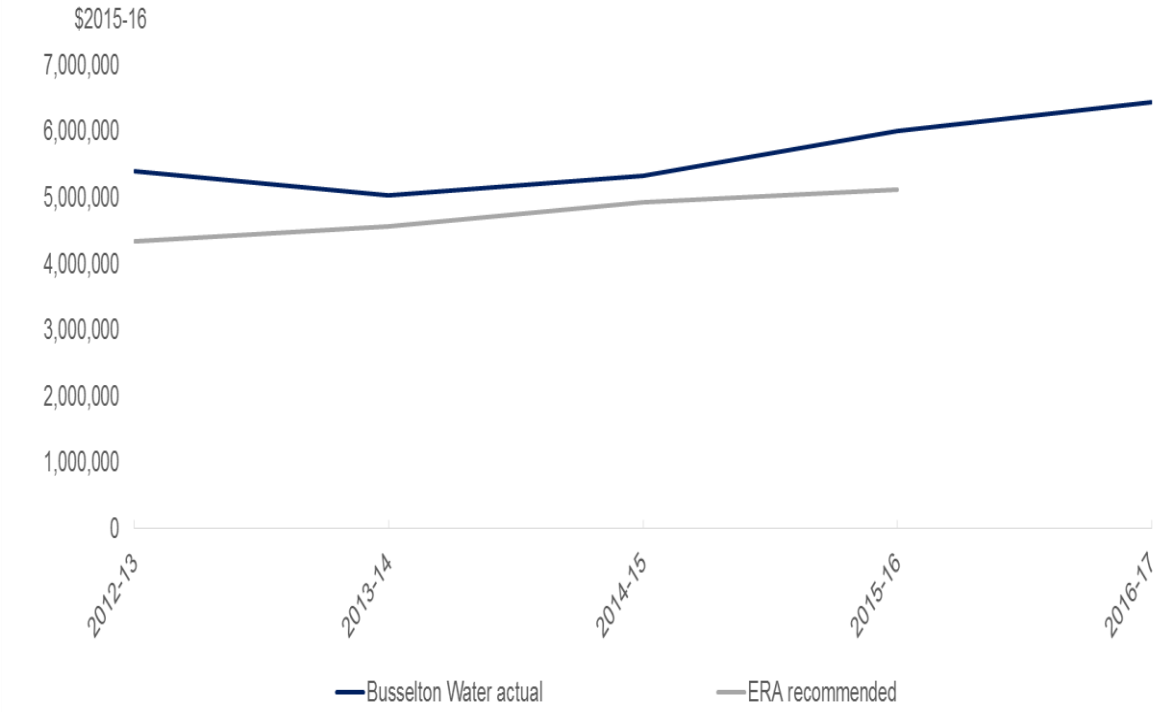
Busselton Water's historic actual operating expenditure (in real, 2015-16 dollars) compared with that recommended by the ERA in the previous inquiry, is set out in Figure 96. Busselton Water's actual operating expenditure was higher than the ERA's recommended operating expenditure for each year of the review period.

[502] [redacted]

[503] Ibid.

[504] Ibid.

Figure 96 Busselton Water and ERA recommended operating expenditure, 2012-13 to 2016-17 ($2015-16 million)



Note: Previous review period finished at 2015-16, hence there was no ERA recommended operating expenditure for 2016-17.

Source: Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board,* 23 March 2013, p. 108; [redacted]

Busselton Water's forecast operating expenditure for the coming review period is summarised in Table 125 below, in nominal terms.

Table 125 Busselton Water's forecast operating expenditure ($ million, nominal)

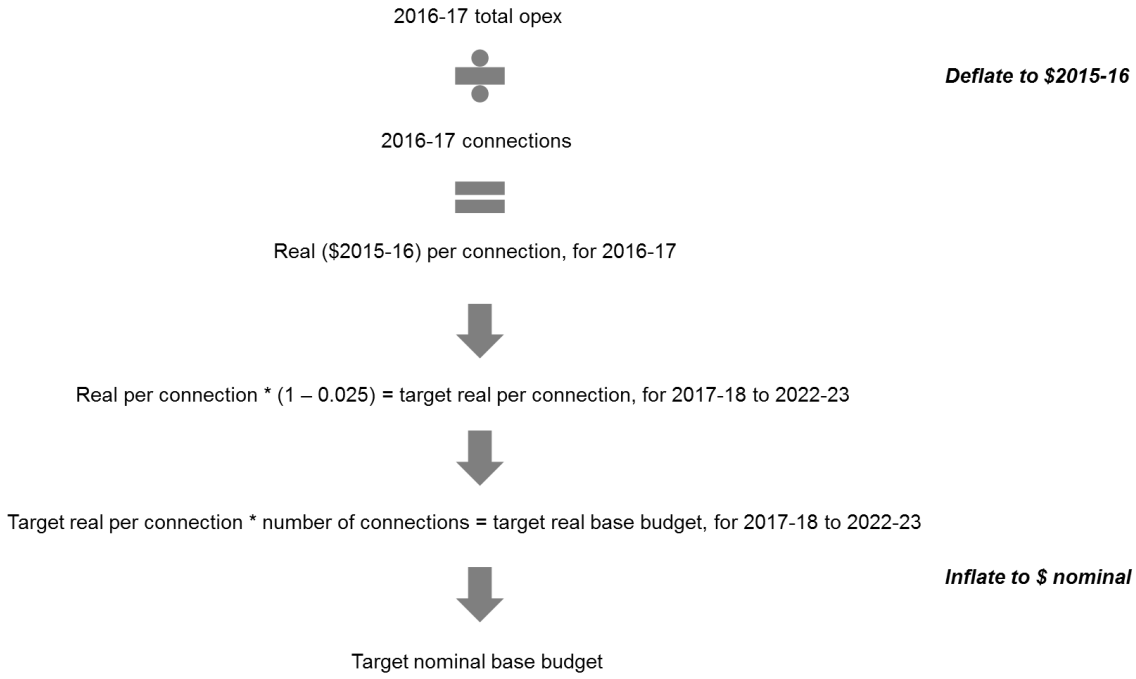
	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Total	6.571	6.913	7.065	7.167	7.261	7.522	7.820

Note: Only forecast operating expenditure for 2018-19 to 2022-23 is included in the cost base for the review period. These figures exclude Busselton Water's forecasts of tax payments, finance and borrowing costs and depreciation, because the ERA forecasts these cost building blocks separately to the operating expenditure forecast. The cost of concessions is also excluded, as these are not an operating expenditure item for regulatory purposes.

Source: [redacted]

The ERA has adopted broadly the same approach as for the Water Corporation in considering Busselton Water's forecast efficient operating expenditure, displayed in Figure 97.

Figure 97 Approach adopted by the ERA in considering Busselton Water's operating expenditure forecast



Source: Economic Regulation Authority

Assumptions and inputs underlying the forecast

Operating expenditure excluded from the cost base

As noted for the Water Corporation, in a regulatory context, operating expenditure associated with supplying non-regulated services — and which is therefore recovered in revenues earned outside of the regulatory pricing framework — is typically excluded from the regulatory cost base. If it is included in the regulatory cost base, a corresponding amount is excluded from allowable revenues.

The operating expenditure forecast provided by Busselton Water excludes non-regulatory components. The ERA has therefore not subtracted any further amounts from Busselton Water's operating expenditure forecast for this purpose.

However, Busselton Water includes the cost of concessions and rebates as an operating expenditure item. The ERA has excluded these costs from the operating expenditure forecast. This is because including them would mean that Busselton Water was compensated twice for concessions and rebates – once via the revenue requirement and tariffs, and then again by the operating subsidy provided by the State Government.

Busselton Water also includes forecast tax payments, finance and borrowing costs and depreciation in its operating expenditure forecast. The ERA has excluded these cost categories from the operating expenditure forecast. This is because the ERA forecasts these cost items separately to the operating expenditure forecast, as part of the tax, and return on and of capital building blocks.

The base year

The ERA has adopted 2016-17 as the base year for its assessment of Busselton Water's operating expenditure forecast. Cardno did not identify any specific inefficiency in Busselton Water's actual operating costs over the previous review period, and concludes that the operating expenditure incurred by Busselton Water is justified.[505]

Total operating expenditure, less the items noted in the section above, in 2016-17 was $6.6 million.[506]

Unit cost inflation

Busselton Water adopts:

- a wages index of [redacted] per annum to escalate operating expenditure on labour; and
- an annual CPI index rate of [redacted] onwards for other categories of operating expenditure.[507]

The ERA has adopted its forecast CPI of 1.79 per cent per annum to account for the expected increase in unit costs that Aqwest will face on its base operating expenditure. The reasons for adopting this forecast of the CPI are set out in the ERA's considerations of the Water Corporation's operating expenditure above.

The ERA therefore allows for lower operating expenditure based on increasing costs than does Busselton Water.

Operating expenditure driven by growth in connections

The ERA has grown the 2016-17 base budget by 2.64 per cent per annum for each year of the review period. This is based on the ERA's forecast of growth in connections over the review period, set out in Appendix 5.

[505] Cardno, *Review of capital and operating expenditure plans for Busselton Water,* Report prepared for the ERA, August 2017, p. 21.

[506] [redacted]

[507] Cardno, *Review of capital and operating expenditure plans for Busselton Water,* Report prepared for the ERA, August 2017, p. 24.

Appendix 9 Rate of return

This appendix sets out the detail of the ERA's approach to estimating the rate of return for the Water Corporation, Aqwest and Busselton Water.

Rate of return framework

The ERA applies the real pre-tax approach for estimating the weighted average cost of capital (**WACC**). This is for consistency with the financial modelling of the building blocks, which is on a real pre-tax basis. The reasons for adopting real pre-tax modelling are discussed in section 2.2.1.2.

The real pre-tax WACC is derived from the nominal pre-tax WACC. The nominal pre-tax WACC can be expressed, following the Officer/Monkhouse WACC framework, as:

$$WACC_{\text{nominal}} = E(R_e) \times \frac{E}{V} \times \frac{1}{(1-T_c(1-\gamma))} + R_d \times \frac{D}{V} \quad (3)$$

Where:

$E(R_e)$ is the nominal post-tax expected rate of return on equity – the cost of equity (grossed up for the value of imputation credits);

R_d is the nominal pre-tax expected rate of return on debt – the cost of debt;

$\frac{E}{V}$ is the proportion of equity in the total financing (which comprises equity and debt);

$\frac{D}{V}$ is the proportion of debt in the total financing;

T_c is the tax rate; and

γ (gamma) is the value of franking credits created (as a proportion of their face value).

The real pre-tax WACC is obtained by discounting expected inflation (π^*) out of the nominal pre-tax WACC as follows:

$$WACC_{\text{real}} = \frac{1+WACC_{\text{nominal}}}{1+\pi^*} - 1 \quad (4)$$

The Water Corporation supports the continued use of a pre-tax rate of return on the basis that its effective tax rate is almost identical to the theoretical tax rate of 30 per cent meaning there is limited benefit in adopting the post-tax framework.

Term of the WACC

The ERA's recommendation for the term of the WACC proceeds on the assumption of a five year regulatory reset of the base risk free rate, combined with annual updating of the

debt risk premium.[508] Under these circumstances, a five year term on the risk free rate matches the term of exposure of the benchmark entity's revenues to interest rate risk.

This also assumes the ability to transact sufficient volumes (notional principal) of pay fixed, receive floating interest rate swaps. The volumes are based on the dollar value of debt in total financing over the 'averaging period'. The period over which the 'on the day' risk free rate in the WACC is averaged is 60 days, thereby reducing volatility in the 'on the day' estimate. This is discussed in further detail in the section on the risk free rate of return.

The benchmark efficient entity and risk

It is standard regulatory practice to evaluate the efficient returns of a monopoly entity with reference to those of a benchmark sample of comparator firms. The comparator firms are selected to be similar to the benchmark efficient entity providing the monopoly services.

For this inquiry, the ERA defines the benchmark efficient entity as 'a pure-play service provider operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of the water services'.[509]

The ERA has opted to apply a single benchmark efficient firm. The reasons for this are discussed below.

A single benchmark

Water service providers have natural monopoly characteristics which imply a minimum efficient scale (**MES**) of operations. Natural monopolies tend to have high levels of operating leverage relative to other industries or a high ratio of fixed to variable costs. Operating leverage is a key business risk. High operating leverage increases total risk (systematic and firm specific) because it reduces the ability of the firm to scale costs in line with demand. When revenues fall, losses are realised more rapidly, due to revenues falling at a quicker rate than costs (relative to a firm with lower operating gearing). On the other hand, when revenues rise, gains are realised more rapidly, due to revenues rising at a relatively faster rate than costs.

Large customer bases are typically needed to ensure recovery of these large fixed costs. Fragmenting the customer base increases the risk that fixed costs are not met.

In addition, the high capital intensity of natural monopolies necessitates access to national and international markets to raise large sums of debt and equity. The large amounts of debt and equity issued allows access to and trading within these markets at a feasible cost. Some of these financing costs are fixed and cannot be justified when dealing with small transactions. Transactions involving the financial instruments of small firms often attract illiquidity premiums due to the lack of trading activity.

These factors mean that level of output required to minimise the long run average cost of a natural monopoly is considerable. If the business existed in a competitive market – and if market share was fragmented below this MES – a smaller firm would have difficulty offering a competitive price, all other things equal, due to the need to divide a large fixed cost across

[508] This is characterised as the risk free rate plus interest rate swap spread for the relevant term.

[509] Pure-play refers to a company that operates in one line of business.

a small customer base. The inefficient smaller firm would lose market share, or be taken over.

In a market where natural monopolies are regulated, duplication of an existing monopoly's assets is considered inefficient. This lack of duplication prevents the loss of market share by a network with inefficient sub-MES operations, to an alternative network service provider with more efficient operations (that is, in the way competition would allow). In these circumstances, firms operating below the minimum efficient scale of operations will incur higher costs, which will be passed on to the consumer directly, or subsidised through other means.[510]

Frontier Economics' analysis of water service providers from the United Kingdom provides examples where regulators made allowances to firms on the basis of operating at a small scale. Across 1999 to 2010, Frontier provides evidence where a size premium has been allowed on the basis of factors such as higher operational gearing, limited access to debt finance, illiquidity premiums on equity and financial market transaction costs.[511] It was also noted that at this time Ofwat had a policy of restricting mergers. This potentially induced regulatory barriers that might have justified the small company allowances.[512] Bottasso and Conti examine the water only sector in the UK from 1995 to 2005, a period which coincides with some of Frontier's analysis. Their analysis on the impact of output levels, customer numbers and area size on costs suggested the existence of unexploited economies based on output, customer density and small scale economies.[513]

In his critique of special regulatory treatment of small firms in the United States Pierce quotes Charles Brown et al. as summarising the situation in the following paragraph:

> Small and large firms are not subject to the same regulatory restraints. Small firms and establishments enjoy regulatory exemptions in a wide array of federal programs both from explicit standards written in the law (de jure) and from the manner in which the rules are enforced (de facto) ... As of 1981, the U.S. Regulatory Council had identified forty-three regulatory programs whose compliance requirements varied with the size of the business.[514]

An example of the differential treatment of firms on the basis of size in the United States is the California Public Utilities Commission's classifying water utilities according to size as Class A, B, C or D. Components of the allowed rate of return are then decided on the basis of the class.[515]

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[510] R. Pierce, 'Small is not beautiful: the case against special regulatory treatment of small firms', *Administrative Law Review*, vol.50, no.3, 1998, pp. 537-578.

[511] Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia: A report prepared for the AER*, July 2013, p. 33.

[512] Ibid.p. 34.

[513] A, Bottasso and M, Conti, 'Scale economies, technology and technical change in the water industry: Evidence from the English water only sector', *Regional Science and Urban Economics,* vol.39, no.2, 2009, pp. 138-147.

[514] R. Pierce, 'Small is not beautiful: the case against special regulatory treatment of small firms', *Administrative Law Review*, vol.50, no.3, 1998, pp. 537-578.

[515] See California Public Utilities Commission, Water action plan, 15 December 2005, p. 3 available at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Water/water_action_plan_final_12_27_05.pdf

and California Public Utilities Commission Water Division, Standard practice for determining fixed capital and rate base of class B, C and D water utilities, June 2001, p.2 available at:

http://www.calwaterassn.com/wp-content/uploads-2012-10/SP-U-05-SM_Determining-Fixed-Capital-and-Rate-Base.pdf.

If a small firm were merged with a large firm, financing debt under the large firm credit rating may appear undesirable. This is because large utilities can (and evidently do) target highly leveraged finance structures which result in credit ratings close to the threshold of non-investment grade. This increases the cost of debt.

However, the small firm treasurer is more likely to consider minimisation of the overall cost of capital. In the cost of capital the cost of equity is higher than the cost of debt on account of shareholders having last claim on the assets of the firm. Reducing both the reliance on equity financing (through increased gearing) and cost of equity (by issuing as a larger consolidated firm) should reduce the overall cost of capital and its associated transaction costs. If this was not so a utility could increase the value of the firm by splitting its operations into smaller firms to reduce and save on capital costs. Therefore, up to a certain firm size, it should be more desirable to finance operations as a larger consolidated entity than finance as a smaller one.

Turning to Western Australia, in 2007 the ERA commissioned ACIL Tasman to undertake an investigation into economies of size and scope in water and waste water services. The findings indicated that the size of the regional and remote areas are below the minimum efficient scale for water and wastewater utilities. It highlighted that there may be cost savings from a reconfiguration of operations in the Bunbury/Busselton area. In relation to regional and remote areas in Western Australia, the report found:

- The minimum efficient scale for a water business appears to be in the order of 125,000 connections. The number of connections in regional and remote areas ranges from approximately 25,000 to 70,000.
- The minimum efficient scale for wastewater appears to be approximately 100,000. The number of connections in regional and remote areas ranges from approximately 10,000 to 60,000.[516]

The pre-feasibility study undertaken by Allen Consulting Group indicated that a single entity may be able to provide the services currently provided by Aqwest and Busselton Water more cheaply. In addition, it was found that the Water Corporation may be able to provide these services more cheaply again.[517] This outcome is summarised in Table 126.

[516] Economic Regulation Authority, *Inquiry on Competition in the Water and Wastewater Services Sector*, 30 June 2008, pp. 108-110.

[517] Ibid, p. 120.

Table 126 Entities and Costs

Entity	Description	Change in cost ($million in net present value terms)
1	AQWEST's current operations combined with the Water Corporation's water operations in Dalyellup and Eaton/Australind	7.0
2	AQWEST's current operations combined with the Water Corporation's wastewater operations in Bunbury	6.1
3	AQWEST's current operations combined with the Water Corporation's wastewater operations in Bunbury and water and wastewater operations in Dalyellup and Eaton/Australind	12.9
4	Busselton Water's current operations combined with the Water Corporation's water operations in Dunsborough/Yallingup	4.4
5	Busselton Water's current operations combined with the Water Corporation's wastewater operations in Busselton	6.9
6	Busselton Water's current operations combined with the Water Corporation's wastewater operations in Busselton and water and wastewater operations in Dunsborough/Yallingup	10.1
7	**AQWEST's and Busselton Water's current operations merged into a single entity**	**- 8.3**
8	AQWEST's, Busselton Water's and the Water Corporation's current operations in or nearby Bunbury and Busselton merged into a single entity[87]	8.6
9	**AQWEST's and Busselton Water's current operations merged into the Water Corporation**	**- 36.7**

Source: ERA 2008

The total cost efficiencies summed to around $36.7 million (2008 dollars) in present value terms over 20 years including transition costs.[518]

In the context of increasing reliance on ground water recharge, Saal and Parker found quality driven economies of scope exist between water and wastewater services in the UK. Quality driven economies of scope in that instance referred to the prospect that improved wastewater treatment quality may reduce the costs of drinking water treatment.[519]

This is evidence that regional and remote water and wastewater services in Western Australia are fragmented below the MES and that there is scope to achieve the MES. The use of multiple benchmarks for firms fragmented below the MES is not consistent with incentivising the MES. This is because firms operating below the MES are rewarded with a higher regulated cost of equity allowance, which reduces the incentive to operate at the MES. The ERA's view is that incentivising structures operating below the MES is not beneficial to consumers or the Western Australian economy.

For this reason the ERA departs from its previous position of using separate benchmarks for the Water Corporation and the smaller water corporations.

[518] Ibid, p. 119.

[519] D, Saal and D, Parker, 'The Impact of Privatization and Regulation on the Water and Sewerage Industry in England and Wales: A Translog Cost Function Model', *Managerial and Decision Economics*, vol.21, pp. 253–268.

Size considerations

The use of a single efficient benchmark does not, of itself, inhibit the entry of small new entrants and thus the development of competition. For example, technological change can reduce the MES leading to smaller firms becoming more competitive than firms operating at a larger scale and in turn offer more competitive prices to consumers. This is a very different situation to rewarding firms on the basis of small size alone when no corresponding efficiencies are evident. The former situation benefits consumers whereas the latter does not. This argument assumes that the MES is correctly defined. The MES may be smaller for small isolated markets. For example, small isolated markets typically have smaller, less diversified customer bases from which to recover costs. The largest *feasible* economies of scale in those markets is small. In such a situation the prospect for economies of scale may still exist in the finance, procurement and administration aspect of the business.

Special regulatory treatment of small firms that have not realised such economies can result in inefficient production and higher prices for consumers. If the policy motivation for special regulatory treatment of small firms is social or equity based, an explicit reviewable subsidy may be more appropriate than using multiple benchmarks which allow higher financing costs for smaller firms.

Just because a firm is smaller than its industry peers does not mean it is not operating at the MES. A firm may be operating in a geographical or legal environment that precludes a large scale of operations. On account of this the firm may be small and have a relatively high associated cost structure, but despite this the firm could still be operating at the MES that is currently feasible. Large firms may be operating well beyond the MES meaning the additional benefits from increasing scale and scope are minimal due to inefficiencies such as increased bureaucracy.[520] Conti and Bottasso found evidence that economies of spatial density fall with size and are constant for larger firms.[521] For this reason it is important not to exclude small firms from the benchmark sample purely on the basis of size. This raises the question of whether risks between firms operating at and above the MES have sufficiently different risks to justify the use of different benchmarks.

With the exception of very small municipal water suppliers, the ERA considers the risks between small and large water utilities to be sufficiently similar to justify the use of a single efficient benchmark firm.[522] The reasons for this are outlined below.

The only risk that should be considered is non-diversifiable risk (see the section on equity beta for further explanation). Assuming a small and large utility are operating at the MES, the major elements affecting the non-diversifiable risk of both small and large water utilities are common. The major aspects relate to the revenue side of the business, specifically factors that affect the covariance of operating income with business cycles and factors that affect the size of this variance.

Pre-determined tariff structures and legislated service charge recovery mitigate the risk of demand forecast errors. Typically tariffs are set in advance instead of market determined which reduces pricing volatility/risk. In addition two part tariffs that use a fixed charge and variable component further reduce risk. This is because the option of increasing the fixed

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[520] Acil Tasman, *Size and scope economies in water and wastewater services*, 24 October 2007, p. 35.

[521] A, Bottasso and M, Conti, 'Scale economies, technology and technical change in the water industry: Evidence from the English water only sector', *Regional Science and Urban Economics*, vol.39, no.2, 2009, p. 146.

[522] Ibid, p. 34.

component of tariffs can attenuate volatility in revenues associated with quantities demanded.[523] For example, at the extreme where the tariff is only a fixed charge and the variable charge is zero the risk associated with forecast volumes is greatly reduced because total revenue will be almost independent of volumes used.

Volatility in revenues may be further reduced through a legislative requirement to pay the fixed charge where there is no option to opt out of paying for the connection. Both small and large utilities are in the business of providing essential services which are considered to be less exposed to business cycles.[524] The covariance of operating income with business cycles is a key driver of non-diversifiable risk.

On the cost side, the ERA considers any major differences in risk to be driven by a deviation from the MES. For example a firm's market share may be fragmented such that the risk of covering large capital expenditures and fixed operating costs is high due to an inability to divide them across a large customer base. Lack of customer diversification in customer types can increase revenue volatility. The cost of equity financing is also likely to be higher as discussed above.

Choice of regulated or non-regulated comparators

It may be argued that the benchmark efficient sample should exclude regulated firms. This is because including regulated firms results in a circularity, where observed outcomes are driven by regulation, instead of competition. However, in practice, excluding regulated firms in the Australian market would lead to the exclusion of firms which are natural monopolies in the benchmarking process.

The Federal Court recently determined that it is not appropriate to characterise the benchmark efficient entity as either a regulated or an unregulated entity.[525] In light of this, to ensure regulatory consistency with its work elsewhere, the ERA includes relevant

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[523] For example, the Western Australian State Government recently announced a 10.9 per cent increase to the fixed charge component of electricity bills for the representative household. See https://www.mediastatements.wa.gov.au/Pages/McGowan-2017/06/Tariffs-fees-and-charges-to-assist-in-budget-repair.aspx for further details.

[524] For example Morgan Stanley Capital International and Morningstar classify the utilities sector as defensive as opposed to cyclical. See https://www.msci.com/documents-10199-1283513/MSCI_Cyclical_and_Defensive_Sectors_Indexes_Methodology_Jun14.pdf/f05126ab-65f6-4f39-b9d2-ad031858475a and http://corporate.morningstar.com/au/documents/methodologydocuments/factsheets/stocksectorstructure_factsheet.pdf.

[525] The ERA previously defined the benchmark efficient entity as a pure-play 'regulated' service provider. However, as determined by the recent Federal Court decision (Federal Court of Australia, *Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79 and Australian Energy Regulator v Australian Competition Tribunal (No 3) [2017] FCAFC 80*, 24 May 2017, [536]-[538]):

> … while it is true that the standard control services provided by the service provider are regulated services, this does not mean that, by force of that fact, the benchmark efficient entity must, correspondingly, be fixed with the character of a regulated entity.
>
> ... Thus, in our view, it is not appropriate to characterise the benchmark efficient entity as either a regulated or an unregulated entity.
>
> It follows that we do not accept, in their entirety, the submissions of either the AER or the electricity network respondents. We see no judicially reviewable error in the Tribunal's primary conclusion (at [907]) that the benchmark efficient entity is not a regulated entity. To the extent that the Tribunal concluded, positively, that, for the purposes of the allowed rate of return objective, the benchmark efficient entity must be fixed with the character of an unregulated entity – and there is some suggestion that it might have done so (see, for example, [914]), although this is not entirely clear – we would respectfully consider that particular conclusion, if reached, to be erroneous.

The ERA has therefore removed the word 'regulated' from its definition of the benchmark efficient entity.

regulated and unregulated firms in the benchmark sample. This is appropriate, provided that these firms provide services with similar characteristics as the reference service in review.

Using a benchmark that operates in the same or similar industry as the service provider is of primary importance if it is to be of any relevance. If the definition of the service being provided by the benchmark is considered to be secondary to the requirement of using unregulated firms in benchmarking, the concept of efficiency in a competitive market becomes nebulous. This is because efficient practices are industry specific – this is well recognised in investment analysts' application of the method of comparables. Strict adherence will likely lead to poor comparators being used for benchmarks that have operations and/or risks that are not comparable. The lack of clarity in which industry to benchmark against would likely lead to greater instability and uncertainty in the definition and application of the benchmark. For this reason the ERA does not exclude regulated firms from the benchmark sample.

The benchmark efficient sample

Costs and benefits need to be evaluated when considering whether to adopt a domestic or international form of any particular model of the rate of return or its components. On balance, the ERA considers that the regulatory costs of using a full international approach is significant in terms of higher uncertainty around estimates. However, in recognition of the absence of listed water service providers in Australia the ERA utilises international comparators for the gearing, credit rating and equity beta parameters.

The Bloomberg equity screening tool was used to search for a sample of utilities that were categorised as 'water'. The US and UK were found to provide the most complete and consistent data for listed water service providers. While the initial search included a much broader range of countries, a variety of issues were encountered, such as extreme values, erratic or incomplete data and companies whose description indicated that they were significantly diversified in activities that were not water distribution.

The resulting sample was augmented with UK water utilities included in the sample used in the ERA's 2013 report that still reported data in Bloomberg.[526] This resulted in a sample of nine water distribution utilities shown in Table 127.[527]

[526] The Bloomberg industry classification system may not necessarily capture all desired comparable entities and so manual cross-checking and augmentation in necessary. Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board: Revised Final Report*, 28 March, 2013. p. 60.

[527] SJW Group was excluded from the sample because it has significant operations in real estate (SJW Land Company) and therefore cannot be considered 'pure play'.

Table 127 Listed Water Service Providers Benchmark Sample

Company	Country	Ticker
UNITED UTILITIES	UK	UU/ LN Equity
SEVERN TRENT	UK	SVT LN Equity
PENNON GRP PLC	UK	PNN LN Equity
AMERICAN WATER W	US	AWK US Equity
AQUA AMERICA INC	US	WTR US Equity
CONN WATER SVC	US	CTWS US Equity
MIDDLESEX WATER	US	MSEX US Equity
YORK WATER CO	US	YORW US Equity
ARTESIAN RES-A	US	ARTNA US Equity

Source: Bloomberg, ERA Analysis

Gearing

Gearing refers to the target proportions of business assets to be financed by debt and equity. Gearing is defined as the ratio of the value of debt to total capital (that is, including debt and equity), and is used to weight the costs of debt and equity when the WACC is determined. The measure of debt used is 'net debt', defined as short term debt plus long term debt less cash and cash equivalents that can offset debt. Current capitalisation – defined as shares outstanding, multiplied by current market price – is used as the measure of the market value of equity.

The relative proportions of debt and equity that a firm has outstanding constitute its capital structure. Capital structures differ across industries, as well as among different companies within the same industry.

Table 128 shows the average gearing for each of the benchmark firms and the overall sample average which is 37 per cent.

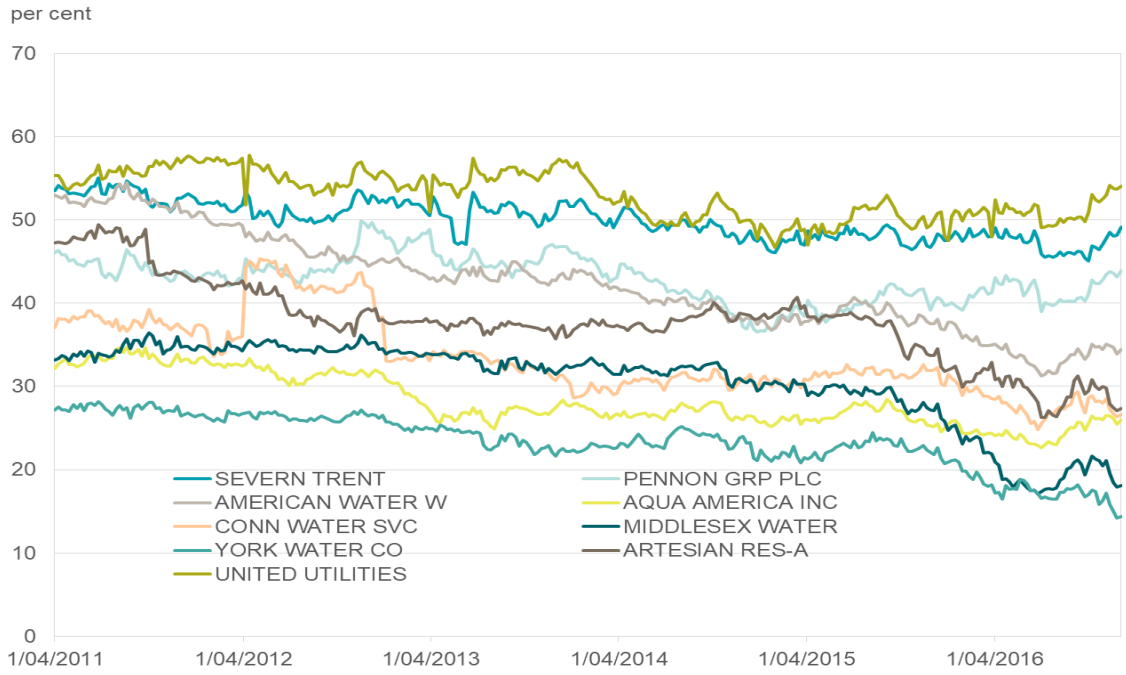
Table 128 Average water utility gearing based on the benchmark sample

Company	Country	Gearing (per cent)
UNITED UTILITIES	UK	51
SEVERN TRENT	UK	49
AMERICAN WATER W	US	41
PENNON GRP PLC	UK	43
AQUA AMERICA INC	US	28
CONN WATER SVC	US	33
MIDDLESEX WATER	US	30
YORK WATER CO	US	23
ARTESIAN RES-A	US	37
Average Gearing		**37**

Source: ERA Analysis, Bloomberg

The trend in gearing observed over the last 5 years for the benchmark sample of water service providers in the US and UK is shown in Figure 98. There appears to be a trend toward reduced gearing over the period across all firms in the benchmark sample.

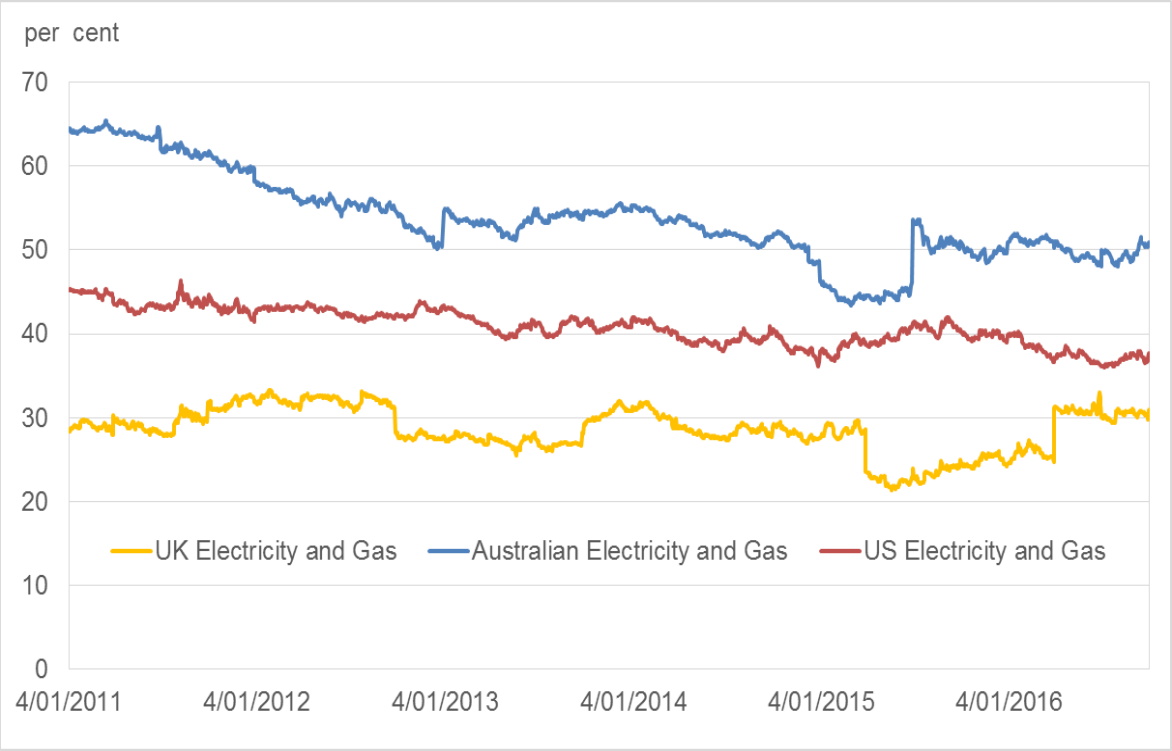
Figure 98 US and UK Listed Water Network Service Provider as Gearing



Source: ERA Analysis, Bloomberg

Country specific factors may also affect the degree of gearing. Ongoing gearing differentials are observed between US/UK and Australian gas and electricity network service providers (NSPs), as shown in Figure 99.

Figure 99 Australian, US and UK Gas and Electricity Network Service Provider Gearing



Source: ERA Analysis, Bloomberg

The trend for the UK is not as clear as in Australia and the US. It could be argued that the changes in gearing over the 5 year period are minor when the ongoing variability in gearing resulting from changes in the market value of equity are taken into account. Although a crude measure, Table 129 still shows that the declining trend over this period is statistically significant at the five per cent level for all three countries as indicated by the t-statistic greater than two. This indicates that the trend changes in gearing are not minor compared to ongoing variability.

Table 129 Regression of electricity and gas network gearing on time (daily trend)

Country	Slope coefficient	t-stat
Australian Trend	-0.005	-10.69
US Trend	-0.003	-34.45
UK Trend	-0.003	-4.01

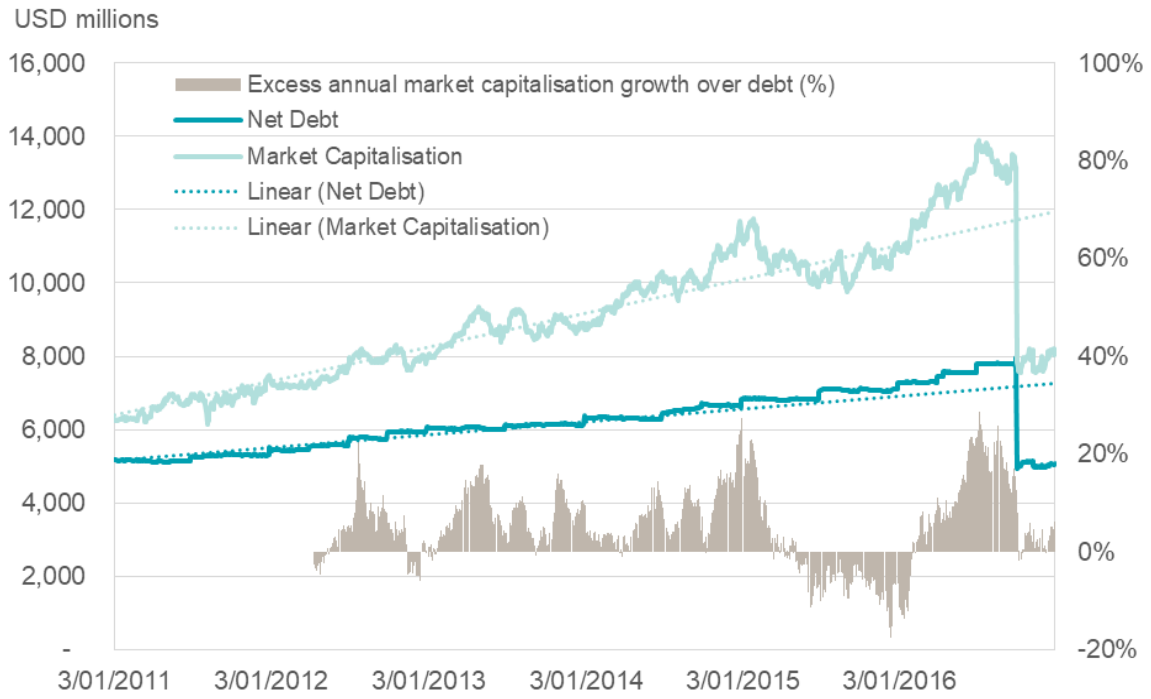
Source: ERA Analysis, Bloomberg

These figures suggest a daily decrease in gearing in the order of 0.003 per cent for foreign firms and 0.005 per cent for Australian firms (based on trading days). Assuming 250 trading days per year over 5 years this translates to a five yearly decrease of 3.75 per cent for foreign firms and a decrease of 6.25 per cent for Australian firms. On average it appears reasonable to assume a decrease in gearing of 5 per cent for Australian firms.

While it is not possible to compare gearing for water utilities in Australia to those overseas, it is possible to compare gearing for Australian electricity and gas utilities. This may shed light on the drivers of decreased gearing in the utility sector. The source of the declining trend in US energy and electricity utilities appears to be that market capitalisation growth

has been outstripping debt issuance over the last 5 to 6 years. This is shown in Figure 100 by the grey bars which correspond to the percentages on the right axis.[528]

Figure 100 Net debt versus market equity growth: US electricity and gas networks



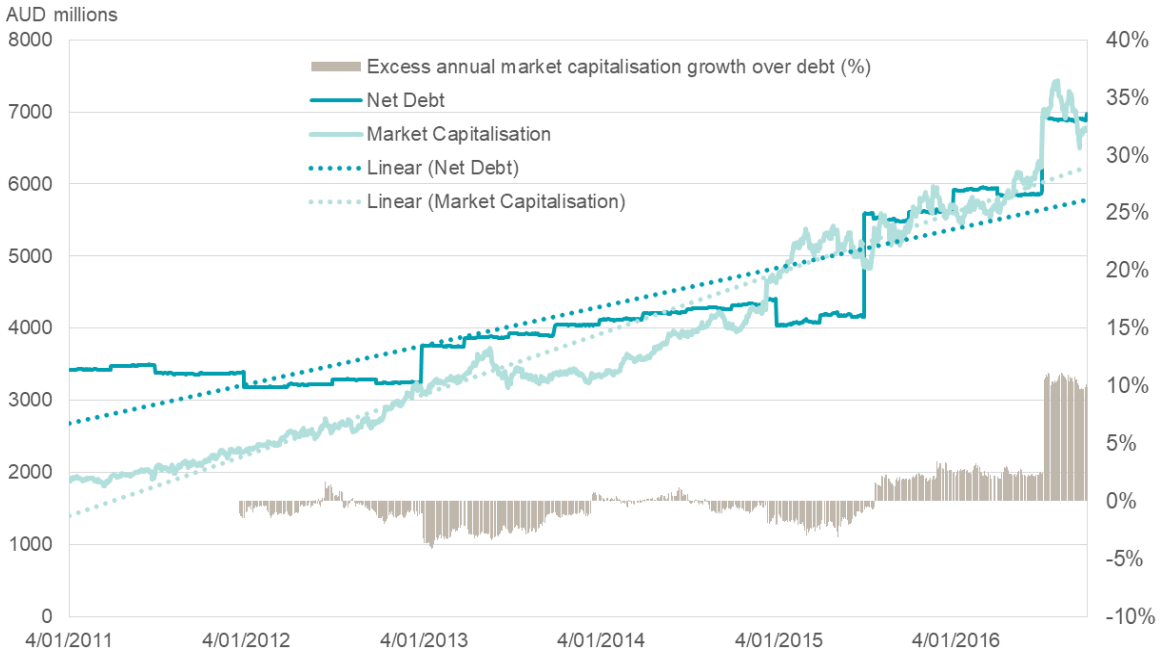
Source: ERA Analysis, Bloomberg

Market capitalisation has been calculated as the average net debt plus average market capitalisation of all listed electricity and gas network utilities for the US weighted by one minus average gearing across the utilities. Net debt has been calculated the same way but multiplied by average gearing instead. The excess market capitalisation growth is calculated as the difference between the annual growth in these figures which is also diagrammatically represented as the difference in slope between the two trend lines.

Market capitalisation growth also appears to have been outstripping debt issuance in the Australian electricity and gas network utility sector as shown in Figure 101.

[528] The drop at the end of the period is a result of data not yet being available for a number of large utilities.

Figure 101 Net debt versus market equity growth: Australian electricity and gas networks



Source: ERA Analysis, Bloomberg

It is difficult to know whether the reduced level of gearing is a deliberate financing decision on the part of utilities in the sample or induced by debt issuance constraints which lag the growth in debt behind equity.

Regardless, the ERA's method set out in the Rate of Return Guidelines in involves observing actual gearing over the last five year period.[529] Forecasts on the direction of net debt in relation to equity, which may include consideration of factors such as market capitalisation forecasts and debt issuance constraints, are not taken into account in the ERA's method. The use of a five year historical average for gearing should smooth out any short term anomalies. The declining trend is still observed over the full period and so is not considered a short term anomaly. If the decline in gearing were to subsequently reverse, for example through a large and sudden increase in debt issuance, the ERA's method will eventually capture this as long as the effect on gearing is sustained.

The ERA also de-levers individual equity beta estimates using actual gearing for each firm observed over the past five years to derive asset betas. The asset betas are then re-levered using the gearing assumption which is typically based on the same sample of firms used to derive equity beta. If the benchmark gearing is not revised to reflect that which is empirically observed, a relatively *low* level of gearing based on that empirically observed for each company in the equity beta sample may be *de-levered out* of empirical equity beta estimates while a relatively *high* level of gearing is *re-levered in*. This will result in overestimates of equity beta. Additionally, failing to 'phase in' observed changes to gearing in each WACC determination may eventually result in a large step change if the trend continues. This potentially exacerbates volatility in the WACC and tariffs paid by consumers.

[529] Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 52

Australian gas and electricity NSPs have sustained a higher level of gearing over the last five years, compared to their US and UK counterparts. The five year averages for each country, and the differentials relative to Australia, are shown in Table 130.

Table 130 5 year average gearing Australia vs US and UK listed Electricity and Gas Network Service Providers

Country	Sample Size	Gearing (per cent)
Australia	4	52
US	54	40
Australia-US Differential		**12**
UK[530]	1	28
Australia-UK Differential		**24**
Average Differential		**18**

Source: ERA Analysis, Bloomberg

On average gearing in Australia tends to be an additional 12 per cent higher than that in the US and an additional 24 per cent higher than that in the UK.

Using the 37 per cent average gearing as a starting point observed for water service providers, an adjustment of 18 per cent – based on the average UK/US and Australia differential in Table 130 – gives gearing of 55 per cent. This estimate is subject to a high degree of imprecision as a result of gearing assumptions being drawn from non-water utilities, foreign countries and small sample sizes (in the UK). For this reason recent Australian regulatory decisions for gearing in water service provision are used as a cross check on the gearing assumption. Table 131 shows that other Australian regulators have consistently used a gearing assumption of 60 per cent for the cost of capital in water service provision.

Table 131 Australian regulatory decisions for gearing in water service provision

Agency	Decision	Date
ESCOSA	60	March 2015
ESCV	60	November 2016
IPART	60	June 2016
QCA	60	September 2014
ICRC	60	June 2013

Source:

Essential Services Commission of South Australia, SA Water Regulatory Rate of Return 2016 – 2020: Final Report to the Treasurer, March 2015, p. 51.
Essential Services Commission Victoria, 2018 Water Price Review, November 2016, p. 40.
Independent Pricing and Regulatory Tribunal, Review of prices for Hunter Water Corporation: Final Report, June 2016, p. 81.
Queensland Competition Authority, SEQ Retail Water Long-Term Regulatory Framework - weighted average cost of capital (WACC), September 2014, p. 21.
Independent Competition and Regulatory Commission, Final Report: Regulated water and sewerage services, 1 July 2013 to 30 June 2019, Report 5 of 2013, June 2013, p. 69.

[530] Cross referencing gas and electricity networks listed on Ofgem's website with Bloomberg SECF yielded only one comparable listed firm.

The reasoning underlying the decisions is varied. The Essential Services Commission of South Australia cites other Australian regulatory decisions on gearing including those of the Australian Energy Regulator. The Independent Pricing and Regulatory Tribunal base its gearing on a review of the WACC methodology carried out in 2013, which cites 60 per cent as the gearing ratio for water.[531] The Queensland Competition Authority based its gearing on a sample of domestic and international water and energy businesses both regulated and unregulated.[532] The Independent Competition and Regulatory Commission adopted 60 per cent based on the actual gearing of the regulated water service provider (ACTEW).[533] The most common rationale is to base the benchmark gearing on a sample of water or energy network service providers. The ERA's analysis above does this directly.

Although the benchmark gearing adopted for the inquiry is slightly lower than that applied in water pricing decisions by other regulators, the methodology is broadly consistent. The distinct downward trend in gearing observed over the last 5 years for water, gas and electricity network service providers in the UK, US and Australia justify the decrease. Some additional anecdotal evidence from ofgem supports the notion that strong increases in the market value of equity have resulted in decreased gearing:

> We have observed an increased demand for 'safe assets', with investors seeking the safety of bonds, partly as a hedge against volatility. Alongside this, investors have shown remarkable appetite (and been willing to pay high premia) for stable regulated utilities. For instance, the recent sales of interests in gas distribution networks occurred at prices representing premia of more than 40% above the regulatory asset value (RAV), suggesting that investors were willing to accept very low yields. There has been a very similar story in the water sector, where acquirers have paid premiums of 40-80% above the RAV.[534]

The following summarises the evidence and analysis above. Historically gearing for Australian water utilities has been observed to be 60 per cent. This figure has been arrived at through directly observing gearing data for a benchmark sample of energy and water utilities in Australia and overseas, observing the actual gearing of the regulated entity in question and observing other regulators' decisions. It appears well accepted that gearing for energy network utilities is a suitable proxy for water utility gearing. The empirical evidence for both water and energy utilities in the US, UK and Australia indicates a downward trend in gearing over the past 5 years. This appears to be driven by strong increase in the market value of regulated utilities' equity. This suggests that gearing for utilities in Australia should be lower than the historical figure of 60 per cent. A decrease in gearing of around 5 percentage points appears to be reasonable on the basis of the analysis above. This figure is lower than the 60 per cent benchmark gearing ratio used for the Water Corporation in the ERA's 2013 Water Inquiry.[535] On this basis a gearing ratio of 55 per cent is appropriate for the inquiry benchmark.

Risk free rate of return

The risk-free rate is the rate of return an investor receives from holding an asset with a guaranteed payment stream; that is, where there is no risk of default. Since there is no

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[531] IPART, *Review of WACC Methodology – Final Report*, December 2013, p. 4.

[532] Queensland Competition Authority, *SEQ Retail Water Long-Term Regulatory Framework - weighted average cost of capital (WACC)*, September 2014, p. 21.

[533] Independent Competition and Regulatory Commission, *Final Report: Regulated water and sewerage services, 1 July 2013 to 30 June 2019: Report 5 of 2013*, June 2013, p. 69.

[534] Ofgem, *Open letter on the RIIO-2 Framework*, 12 July 2017, p. 3

[535] Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board: Revised Final Report*, 28 March, 2013. p. 60.

likelihood of default, the return on risk-free assets compensates investors for the time value of money.

The ERA uses the nominal yields on 5 year Australian Commonwealth Government Securities. This provides an observable proxy for the 5 year risk free rate.

As discussed in the rate of return framework section above, the ERA applies a term of 5 years for the risk free rate of return in this Inquiry.

Averaging period

The ERA considers that firms – including the benchmark firm – may issue debt at any time. Such firms also may hedge the risk free rate, by undertaking 'interest rate swaps'. Firms thereby can fix the risk free rate at the rate prevailing 'on-the-day' of the swap, for any range of terms, typically up to 10 years. With regulation, where rates of return are set by a regulator for a specified period, such as 5 years, such a hedging strategy allows a benchmark firm to lower its overall cost of debt. This is because, in normal circumstances, the yield curve is upward sloping. For example, fixing the risk free rate over a 5 year period then allows for a fixed cost of debt around 50 basis points lower than would obtain with typical longer term 10 year debt financing.

The swaps market is extremely liquid. Table 132 shows that total annual swaps turnover in Australian dollars is over 5 trillion dollars in 2014-15 and over 8 trillion dollars in 2015-16. Furthermore, growth in the volumes of notional principal transacted in the interest rate swaps market in Australia and worldwide is substantial as indicated by the 35.3 percent change in annual fixed/float swap turnover for 2014-15 to 2015-16 shown in Table 132.

Table 132 Fixed / Floating AUD Swaps annual turnover (billions)

Year	Bank	Other	Total
2014-15	5,830	1,789	7,619
2015-16	8,516	1,791	10,307
per cent change	46.1	0.1	35.3

Source: ERA Analysis, Australian Financial Markets Report

Recent regulatory decisions for gas network service providers have implied a requirement that notional principal of up to $2.1 billion be hedged over 20 trading days. That implies an average swap volume of more than $100 million per day.[536] In addition, the ERA received verbal advice from Chairmont Consulting in 2013 indicating that volumes of up to $200 million per day, in normal circumstances, would not result in excessive hedging costs.[537] The market for swaps has grown since the time that estimate was made (Table 132).

Based on that information, the ERA considers that increasing the averaging period to 60 trading days will be sufficient to cover the Water Corporation's benchmark hedging requirement – which is around $10 billion (based on the regulated asset base of around $18 billion, and gearing of 55 per cent).

[536] Based on 60 per cent of the regulated asset base in Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020*, 30 June 2016, p.209 and the return on debt methodology set out in Appendix 4 of that document.

[537] Chairmont's verbal advice was provided in conjunction with its 2013 consulting report to the Authority (Chairmont Consulting, *Comparative Hedging Analysis*, 12 June 2013).

Accordingly, the ERA adopts a 'hybrid trailing average' for estimate the cost of debt, which is comprised of:

- a 60 day average 'on the day' estimate of the 5 year risk free rate, given by interest rate swaps;
- a 10 year trailing average of the debt risk premium (see below); and
- allowances for debt raising and hedging costs (see below).

The 60 day average 'on the day' estimate of the 5 year risk free rate also underpins the risk free rate used for the return on equity (see below).

Estimate of the 5 year risk free rate of return

The 5 year nominal risk free rate of return has been interpolated from the 60 day average of yields on Commonwealth Government Securities, up to 29 March 2017.[538] The 5 year estimate based on this series is 2.25 per cent.

Benchmark credit rating

The ERA notes that credit rating agencies – such as Standard & Poor's (**S&P**) and Moody's – explicitly take economy wide and company specific factors into account when assigning credit ratings to debt securities. For example, S&P determines the credit rating by evaluating the business risk (qualitative assessment) and financial risk (quantitative assessment) faced by holders of debt securities. Table 133 presents the S&P risk profile to determine the credit rating for a particular business.

Table 133 Standard and Poor's risk profile matrix

Business Risk Profile	Financial Risk Profile					
	Minimal	Modest	Intermediate	Significant	Aggressive	Highly Leveraged
Excellent	AAA/AA+	AA	A	A-	BBB	-
Strong	AA	A	A-	BBB	BB	BB-
Satisfactory	A-	BBB+	BBB	BB+	BB-	B+
Fair	-	BBB-	BB+	BB	BB-	B
Weak	-	-	BB	BB-	B+	B-
Vulnerable	-	-	-	B+	B	B- or below

Source: Standard & Poor's RatingsDirect 18 September 2012

Business risk stems from the variability in prices, quantities produced and sold and operating earnings. Indicative measures of business risk considered by Standard and Poor's include:[539]

- country risk
- industry characteristics
- company/competitive position

[538] The two securities chosen to straddle the 29 March 2022 maturity date are Treasury Bond 124 and 128. Treasury Bond 124 was chosen instead of 151 as the earlier bond because a complete series of yields over the 60 day averaging period was not available for Treasury Bond 151.

[539] Standard & Poor's, *Methodology: Business Risk/Financial Risk Matrix Expanded: Ratings Direct*, 18 September 2012, p. 3.

- profitability/peer group comparison; and
- management & strategy.

The ERA compares country risk premiums and profitability measures for each of the water network's comparators to industry averages to gauge the network's benchmark business risk profile on the spectrum of vulnerable to excellent.

Financial risk stems from the financial structure of the business. Indicative measures of financial risk considered by Standard and Poor's are outlined in Table 134.

Table 134 Standard and Poor's example financial risk indicative ratios table

	FFO/Debt (%)	Debt/EBITDA	Debt/Capital (%)[540]
Minimal	greater than 60	less than 1.5	less than 25
Modest	45-60	1.5-2	25-35
Intermediate	30-45	2-3	35-45
Significant	20-30	3-4	45-50
Aggressive	12-20	4-5	50-60
Highly Leveraged	less than 12	greater than 5	greater than 60

Source: Standard & Poor's RatingsDirect 18 September 2012

Standard and Poor's 2013 Corporate Methodology defines funds from operations (**FFO**) as shown in (5).[541]

$$FFO = EBITDA - Net\ Interest\ Expense - Current\ Tax\ Expense \quad (5)$$

Where:

$EBITDA$ (earnings before interest, tax, depreciation and amortisation) is revenue less operating expenses plus depreciation and amortization expenses;

$Net\ Interest\ Expense$ is interest paid less interest earned, capitalised during the financial year; and

$Current\ Tax\ Expense$ is the tax expense currently payable for the financial year.

The financial risk profile is gauged using the ratios in Table 134 for each of the water authorities' comparators. These are calculated based on three complete financial year averages, over the period 2014 to 2016.[542] These ratios are cross referenced to the ranges in Table 134 to gauge the benchmark financial risk profile on the spectrum of minimal to highly leveraged.

[540] Here capital is defined as the market value of equity and net debt.

[541] Standard & Poor's, *Methodology: Business Risk/Financial Risk Matrix Expanded: RatingsDirect*, 19 November 2013, p. 13.

[542] US based company's use three US financial years ending December each year with 2015 being the last year complete data was available. UK companies use three financial years ending in March each year with the last year ending in 2016. Severn Trent did not have historical data available for some fields and so the latest observation for each of the fields was used.

The financial and business risk profiles are then mapped on to Table 133 to gauge the appropriate credit rating. This credit rating is then reconciled with the observed long term issuer credit ratings for the benchmark comparators. Discrepancies are reconciled with a closer examination of the qualitative factors affecting the benchmarks. The ERA considers that, by utilising the above Standard and Poor's Risk Profile Matrix, in conjunction with the observed credit ratings of relevant comparator companies, regulatory judgement can be exercised in order to determine the appropriate benchmark efficient credit rating for each of the water networks.

The metrics for the benchmark sample of firms outlined above were compiled and are presented in Table 135.

Table 135 Benchmark sample credit metrics

Company	S&P Credit Rating	EBIT Margin	EBITDA Margin	Return on Capital	FFO/Debt	Debt/EBITDA	Debt/Capital
UU/ LN Equity	-	37%	57%	7%	6%	13	52%
SVT LN Equity	BBB-	30%	48%	11%	12%	6	46%
PNN LN Equity	-	15%	27%	5%	6%	12	43%
AWK US Equity	A	33%	46%	5%	4%	17	42%
WTR US Equity	-	41%	57%	9%	5%	15	28%
CTWS US Equity	A	26%	39%	7%	4%	19	34%
MSEX US Equity	A	27%	37%	6%	5%	14	32%
YORW US Equity	A-	49%	62%	7%	5%	12	24%
ARTNA US Equity	-	30%	42%	6%	4%	16	38%

Source: ERA Analysis, Bloomberg

Note: Capital here is defined as net debt plus the market value of equity

Credit ratings were available for only 5 of the 9 companies in the sample. Several subsamples were created based on country and credit ratings. An average across all of the companies' credit metrics were used as the benchmark for this Inquiry. The country risk premium for the inquiry benchmark is calculated as that attached to Australian securities averaged over the same period over which all of the other benchmark metrics were observed. The results for the metrics – used to establish the business risk profile – are shown in Table 136.

Table 136 Business risk profile metrics by subsample and benchmark

Average sorted by	EBIT Margin	EBITDA Margin	Return on Capital	Country Risk Premium
UK	27%	44%	7.79%	8.96%
US	34%	47%	6.59%	7.81%
BBB- rated	30%	48%	10.94%	NA
A/A- rated	33%	46%	6.28%	NA
Inquiry Benchmark	32%	46%	6.99%	7.46%
Benchmark profile	**Between BBB- and A/A- rated**	**Between BBB- and A/A- rated**	**Better than A/A- rated**	**Relatively Strong**

Source: ERA Analysis, Bloomberg

The inquiry benchmark EBIT and EBITDA margin is 32 and 46 per cent. All else equal, these suggest a credit rating around A/A-. The return on capital for the benchmark is higher than the US average and the A/A- rated sample. All else equal, these measures suggest a rating of at least A-. The Australian country risk premium is lower than that of the UK and US which supports a higher credit rating for the Inquiry benchmark. The business risk profile should therefore fall in either the strong or excellent category in Table 133.

The credit metrics for the financial risk profile are shown in Table 137.

Table 137 Financial risk profile metrics by subsample and Water Corporation benchmark

Sample	FFO/Debt	Debt/EBITDA	Debt/Capital
UK	8%	10	47%
US	4%	15	33%
BBB- rate	12%	6	46%
A/A- rated	4%	16	33%
Inquiry Benchmark	6%	14	55%
Benchmark Profile	**Highly leveraged, better than A/A- rated - Aggressive**	**Highly leveraged, better than A/A- rated - Aggressive**	**Aggressive**

Source: ERA Analysis, Bloomberg

The funds from operations to debt coverage ratio is on the lower end of the spectrum and indicates high leverage according to Table 134. However, this metric is still higher than the A/A- sample suggesting that such a low ratio is not problematic in the water utility sector. This somewhat tempers the view of high financial risk stemming from this metric and so an 'aggressive' rating, one increment below highly leveraged in Table 134, would appear appropriate. Similarly, the debt to EBITDA ratio indicates high leverage according to Table 134, but again indicates less financial risk than the A/A- sample and so an aggressive rating is also considered appropriate. The benchmark debt to capital ratio (or gearing) is based on that established in above. At 55 per cent it is higher than all other companies in the sample and is rated as 'aggressive' according to Table 134. This analysis indicates a financial risk profile of 'aggressive' is appropriate for the Inquiry benchmark.

A business risk profile of strong or excellent and a financial risk profile of aggressive mapped onto the Standard and Poor's risk matrix in Table 134 corresponds with a credit rating of either BB or BBB. The BB rating is below investment grade. The ERA considers this a very unlikely rating for the Water Corporation benchmark because it would greatly impede a utility's ability to raise debt financing. The ERA therefore recommends a benchmark Standard and Poor's credit rating of BBB for the purpose of estimating the Water Corporation's WACC.

The Water Corporation supports the use of a BBB rating across the entire business. It cites that the Australian Energy Regulator, Essential Services Commission of South Australia, Independent Pricing and Regulatory Tribunal and Essential Services Commission of Victoria use of a benchmark within the BBB range. The Water Corporation submits that if a Water Corporation specific rating is to be used in place of a benchmark a different credit rating should be used for its metropolitan and country business segments, in recognition of the differing levels of risk faced by each. The use of multiple benchmarks has been addressed in the section on the benchmark efficient entity and risk above.

Cost of debt

The ERA estimates of the cost of debt by adding a debt risk premium, hedging costs and debt raising costs to the interest swap (**IRS**) rate.

Cost of Debt = IRS Rate + Debt Risk Premium + Hedging + Debt raising costs

The hybrid trailing average approach fixes the risk free rate, incorporated in the base rate, at the start of the 5 yearly period 'on-the-day', while incorporating a trailing average for the annual estimate of the DRP. The 5 yearly period applied here assumes the cost and tariffs for Water Corporation, Aqwest and the Busselton water board will be subject to 5 yearly review.

The hybrid trailing average cost of debt adopted by the ERA differs from the full trailing average proposed by Water Corporation. The Water Corporation recommends the use of a ten-year trailing average approach to determine the full cost of debt for the following reasons:

- It is more reflective of the actual financing costs of the Corporation, leading to prices which recover actual costs as closely as possible, preventing under or over recovery of costs.
- It more closely aligns with the long lives of water and sewerage assets, enabling investments to be evaluated more accurately.
- It will reduce price volatility from one price review period to the next. More stable prices better reflect the actual cost of investing in long-term assets and enable households, businesses and the Government to budget more effectively.
- A commercial rate of return that accurately reflects the finance costs of an efficient, competitive business will be more attractive to private investors looking to invest in the water industry.

The hybrid trailing average uses an 'on-the-day' estimate of the 5 year risk free rate while using a 10 year trailing average estimate of the 10 year debt risk premium. The 'on-the-day' 5 year risk free rate estimate is adopted by the ERA in recognition of Australian firm's ability to access an increasingly deep and liquid interest rate swap market to match the interest rate exposure of their revenue flows to debt financing costs. The ERA's view is that the cost of a financing strategy using swaps results in a lower expected cost of debt compared implementing a full trailing average which involves an additional term premium between the 10 and 5 year risk free rate. In addition, the use of a full trailing average can result in a violation of the principle that the return on debt should be lower than the return on equity, due to debt holders having higher priority claim on the debt issuer's assets. This comes about as a result of the full trailing average return on debt incorporating historical Treasury yields which were high compared to current yields. The return on equity however, only incorporates the current relatively low yields.

IRS rate

The ERA will use estimates of the prevailing 5 year IRS rate as the base rate input for estimating the return on debt. The swap rate incorporates a spread on the 5 year risk free rate estimated using Commonwealth Government Securities. Use of the swap rate (instead of the risk free rate) as the base rate is consistent with typical floating rate instrument conventions, whereby the base rate is periodically reset with reference to the IRS rate. For example a floating rate instrument that has a quarterly reset typically makes reference to the 3 month bank bill swap rate when resetting the base rate every three months. The ERA will make reference to the Australian dollar 5 year swap rate when resetting the base rate

every 5 years.[543] The 5 year IRS estimate over the 60 trading days to 29 March 2017 is 2.614 per cent.

Debt risk premium

A 10 year term for its estimate of the debt risk premium (**DRP**) is consistent with the average term of debt at issuance by the benchmark efficient entity with long lived assets. In past regulatory decisions the ERA has acknowledged that it is efficient for such an entity with long lived assets, such as a network service provider, to use debt with a 10 year term to maturity in financing.[544] In addition, the ERA has acknowledged the difficulties in hedging the DRP on such financing on account of the feasible hedging instruments not being available in the Australian market.[545] For this reason, the ERA's hybrid trailing average approach annually updates the DRP under the assumption that the benchmark efficient entity finances one-tenth of the total debt portfolio each year using debt instruments with a 10 year term in order to minimise exposure to adverse credit conditions.

The 10 year DRP is calculated using:

- the Reserve Bank of Australia's (**RBA**) corporate credit spreads based on the benchmark credit rating for historical estimates used in the 10 year trailing average; and
- the 10 year cost of debt based on the benchmark credit rating calculated using the ERA's bond yield approach less the 10 year IRS rate for current and future estimates.[546]

The historical estimates for the trailing average DRP are based on the RBA's spread to swap series.[547] The effective tenor underlying the 10 year variant of this series tends to be less than 10 years as a result of a large number of bonds in the sample having a remaining term to maturity less than 10 years. To correct this, the effective 10 year DRP is linearly extrapolated from each month's 7 and 10 year spread to swap estimates. Since the estimates are only available on a monthly basis, daily estimates need to be linearly interpolated from the 10 year extrapolated start of month and end of month estimates. The calendar year average of these daily spread observations is calculated and then annualised (assuming semi-annual payments) to arrive at the DRP applicable for that year. These estimates are from the earliest 9 calendar year estimates for the 10 year trailing average DRP. The tenth and latest DRP estimate uses the extrapolated and interpolated daily estimates described above up to the date of the WACC decision. From that point on, the DRP – calculated using the ERA's bond yield approach – is used as the end of month spread, for each month up until the end of the calendar year. The average of the resulting

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[543] Specifically, the Authority will use the annualised 5 year swap mid-rate, as published on Bloomberg (Last Price), over the relevant averaging period which is 60 days in this case. Other relevant information is as follows: ADSWAP5 Curncy, PX_LAST data from the Bloomberg terminal. This is the average of the bid and ask rate on the 5 year Australian Dollar interest rate swap rate (mid rate). Effective: T + 1, Floating side index: BBSW6M, Day Count ACT/365, payment and reset frequency semi-annual. Fixed side: Day Count ACT/365, payment frequency semi-annual. The default pricing source CMPN – the composite with a close time based on the New York market.

[544] Economic Regulation Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System*, 14 October 2014, p. 189.

[545] Ibid.

[546] The 10 year IRS rate is based on the annualised 60 day average of the last price (mid-price) returned using ADSWAP10 CMPN Curncy in Bloomberg.

[547] See Reserve Bank of Australia, 'Aggregate Measures of Australian Corporate Bond Spreads and Yields – F3', *Statistical Tables*.

daily estimates for the calendar year using this approach form the latest DRP estimate. The simple average of all ten DRP estimates is calculated as the 10 year trailing average DRP which is used in the WACC.

The ERA's bond yield approach is explained in detail in appendix 3 of the ERA's Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline.[548] An overview of the approach is as follows. The approach establishes a sample of bonds based on the criteria given in Table 138.

Table 138 Bond yield approach criteria

Criteria	Bond Yield Approach
Standard and Poor's Rating	As determined for benchmark
Country of risk	Australia
Currency	Australian dollar, United States dollar, Euro currency and British pound
Maturity date	>= 2 years from now
Maturity type	Bullet or callable or putable but no perpertual
Security type	Exclude inflation linked note
Sector/Industry group	Exclude 'Financials' (based on Bloomberg Industry Classification System Level 1 Sector Name)
Was called	No

The Australian dollar equivalent yields on each of the bonds meeting these criteria are then observed over the specified averaging period (in this case 60 trading days). The 60 day average of the yields from each bond becomes a single observation. These observations are then used to construct yield curves using two widely accepted econometric techniques (Nelson-Siegel and Nelson-Siegel-Svensson). The Gaussian kernel approach is an additional technique, which also is used. It is the method used by the RBA to calculate its corporate credit spreads. In essence, the Gaussian kernel approach estimates a yield for the target term to maturity (in this case 10 years) by assigning greater weight to the observed yields on bonds that are closer to the target tenor and less on those bonds further from the target tenor. The weighting is based on the shape of a normal distribution and also takes the face value of the bonds into account so that bonds with a greater face value are assigned a higher weight. Given that this approach tends to result in estimates with an effective tenor of less than 10 years, linear extrapolation based on the 7 and 10 year target tenor Gaussian kernel estimates – out to an effective tenor of 10 years, is required.

The results for the 10 year cost of debt on all three methods are annualised assuming semi-annual payments, and then averaged. The corresponding annualised 10 year IRS rate is deducted to arrive at the 'on-the-day' DRP estimate.

The Water Corporation's cost of debt is based on a Standard and Poor's credit rating of BBB as established above. The criteria in Table 138 yielded a sample of 35 bonds.[549] The results for the three methods estimated on a 60 day average of yields for each bond are shown in Table 139.

[548] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline (As amended on 21 July 2016)'*, 30 June 2016, pp. 562-596.

[549] One bond AM7968663 was deleted from the original sample of 36 bonds due to insufficient observations.

Table 139 Water Corporation BBB 'on-the-day' debt risk premium estimate as at 29 March 2017

Method	per cent
Gaussian kernel (Extrapolated)	5.060
Nelson-Siegel	4.994
Nelson-Siegel Svensson	4.994
Average of all three Methods	**5.016**
10 Year IRS Rate	3.032
10 Year Debt Risk Premium	**1.984**

Source: ERA Analysis, Bloomberg

The resulting 10 year regulatory cost of debt based on the average of all three methods is 5.016 per cent. The 10 year IRS rate over the corresponding averaging period was 3.032 per cent. Deducting the 10 year IRS rate from the regulatory cost of debt gives an 'on-the-day' debt risk premium of 1.984 per cent.

For the previous nine years in the trailing average DRP calculation the RBA spread to swap on BBB band bonds (which includes BBB+, BBB and BBB-) are used as an approximation for BBB. (The RBA does not produce historic yield series exclusively based on the BBB rating.) The trailing average results based on the 'on-the-day' estimate and RBA spreads to swap are shown in Table 140.

Table 140 Water Corporation trailing average debt risk premium

Financial Year	Debt Risk Premium
2017	2.181%
2016	2.511%
2015	1.815%
2014	2.980%
2013	2.982%
2012	2.994%
2011	2.019%
2010	2.502%
2009	5.849%
2008	1.142%
Trailing Average	**2.698%**

Source: ERA Analysis

The 'on-the-day' estimate is applied to the 2017 financial year from 29 March 2017 onward. The average of this and the extrapolated/interpolated daily RBA spread to swap estimates prior to that date gives a DRP of 2.181 per cent for the 2017 financial year. The ten year trailing average DRP for application in the WACC for Water Corp for the purposes of this Inquiry is 2.698 per cent.

Hedging and debt raising costs

As part of a previous regulatory decision, the ERA engaged Chairmont to advise on the

costs of undertaking swaps.[550] Chairmont estimates the following costs for each of the components, based on the data in Table 141 and its own enquiries.

Table 141 Hedging transactions costs, BBB credit rating

Estimate (basis points per annum)	10 year fixed to floating	Floating to 5 year fixed	Total
Evans & Peck (January 2015)	8.0	5.0	13.0
UBS (November 2014)			23
Jemena (June 2013)			7.9 – 9.4

Source:

Evans & Peck, reported in Incenta, WACC parameters for GAWB Price Monitoring Investigation 2015-20 – Draft Report, February 2015, p. 32 (swapping 10 for 5; $250 m debt; BBB; to mid-rate; as at 12 January 2015)

UBS, reported in Transgrid, Revised revenue proposal, 13 January 2015, Appendix R, p. 6 (BBB+ credit rating)

Jemena, Rate of Return Guidelines – Consultation Paper: Submission, 21 June 2013, p. 22 (BBB+ credit rating)

For five year swaps (at the initiation of five year period) the different submissions provide a range of estimated costs. Evans and Peck (2015) 5 basis points; UBS less than 5 basis points; Jemena less than 5 basis points (that is, less than half of the total 8-10 basis points, as a 5 year swap costs less for capital and credit charges). This suggests approximately 4 basis points is appropriate. This is also supported by informal discussions held by Chairmont with two banks in late 2014.

For cross-currency swaps there was only one estimate provided, by UBS, which reported 18 basis points. Chairmont's discussions with the banks suggest that this estimate is at the high end of costs and is likely to overstate a swap in relation to a new issuance. Furthermore, banks tend to be more aggressive on swap pricing when linked to other business. A lower level of 10 basis points appears to be reasonable, so for further calculation a mid-point of 14 basis points is used.

There are also estimates for ten year Australian dollar fixed-floating swaps. The submissions are Evans and Peck (2015) 8 basis points; UBS 5 basis points; Jemena and Authority (implied) 5 to 7 basis points. Taking a mid-point such as 6 basis points appears reasonable for this component.

The ERA calculates the weighted cost of hedging, using Chairmont's basis point per annum estimates set out above, as the sum of:

- 5 year swap floating for fixed for the full amount of debt = 4 basis points x 100 per cent = 4.0 basis points; plus
- 10 year cross currency swaps for (100 – 65 =) 35 per cent of debt issuance = 14 basis points x 35 per cent = 4.9 basis points;
- 10-year fixed-float AUD swaps for (65 – 24=) 41 per cent of debt issuance = 6 basis points x 41 per cent = 2.5 basis points.

[550] Chairmont Consulting, *Hedging Costs in the Cost of Debt*, 13 May 2015.

That sum gives a total cost of hedging of 11.4 basis points for the BBB credit rating. Accordingly, the ERA recommends an allowance of 11.4 basis points in the cost of debt for the Water Corporation's hedging costs in this decision.

The ERA is of the view that debt raising costs should be incorporated as a component in the rate of return on debt. However, these debt raising costs should only include the direct cost components. These costs will be recompensed in proportion to the average annual issuance, and will cover: (i) gross underwriting fees; (ii) legal and roadshow fees; (iii) company credit rating fees; (iv) issue credit rating fees; (v) registry fees; and (vi) paying fees. The ERA considers that its 2013 Rate of Return Guidelines estimate of 12.5 basis points per annum still provides a reasonable estimate of debt raising costs for the benchmark efficient entity.[551]

Return on equity

In estimating the return on equity, the ERA relies on the Sharpe-Linter Capital Asset Pricing Model (**SL CAPM**). This approach is consistent with modern finance/portfolio theory whereby investors will not require a discount (return premium) on an asset exposed to risks that are diversified away in the context of overall portfolio return. Under this framework however, investors will require a relative discount (return premium) on assets that are exposed to a higher level of non-diversifiable (systematic) risk which is captured by the SL CAPM.

Return on equity estimates are forward looking and are *expected* returns – not returns realised in reality (actual returns). Actual returns are only useful in measuring the level of exposure to systematic risk.

The Water Corporation believes that theoretical models should not be solely relied on to determine the return on equity, subsequently making reference to the SL CAPM. This is on the basis that it believes that theoretical models do not always reflect reality.

While the Water Corp submits that theoretical models should not be solely relied on to determine the return on equity it did not recommend any other means of estimating the return. There are many competing models for estimating the return on equity that attempt to prove excess returns observed in realised returns are not anomalies. The SL CAPM, however, remains the most well accepted model in developing expectations. In addition, the SL CAPM functions through the application of an estimated market risk premium. The ERA develops forward looking expectations on this parameter taking a range of models and capital market indicators into account.

Market risk premium

Methods to calculate the MRP

The MRP consists of two components; the nominal risk free rate (outlined above) and the market return on equity. The MRP is generally calculated as follows:

[551] Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 198.

$$MRP = E(R_M) - R_f$$

where:

$E(R_M)$ is the expected market return on equity observed in the Australian stock market; and

R_f is the 5 year risk free rate of return.

Estimation of these two components of the MRP is discussed below.

Estimating the expected market return on equity

One view is that – given a sufficient period of time – the market return on equity will revert to a long run historical average. This implies that the long run historical average is a good forecast of the market return on equity, despite the short term fluctuations around the average. This outcome, in fact, tends to be realised in Australian equity market data. The implication is that the long run historical average Australian market return on equity is a good forecast of the future market return on equity. The historical data indicates that over a long period of time the long run historical mean will tend to be realised on *average*.

Other methods attempt to account for the shorter term fluctuations observed in the market return on equity by using forward looking, as opposed to historical, data. The most common example is the Dividend Growth Model (**DGM**) which uses forecast cash flows (dividends) based on growth expectations and solves for a discount rate which equates this stream of cash flows to the current stock price. This forward-looking discount rate is the implied market return on equity.

Estimating the risk free rate of return

The current risk free rate of return that will be realised for the next 5 years is observable.[552] Future 5 year risk free rates of return are unobservable and so must be forecast. There is no consensus as to whether historical rates or the 'on-the-day' rate should be used in the MRP calculation. Use of the on-the-day risk free rate assumes that the prevailing rate is a better forecast of future rates than the long term historical average rate. This is based on the premise that the risk free rate does not revert to a long run average. In that case, using the latest observation minimises the deviation between the forecast and the realised rate. Australian Government bond yield data used as the measure of the risk free rate of return does not exhibit a tendency to return to a long run average.[553] The implication is that the on-the-day rate is a better forecast of the risk free rate than the long run average. Hence the current on-the-day observed risk free rate for the next 5 years is used for the purpose of calculating the WACC for Water Corporaton, Aqwest and Busselton Water.

[552] Yields on Australian Treasury bonds are used as a proxy for the risk free rate of return. These yields are observable because a Treasury bond's current market price, coupon interest rate and principal payable upon maturity are observable prior to maturity. The discount rate that equates a bond's remaining coupon payments and principal with the current price is the current yield to maturity.

[553] Economic Regulation Authority, *Appendices to the Explanatory Statement for the Rate of Return Guidelines: Meeting the requirements of the National Gas Rules*, 16 December 2013, p. 140.

Specific methods for calculating the MRP

The ERA uses three methods to inform its judgment for the 5 year forward-looking MRP.

First, the Ibbotson method calculates the average of a series of annual MRP observations. The MRP is calculated for each calendar year spanning back over the longest period of time for which data is available. There are currently 134 annual Australian MRP observations dating back to 1883. These observations are derived by deducting the risk free rate in each calendar year from the realised market return on equity in that year. The arithmetic average of these observations is typically employed, but the geometric average is also often quoted. If one believes the risk free rate and market return on equity are related, such that they will not drift too far apart, the Ibbotson method would be emphasised. This is because it is reliant on reversion of the MRP, as opposed to market return on equity, to a long run average.

Second, the Wright method uses the long run average of a series of annual *real market return on equity* observations. This average market return on equity is indexed with a 5 year inflation forecast. The inflation forecast used by the Authority is that implied from the difference between the on-the-day nominal and real 5 year risk free rate of return. To arrive at the Wright MRP estimate the on-the-day risk free rate is then subtracted from the indexed average market return on equity.[554] If one believes that the market *return on equity* will revert to a long run average rate – regardless of the behavior of the risk free rate – more emphasis would be placed on the Wright method. This is because the Wright method reflects a perpetual outlook on the real market return on equity.

Third, the DGM based approach to estimating the MRP also deducts the 10 year on-the-day risk free rate of return from the DGM based estimate of the market return on equity. The DGM based method has the benefit of being forward looking. It takes the current economic outlook into account, by accounting for market participants' dividend growth expectations.

However, the DGM is known to produce upwardly biased estimates. As noted by McKenzie and Partington in their report to the Australian Energy Regulator, the shortcomings of the DGM are:

- analyst forecasts have a tendency to be upwardly biased, as they are often based on over-optimistic expectations for target prices and earnings;
- DGMs may not fully reflect market conditions if firms follow a stable dividend policy; and
- DGMs do not capture non-dividend cash flows, such as share repurchases or dividend re-investment plans.

The treatment of data under the three methods is outlined in Table 142.

[554] Despite the naming convention the 'on-the-day' rate is usually an average over some short period of time such as 20, 40, or in this case, 60 trading days prior to the day of the cost of capital determination date to reduce the risk of idiosyncratic events unduly influencing the risk free rate forecast.

Table 142 Data treatment in various market risk premium calculation methods

Approach	Market return on equity	Risk free rate
Ibbotson	Historical	Historical
Wright	Historical	On-the-day
DGM based	Forward looking	On-the-day

Application of methods to calculate the MRP

Historical data approaches

Brailsford, Handley and Maheswaran (BHM) produce the longest series of historical equity risk premium data for Australia. However, in 2013 NERA Consulting raised concerns over potential downward bias in some of the older data observations and produced an adjusted version of the BHM data. Professor Handley responded to these concerns highlighting shortcomings in NERA's adjusted series. The ERA is not aware of any data that rectifies these issues or new information that favours the use of one data source over the other. To minimise the potential error from incorrectly favouring one source, the ERA uses the average of the NERA and BHM data.

The results of applying the Ibbotson method are shown in Table 143. Four sub-periods are reported involving years prior to 1988 (which corresponds to the date of the introduction of the dividend imputation regime). The ERA has more confidence in the shorter pre-1988 datasets, given potential bias prior to 1958.[555]

Table 143 MRP results from Ibbotson method classified by sub-periods of improving data quality

	Arithmetic mean			Geometric mean		
Period	**NERA**	**BHM**	**Average**	**NERA**	**BHM**	**Average**
1883-2016	6.55%	6.20%	**6.38%**	**5.19%**	4.84%	**5.01%**
1937-2016	5.79%	5.84%	**5.82%**	3.93%	3.97%	**3.95%**
1958 - 2016	6.29%	6.29%	**6.29%**	3.92%	3.92%	**3.92%**
1980 - 2016	6.08%	6.08%	**6.08%**	3.77%	3.77%	**3.77%**
1988 - 2016	5.53%	5.53%	**5.53%**	3.88%	3.88%	**3.88%**

Source: Brailsford, Handley, Maheswaran (2012) and ERA Analysis.

There are mixed views on the appropriate averaging process for historic returns. McKenzie and Partington state it is well understood that geometric average returns will tend to understate returns.[556] In the same report they also highlight Blume's 1974 study which shows that the arithmetic average will tend to overstate returns when it is compounded over more than one period. This is due to compounding the sampling error inherent in the data. Therefore the ERA's view is that an unbiased estimator is likely to lie somewhere between the two types of averages. In lieu of any other information, the ERA seeks to minimise any

[555] Professor Handley notes that the differing start dates of 1883, 1937, 1958 and 1980 correspond to periods of increasing data quality but decreasing sample size. See J. Handley, *An estimate of the historical equity risk premium for the period 1883 to 2010*, p.4.

[556] M. McKenzie and G. Partington, *Supplementary report on the equity MRP*, 22 February 2012, p. 5.

error associated with over-reliance on one of the two types of averages by using the simple average of the lowest arithmetic mean and highest geometric mean in Table 143.

The ERA considers that the average of the lowest arithmetic mean estimate of 5.53 per cent and highest geometric mean estimate of 5.19 per cent provides a reasonable Ibbotson based MRP estimate. That average MRP estimate is 5.36 per cent.

The results of applying the Wright method to the historical data are shown in Table 144.

Table 144 MRP result from Wright method

	NERA	BHM	Average
Nominal market return on equity including realised inflation	11.94%	11.59%	11.76%
Real market return on equity excluding realised inflation	8.91%	8.56%	8.74%
Expected Inflation	1.79%	1.79%	1.79%
Nominal market return on equity including expected inflation	10.86%	10.50%	10.68%
5 year Risk Free Rate of Return	2.25%	2.25%	2.25%
Market Risk Premium	8.61%	8.25%	8.43%

Source: ERA Analysis December 2016, NERA (2013), Brailsford, Handley and Maheswaran (2012).

The historical nominal market return on equity series is adjusted for realised inflation to create a real market return on equity series. The average of this series is 8.61 per cent using NERA's data and 8.25 per cent using the BHM data. These averages are then indexed for expected inflation over the forthcoming 5 year period of 1.79 per cent. The average of the resultant nominal market return on equity estimates is 10.68 per cent. Deducting the 5 year risk free rate of 2.25 per cent from this figure results in an MRP of 8.43 per cent.

Forward looking data approach (DGM)

Dividend growth expectations are extremely variable due to the continuous arrival of new information in the market. The latest information is therefore the most relevant to the expected return. Accordingly, the ERA has included estimates that are less than two years old. The updated table of DGM estimates from a range of DGM models is shown in Table 145.

Table 145 Recent estimates of the MRP using the DGM

Study/Author	Date	Dividend yield source	Theta	Risk free rate (%)	Implied MRP (%)
Frontier Economics	July 2015	Thomson Reuters I/B/E/S	0.35	2.85	8.35
AER	May 2016	Bloomberg	0.6	2.93	7.57 – 8.84
ERA	May 2016	Bloomberg	0.53	1.82	8.12
Frontier Economics	June 2016	NA	0.56[557]	2.13	8.09
Estimated range of the MRP					**7.6 – 8.8**

Source:

Frontier Economics, *An updated estimate of the required market return on equity*, Report prepared for Ergon Energy, July 2015, p. 6.

SFG Consulting, *Updated estimate of the required market return on equity*, Report for SA Power Networks, May 2015, p. 4.

Australian Energy Regulator, *Final decision: AusNet Services distribution determination 2016 to 2020*, Attachment 3: Rate of return, May 2016.

Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, 30 June 2016, p. 114.

Frontier Economics, *The market risk premium*, Report prepared for Aurizon Network, November 2016, p. 53.

The ERA has also updated its two stage DGM estimate. The DGM estimate is based on a two stage approach outlined in equation (6).

$$P_0 = \frac{m \text{ x } E(D_0)}{(1+k)^{m/2}} + \sum_{t=1}^{N} \frac{E(D_t)}{(1+k)^{m+t-0.5}} + \frac{\frac{E(D_N)(1+g)}{k-g}}{(1+k)^{m+N-0.5}} \quad (6)$$

Where:

P_0 is current price the of the equity index;

m is the fraction of the current year remaining;

$E(D_0)$ is the dividend inclusive of imputation credit value per share expected in the current year;

$E(D_t)$ is the dividend inclusive of imputation credit value per share expected t years into the future;

k is the market return on equity implied by the model;

[557] Frontier Economics apply the Queensland Competition Authority's assumption that a distributed imputation credit is worth 0.56.

N is the year of the furthest out dividend forecast; and

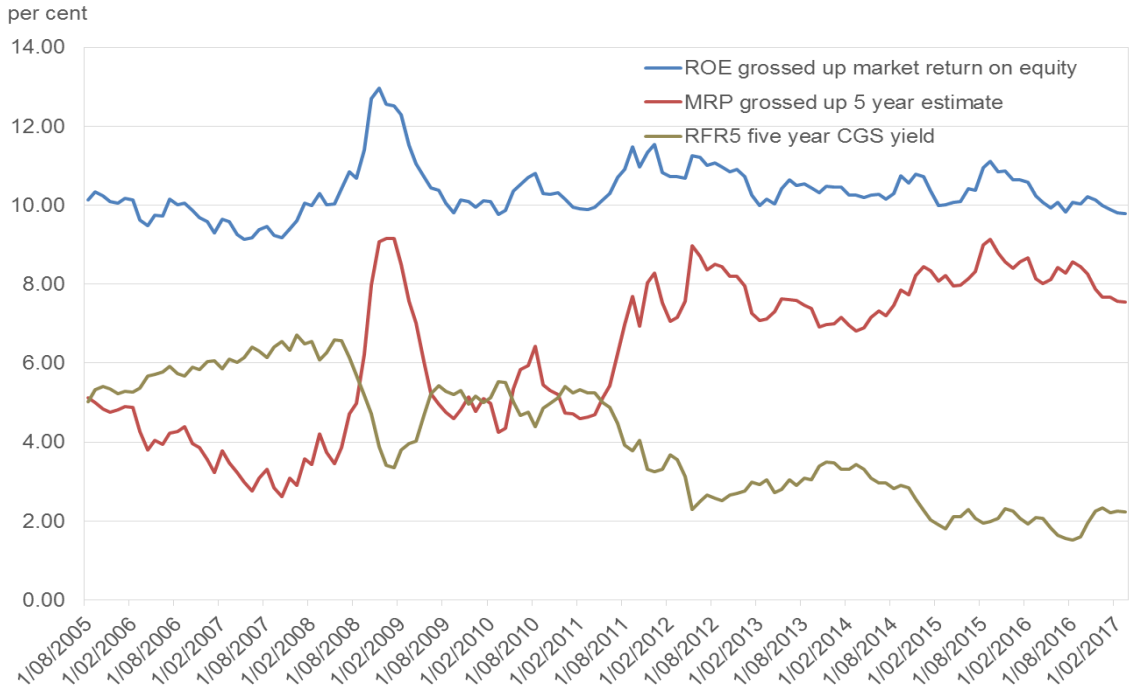
g is the long run dividend growth rate.

Monthly cash (or net) dividend per share forecasts for the All Ordinaries Index are sourced from Bloomberg for the current year, the next year and the year after. The monthly closing price for the All Ordinaries index is also sourced from Bloomberg.

The assumption for the long run dividend growth rate is 4.6 per cent. This is based on Professor Lally's 2013 study which equates to the estimated long run nominal GDP growth of 5.6 per cent, less 1.0 per cent to account for new share issues and new companies.

The ERA's DGM based MRP estimate as at 29 March 2017 is 7.51 per cent. This is a result of subtracting the risk free rate of 2.25 per cent from the solution for the market return on equity of 9.76 per cent. This estimate falls slightly outside the range of DGM estimates in Table 145. This appears to be a result of both decreased return on equity expectations and a rise in the risk free rate of return since the latter part of 2016 (see Figure 102). The differences in the ERA's March 2017 DGM estimate and the range can therefore be reconciled with the range on account of these changes over time.

Figure 102 Dividend growth model return on equity, risk free rate and market risk premium



Source: ERA Analysis, Bloomberg

Table 146 shows the MRPs calculated using the Ibbotson, Wright and DGM methods as well as the DGM range observed from other decisions.

Table 146 MRP estimates based on various methods

	Ibbotson	Wright	Latest ERA DGM	Other recent DGM estimates - range
MRP	5.36%	8.43%	7.51%	7.6 – 8.8%

Determining the final estimate of the MRP

The range for the MRP based on the estimates considered in Table 146 is 5.4 to 8.8 per cent. The rounded Ibbotson estimate forms the lower bound while the upper bound of the DGM range forms the overall upper bound.

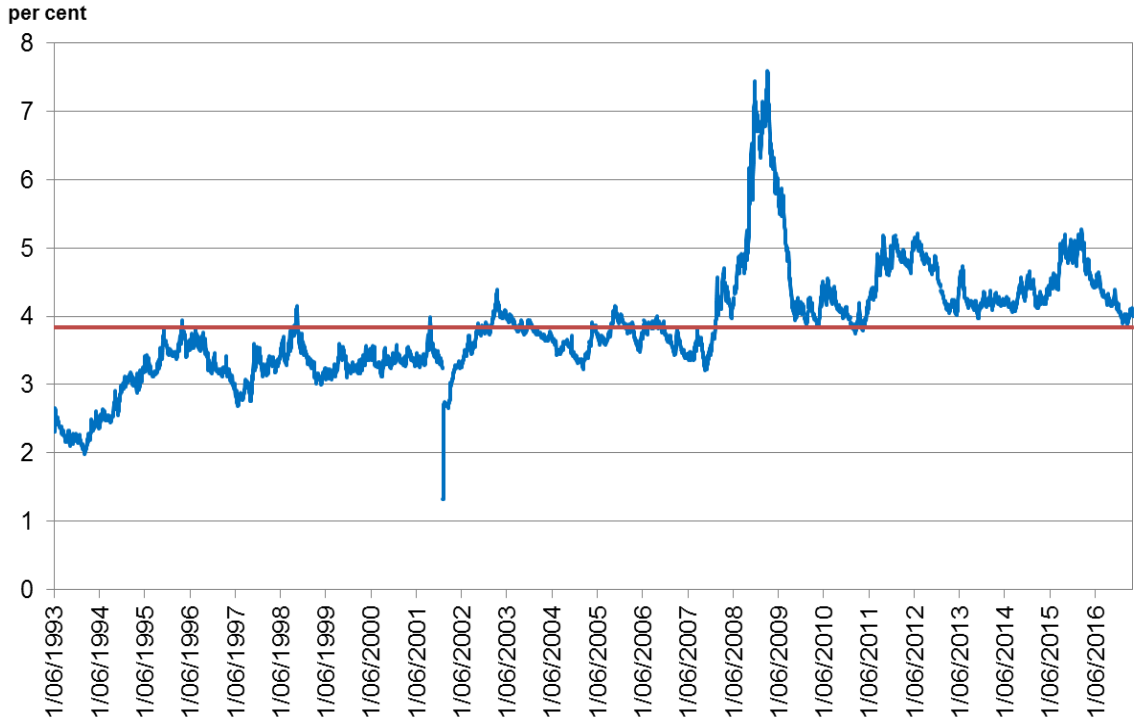
Forward looking indictors are used as additional information in forming capital market expectations and the associated estimate of the expected MRP within the established range. The four following forward looking indicators, which are readily available up to 29 March 2017, are used to condition expectations over the next 5 years:

- dividend yields on the All Ordinaries, a financial metric;
- interest rate swap spreads on 5 year bonds, which can be viewed as a type of term structure variable;
- default spreads, another term structure variable that makes forward looking expected returns explicit; and
- the Australian Stock Exchange (ASX) 200 Volatility Index (VIX) which measures investors' perceptions of equity market risk.

In addition, the February 2017 outlook for economic conditions in the Reserve Bank of Australia's Statement on Monetary Policy useful in forming capital market expectations.

Dividend yields

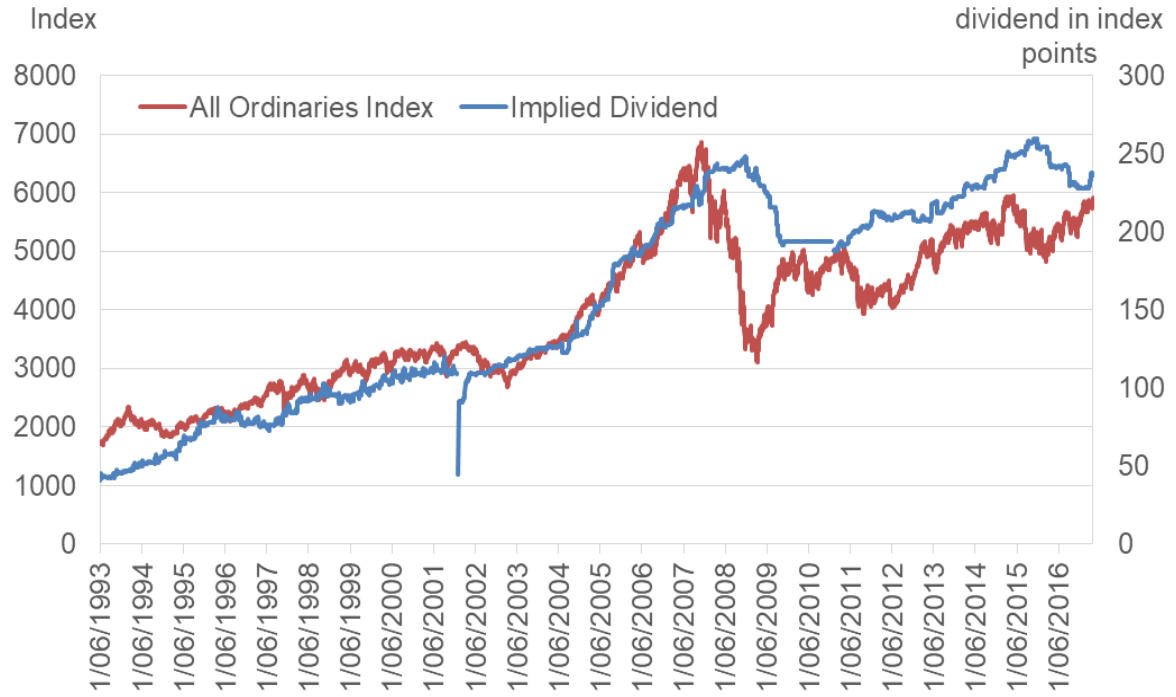
Figure 103 All Ordinaries index annual dividend yields



Source: ERA Analysis, Bloomberg

There appears to be a recent downward trend in historically high dividend yields toward the long run average (Figure 104). This trend appears to stem more from the price gains in the All Ordinaries index since early 2016, which have experienced a rate of increase much stronger than the dividends per share rate of decrease (Figure 104). This price appreciation tends to indicate a more positive earnings growth outlook which in turn is typically associated with a reduced MRP.

Figure 104 All Ordinaries index and implied dividend

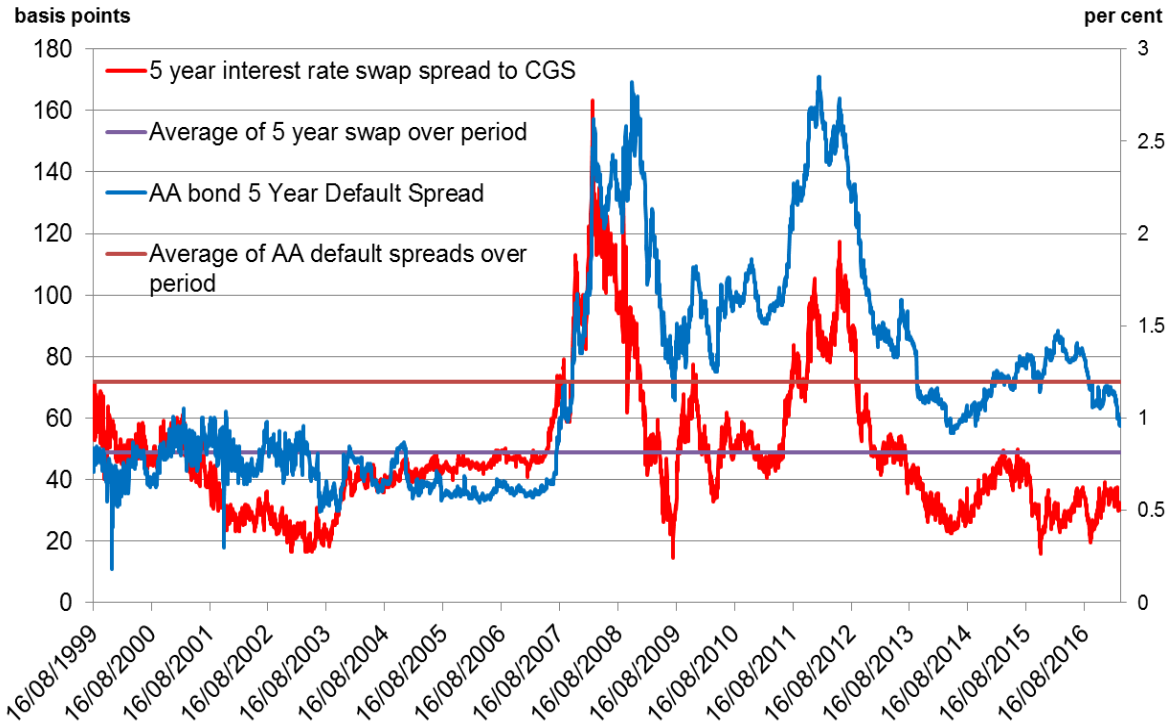


Source: ERA Analysis, Bloomberg

Default and Interest Rate Swap Spreads

The 5 year interest rate swap spreads capture, among other things, the credit risk of financial institutions. The Interest Rate Swap (**IRS**) rate is the index rate at which financial institutions borrow and lend from each other. This rate is higher than the CGS yield of an equivalent term with the 'spread' over the CGS capturing the credit risk of financial institutions.

Figure 105 5 Year interest rate swap versus 5 year default spread



Source: ERA Analysis, Bloomberg

The 5 year interest rate swap spread (Figure 105, left side, basis points), is well below the series average level and from time to time has approached the pre-2007 low points. The current spread suggests that levels of risk in the financial sector are fairly benign. Accordingly, there is no justification for a relatively high MRP on the basis of financial system risk.

The default spread (Figure 105, right side, per cent) has not returned to pre-crisis levels, but has been trending downward since early 2016. It is currently around 0.2 percentage points below the series average of 1.2 per cent. This suggests that levels of credit risk in the broader corporate sector have eased substantially. The reduced corporate sector credit risk supports a relatively low expected MRP.

The ERA considers that interest rate swap and default spreads therefore support an MRP estimate somewhat below the mid-point of the historic range.

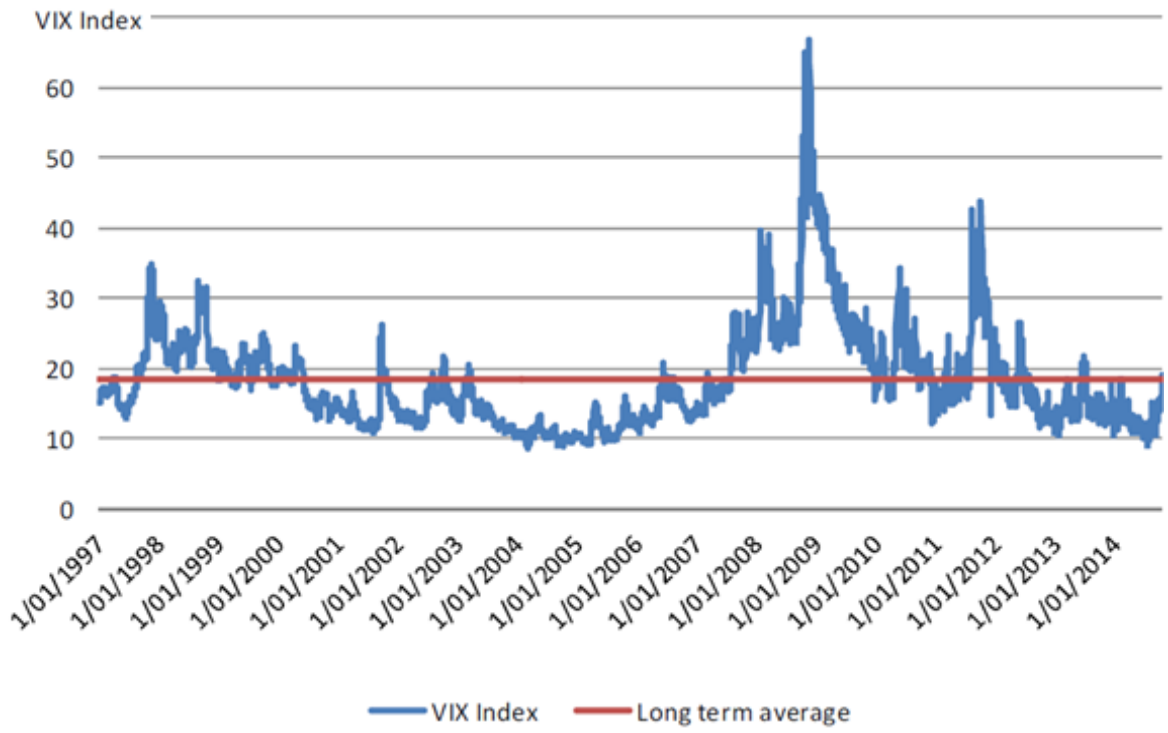
Stock Market Volatility Index

The benefit of using stock market volatility indices is that it represents a different class of index to those discussed already. As outlined above, the IRS spreads and default spreads convey similar information while the DGM is an extension of dividend yields. Using different versions of similar indicators introduces the risk of double counting, or over-weighting measures that contain the same information. A volatility index of some variety provides a differentiated measure of risk as it is concerned with variance (uncertainty around return outcomes) as opposed to levels of return or yields. The VIX therefore is used as measure of forward looking risk in this Inquiry.

Although useful for gauging future perceptions of risk stemming from forecast variability in returns, the Authority has access to only a limited history, dating back only to 2008. However, the AER has sourced a longer term series of the ASX 200 VIX index which allows

for more meaningful historical comparison between the most recent level of the VIX and previous levels back to 1997. This series is reproduced in Figure 106.[558]

Figure 106 Implied Volatility (ASX200 VIX) over time

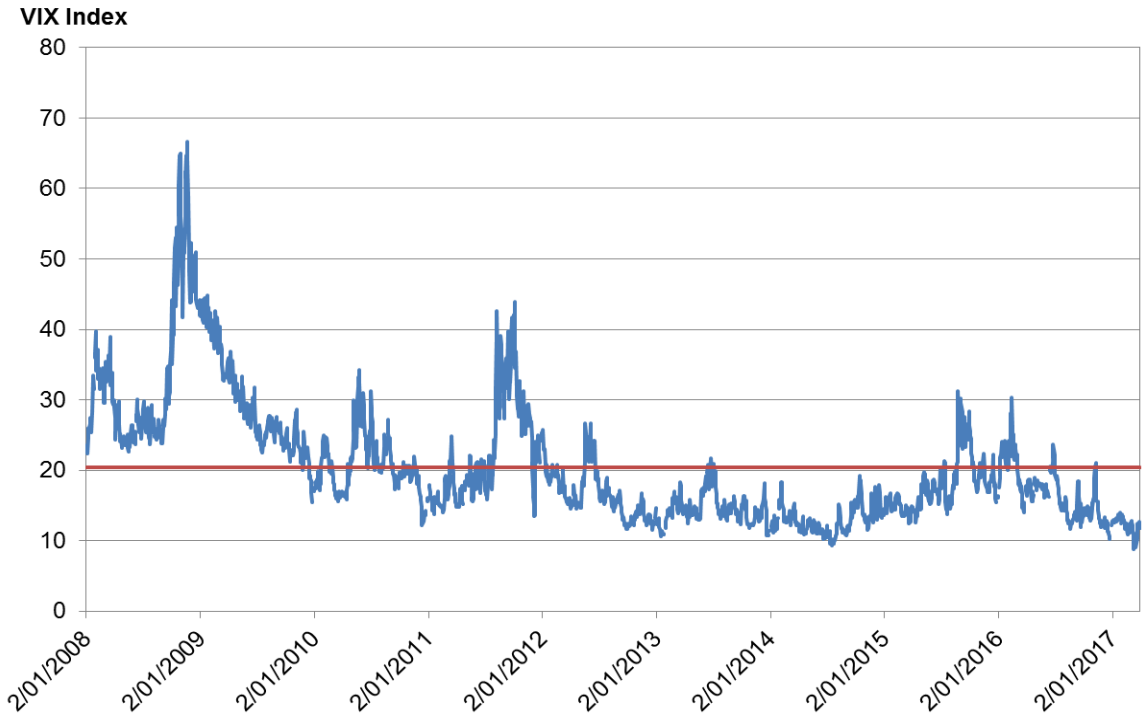


Source: Australian Energy Regulator

The series around 2014 reaches a level which is approximately on par with the low points observed over 2004 to 2005. More recently the series has begun to revert toward the long term average level observed. The series has been updated to 29 April 2017 in Figure 107 with data that is accessible to the ERA.

[558] Australian Energy Regulator, *Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-2020: Draft Decision*, Attachment 3: Rate of Return, November 2014, p. 205. The Authority is not able to access this proprietary data as it is no longer available. The Authority has been advised by the Australian Energy Regulator that the series prior to 2008 was sourced from Bloomberg as the CITJAVIX Index, which is no longer provided by Bloomberg. The AER's chart of this data is therefore reproduced here.

Figure 107 Implied Volatility (ASX200 VIX): 2 January 2008 to 29 March 2017



Source: ERA Analysis, Bloomberg

This series shows that the current VIX is below the long term average value in the observed data (indicated by the red line) in Figure 106 and Figure 107. It is also on par with some of the lowest levels in the series. This supports the choice of an MRP that is below the mid-point of the historic MRP range.

The RBA's outlook

The ERA notes that the Reserve Bank of Australia's February 2017 Statement on Monetary Policy (SMP) said that growth in Australia's major trading partners was higher than expected in 2016 and is likely to remain above potential, due to expansionary monetary and (US) fiscal policy. Domestic non-mining business is expected to pick up over the medium term, driven by investment in New South Wales and Victoria, which have been less susceptible to the falling away of the mining investment boom. Capacity utilisation measures have been increasing over the past two years and are above their long term averages. The RBA cites uncertainty around the timing and magnitude of inflation driven by labour cost growth and rising global inflationary pressure as one of the key risks to activity. Its current activity forecasts, however, assume the impact of these risk factors diminishes over the short to medium term.[559]

The mildly positive outlook for economic activity and relatively subdued risk outlook tend to indicate a more favorable investment climate thereby relieving pressure on the expected MRP.

[559] Reserve Bank of Australia, *Statement on Monetary Policy*, February 2017.

The point estimate of the MRP

The forward looking MRP for input to the Sharpe Lintner CAPM is unobservable. The ERA has therefore used for a range of information in order to estimate the MRP. That information includes:

- a range for the MRP that reflects historic excess returns;
- a range for the forward looking MRP based on the DGM model;
- conditioning variables which indicate expectations for relative risk over the regulatory period – interest rate spreads, market volatility, as well as current expectations for dividend yields; and
- the central bank's economic outlook.

The estimated range is 5.4 per cent to 8.8 per cent, which spans:

- the range of the MRP implied by the historic data, which is 5.4 per cent to 8.4 per cent;
- the range for the MRP implied by recent estimates from the DGM, which is 7.5 per cent to 8.8 per cent.

With regard to the historic estimates, the ERA draws on a range of forward looking indicators to assist its determination of the most reasonable point estimate of the MRP from within the estimated historic range:

- Dividend yield data suggests an estimate that is close to the mid-point of the range.
- The spread data for the corporate sector supports a forward looking estimate that is somewhat below the mid-point of the historic range.
- The VIX data indicates that the 5 year MRP is below the mid-point of the historic range.
- The RBA's outlook for market conditions supports a relatively low MRP.

The conditioning data, taken together, suggest that the forward looking MRP should be somewhat below the mid-point range for the MRP using historic data, which is 6.9 per cent. The ERA also notes the current outlook for market conditions – more broadly – also supports this view.

In addition, the ERA notes that a forward looking MRP, estimated using the DGM, falls within a range of 7.6 per cent and 8.8 per cent. However, the ERA considers that it is widely accepted that DGM estimates of the market return on equity (and by extension the MRP) tend to be over-estimated. Some of the reasons for this are:

- DGMs may not fully reflect market conditions if firms follow a stable dividend policy;
- analyst forecasts (which underpin some of the studies reported in Table 145 and which will often be incorporated in the 'consensus' estimates) have a tendency to be upwardly biased, as they are often based on over-optimistic expectations for target prices and earnings; and
- DGMs do not capture non-dividend cash flows, such as share repurchases or dividend re-investment plans.[560]

[560] See for example M. McKenzie and G. Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 26-31.

Accordingly, the DGM estimates need to be tempered to account for these issues which imply upward bias in the resulting estimates of the MRP. Also, as shown in Figure 102, DGM based estimates have begun to trend down, mainly as a result of recent increases in the 5 year risk free rate estimate and partly as a result of a decreased expected return on equity. These recent developments are not reflected in the DGM range developed in Table 145, because the latest estimate in that table was made on June 2016, while these developments have come about from September 2016 onward.

Taking all the information above into account, the ERA judges the forward looking estimate of the MRP for this inquiry to be 6.8 per cent. This reflects the ERA's view on capital market expectations as at 29 March 2017.

Equity beta

Equity betas were estimated for each of the firms in the benchmark sample of water service providers in the US and UK outlined in Table 127 above. The approach used is similar to that set out in the ERA's Rate of Return Guidelines prepared for meeting the requirements of the National Gas Rules.[561] The estimates first remove the effect of each firm's actual gearing on equity beta. This process is referred to as 'de-levering' and produces an 'asset beta' for the firm which is a measure of the firm's systematic risk assuming no gearing. The asset betas are then re-levered using the benchmark gearing assumption of 55 per cent for Water Corp and 30 per cent for Aqwest and the Busselton Water.

Benchmark betas

The initial results at 55 per cent gearing are shown in Table 147 and Table 148.

Table 147 US water service providers' equity betas re-levered at 55 per cent gearing

Regression method	AWK	WTR	CTW	MSE	YOR	ART	Average
OLS	0.52	0.82	0.83	1.08	1.34	0.73	**0.89**
LAD	0.48	0.78	0.75	0.75	1.07	0.71	**0.76**
Robust MM	0.54	0.82	0.85	0.94	1.21	0.65	**0.84**
Thiel Sen	0.53	0.83	0.87	0.93	1.29	0.66	**0.85**
Average	**0.52**	**0.81**	**0.82**	**0.93**	**1.23**	**0.69**	**0.83**

Source: ERA Analysis, Bloomberg

US water service providers equity betas are 0.83 on average while the UK average is lower at 0.76. This appears to be mainly on account of the US York Water Company producing a very high beta estimate of 1.23 on average across all four regression methods. Without York Water Company the average US equity beta is 0.79.

[561] Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the requirements of the National Gas Rules*, 16 December 2013, pp. 167-182.

Table 148 UK water service providers equity betas re-levered at 55 per cent gearing

Regressions method	UU/	SVT	PNN	Average
OLS	0.68	0.76	0.83	**0.76**
LAD	0.73	0.76	0.85	**0.78**
Robust MM	0.68	0.73	0.82	**0.74**
Thiel Sen	0.68	0.75	0.80	**0.75**
Average	**0.69**	**0.75**	**0.82**	**0.76**

Source: ERA Analysis, Bloomberg

The equity betas for the UK service providers exhibit less variation between estimates, both across regression methods used and companies. This suggests a greater degree of certainty in the UK water service provider equity beta estimates. Tests of robustness of the equity beta estimates are outlined below.

Robustness

The test statics for the US water service provider equity beta estimates are shown in Table 149. All estimates report a test statistic great than 1.96 indicating that they are statistically significant at the 5 per cent level. This indicates that the estimates are meaningful from a statistical perspective.[562]

Table 149 US water service providers equity beta statistical significance

	AWK	WTR	CTW	MSE	YOR	ART
OLS	0.52	0.82	0.83	1.08	1.34	0.73
t-stat	*5.36*	*6.79*	*5.83*	*6.83*	*7.11*	*4.83*
LAD	0.48	0.78	0.75	0.75	1.07	0.71
t-stat	*3.96*	*5.08*	*4.58*	*5.05*	*5.80*	*4.44*
MM	0.54	0.82	0.85	0.94	1.21	0.65
t-stat	*5.41*	*6.61*	*6.29*	*6.60*	*7.27*	*4.67*

Source: ERA Analysis

Equity beta estimates can be subject to thin trading where the stock of the company in question is traded relatively infrequently compared to the index or the index is traded relatively infrequently compared to the stock of the company in question. The phenomenon is more common for smaller capitalisation stocks. This creates a mismatch in timing of responses between the two sets of returns (on the company stock and index) and can result in biased beta estimates. Dimson's beta or 'sum' beta is a test for thin trading. This measure calculates three betas; one where the two sets of returns are mismatched by one period backward (lag beta), one where they are mismatched by one period forward (lead beta) and a conventional coincident beta estimate where the returns are synchronised. The three betas are summed together and tested for statistical significance. A statistically significant Dimson's beta is evidence of thin trading. The idea behind this is that the lag and/or lead betas are significant indicating delayed returns responses between one set of returns and the other.

[562] Thiel-Sen estimate are a non-parametric measure and so these tests for statistical significance are no directly applicable.

Table 150 shows the results for the thin trading tests on the US water service providers equity beta estimates.

Table 150 US water service providers thin trading tests

Company	Thin Trading Test (t-stat)	Outcome	Lag Beta (t-stat)	Coincident Beta (t-stat)	Lead Beta (t-stat)	Outcome
AWK	**2.39**	Evidence of thin trading	-1.81	***5.36***	-0.47	Weak evidence of thin trading
WTR	**2.15**	Evidence of thin trading	-1.27	***6.79***	-0.72	Weak evidence of thin trading
CTW	**2.74**	Evidence of thin trading	**-2.74**	***5.83***	0.03	**Evidence of thin trading**
MSE	0.38	No evidence of thin trading	-0.47	***6.83***	0.12	No evidence of thin trading
YOR	**3.43**	Evidence of thin trading	**-2.66**	***7.11***	-0.53	**Evidence of thin trading**
ART	**2.53**	Evidence of thin trading	**-3.13**	***4.83***	0.65	**Evidence of thin trading**

Source: ERA Analysis

Five of the seven US based estimates show evidence of thin trading. However, of these only Connecticut Water (**CTW**), York Water Company (**YOR**) and Artesian Water (**ART**) report a statistically significant lag beta. This is evidence of thin trading for those companies and so their beta estimates are not considered robust. Accordingly, they should be excluded from the analysis.

The test statistics for the UK water service provider equity betas are shown in Table 151.

Table 151 UK water service providers equity beta statistical significance

	UU/	SVT	PNN
OLS	0.68	0.76	0.83
t-stat	***8.57***	***8.49***	***8.46***
LAD	0.73	0.76	0.85
t-stat	***8.57***	***7.33***	***9.30***
MM	0.68	0.73	0.82
t-stat	***8.63***	***9.30***	***9.08***

Source: ERA Analysis

All estimates report a test statistic great than 1.96 indicating that they are statistically significant at the 5 per cent level. This indicates that the estimates are meaningful from a statistical perspective.[563] The results of the Dimson's thin trading test for the UK equity betas are shown in Table 152.

[563] Thiel-Sen estimate are a non-parametric measure and so these tests for statistical significance are no directly applicable.

Table 152 UK water service providers thin trading tests

Company	Thin Trading Test (t-stat)	Outcome	Lag Beta (t-stat)	Coincident Beta (t-stat)	Lead Beta (t-stat)	Outcome
UU/	-0.20	No evidence of thin trading	-0.59	***8.57***	0.76	No evidence of thin trading
SVT	-0.77	No evidence of thin trading	-0.15	***8.49***	0.83	No evidence of thin trading
PNN	0.30	No evidence of thin trading	-0.41	***8.46***	0.15	No evidence of thin trading

Source: ERA Analysis

None of the estimates report evidence of thin trading. Accordingly, all of the UK estimates are robust enough for use in determining a benchmark beta estimate.

Estimate of beta

The overall sample average – excluding equity beta estimates for the US that were considered non-robust – is 0.75 (Table 153).

Table 153 Final Water Corporation benchmark sample averages

Regression method	AWK	WTR	MSE	UU/	SVT	PNN	Average
OLS	0.52	0.82	1.08	0.68	0.76	0.83	0.78
LAD	0.48	0.78	0.75	0.73	0.76	0.85	0.73
Robust MM	0.54	0.82	0.94	0.68	0.73	0.82	0.76
Thiel Sen	0.53	0.83	0.93	0.68	0.75	0.8	0.75
Average	**0.52**	**0.81**	**0.93**	**0.69**	**0.75**	**0.82**	**0.75**

Source: ERA Analysis

The use of international benchmarks implies higher uncertainty in the resulting estimate of the benchmark parameters. As Frontier noted in its 2013 report to the AER on risk in regulated energy networks:

- the structure of foreign water utilities may differ from those in Australia;
- foreign regulatory arrangements governing water utilities overseas may differ from those in Australia; and
- water utilities overseas may also be exposed to different macroeconomic factors/risk drivers to those in Australia.[564]

For this reason caution should be used when relying on foreign estimates of equity beta.

The estimate of equity beta of 0.75 for water, in this case, is higher than recent estimates for gas network businesses, of 0.7.[565] There is no intuitive reason why the equity beta estimate should be higher for water in Australia than for energy, given the risks faced.

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[564] Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia: A report prepared for the AER*, July 2013, p. 93

[565] See Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline: As amended on 21 July 2016*, 30 June 2016, p. 189 and Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of return*, 30 June 2016, p. 298

The Frontier report mentioned above contained a table that summarised the risks that a regulated network may be exposed to. This is reproduced in Table 154.

Table 154 Summary of risks that a regulated network may be exposed to

Business risks	Financial risks
Demand risk	Refinancing risk
Input price risk	Interest rate reset risk
Cost volume risk	Illiquidity risk
Supplier risk	Default risk
Inflation risk	Financial counterparty risk
Competition risk	
Stranding risk	
Political / regulatory risk	
Other business risks	

Source: Frontier Economics 2013

Risks in Table 154 affecting equity beta only include those that are non-diversifiable or non-business specific. The main non-business specific risks are demand/volume risk, competition/price risk and the default risk effect on leverage. The non-diversifiable risks faced by water utilities are very similar to those of energy utility networks. Both are in the business of providing essential services which are considered to be less exposed to business cycles.

For example, Morgan Stanley Capital International and Morningstar classify the utilities sector as defensive, as opposed to cyclical.[566] This demonstrates that intrinsically, both water and energy utilities are relatively well protected from demand or volume risk stemming from business cycles. Both are regulated at some level, resulting in reduced price risk. Both are considered natural monopolies with high levels of operational leverage. This results in both water and energy networks having high barriers to entry, given the requirement to serve a large share of the market so as to reduce the risk of not recovering fixed costs. Relatively low pricing/volume risk and large market share result in relatively stable revenues, operating income and cash flows. The covariance of operating income with business cycles is a key driver of asset and thus equity beta. The above demonstrates that both water and energy utilities share the same key drivers of asset and thus equity

[566] See Morgan Stanley Capital International, *MSCI cyclical and defensive sectors indexes and methodology*, June 2014 available at: https://www.msci.com/documents-10199-1283513/MSCI_Cyclical_and_Defensive_Sectors_Indexes_Methodology_Jun14.pdf/f05126ab-65f6-4f39-b9d2-ad031858475a and Morningstar, *Morningstar stock sector structure factsheet*, available at: http://corporate.morningstar.com/au/documents/methodologydocuments/factsheets/stocksectorstructure_factsheet.pdf.

beta. The relatively stable revenues, operating income and cash flows enhance the ability of both water and energy utilities to target a highly leveraged financial structure which is a key driver of leveraged asset beta, or in other words, the equity beta.

One possible difference between water and energy utilities is that where the water utilities' fixed charges are levied on home owners with no ability to opt out, the risk or variability in operating income may be lower than that of energy networks, who are unable to levy the fixed charges on home owners who have opted out. However, this would result in empirically observed equity betas being *lower* for water than for energy utilities. Such a comparison is difficult to make in practice due to the small sample sizes of water utilities in Australia and overseas, precluding analysis of variance between water and energy utilities.

The main points of this analysis are summarised as follows. The empirically observed equity beta estimate for water utilities overseas is 0.75. Caution should be used when relying solely on these foreign estimates of equity beta. This is because Australian and foreign utilities may have differences in company structure, regulatory arrangements, macroeconomic factors and risk drivers. Recent equity beta estimates for energy utilities in Australia are 0.7. There is no intuitive reason why equity beta should be higher for water than for energy utilities. On this basis, the Authority considers an equity beta of 0.70 to be an appropriate estimate for use in calculating the WACC for Water Corporation.

Gamma

In the Rate of Return Guidelines, the ERA estimated gamma (γ) as the product of the estimate of the utilisation rate (θ) and distribution rate (F).

Utilisation Rate

The ERA considers that three different approaches to estimating gamma are appropriate, based on the following methods for estimating the utilisation rate:

- the equity share approach;
- the taxation statistics approach; and
- the Dividend Drop-off (**DDO**) method.

The ERA bases its estimate of gamma on the equity share ownership approach, taxation statistics approach and DDO approach. The approaches are listed in order of their importance with respect to weighting.

The equity share ownership approach uses share ownership data published by the Australian Bureau of Statistics for both equity generally (all equity both listed and unlisted) and exchange listed equity. Between July 2000 and December 2015 all equity averaged 59 per cent, while listed equity averaged 47 per cent.[567]

The taxation statistics approach, uses Australian Tax Office (**ATO**) Franking Account Balance (**FAB**) data, on account of Hathaway's finding that this data is more reliable than

[567] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 5 Gamma*, 30 June 2016, p. 24.

the ATO dividend data. The Australian Energy Regulator's (**AER**) estimate for the utilisation rate using this approach is 0.48.[568]

The utilisation rate based on the DDO method is subject to considerable uncertainty. Accordingly the ERA relies on an established range of 0.35 to 0.69. The lower bound is based on Vo et al's unadjusted estimates and SFG Consulting's unadjusted finding.[569] The upper bound is established based on the Lally adjustment to the upper bound of the Vo et al. study.[570]

Distribution Rate

The dividend distribution rate for listed equity is based on the Australian Tax Office Franking Account Balance data and cumulative payout approach which both supports a distribution rate of 0.7 for all equity.[571] The product of this distribution rate and associated share ownership proportion of 0.59 gives a gamma estimate of 0.41. After reviewing estimates made by Handley, Lally, other experts and the Australian Energy Regulator's determination, the Authority considered that an estimate of 0.8 was reasonable for the listed equity distribution rate. [572] The product of this distribution rate and associated share ownership proportion of 0.47 gives a gamma estimate of 0.38.

Estimate of gamma

The all equity distribution rate of 0.7 per cent gives an equity share ownership based estimate of 0.41 for gamma and a tax statistics based estimate of 0.34. The listed equity distribution rate of 0.8 per cent gives an equity share ownership based estimate of 0.38 for gamma and DDO study based range of 0.28 to 0.55. The results are summarised in Table 155.

[568] Australian Energy Regulator, Jemena Gas Network's 2015-20 Access Arrangement Draft Decision, Attachment 4, p. 4-20.

[569] D. Vo, B. Gellard and S. Mero. 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' *Conference Paper, Australian Conference of Economists 2013*, final paragraph and SFG Consulting, *Dividend drop-off estimate of theta, Final Report*, 21 March 2011, p. 32.

[570] Based on adjusting the range of 0.35 to 0.55 (using robust techniques) set out in D. Vo, B. Gellard, S. Mero. 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia', *Conference Paper, Australian Conference of Economists 2013*, final paragraph. The Lally adjustment requires dividing the estimate of theta by the corresponding estimate of delta. The corresponding value of delta in that study for the upper bound (unrounded) value with no market correction of 0.53 was 0.77 (Table 5). Dividing 0.53 by 0.77 gives 0.69.

[571] Ibid, p. 42.

[572] Ibid. p. 44.

Table 155 Estimates of the value of imputation credits

Approach	Utilisation Rate	Distribution Rate	Value of Imputation Credits
All equity (listed and unlisted)			
Equity share ownership	0.59	0.7	0.41
Tax statistics (FAB data)	0.48	0.7	0.34
Listed equity only			
Equity share ownership	0.47	0.8	0.38
DDO studies	0.35 to 0.69	0.8	0.28 to 0.55

Source: ERA Analysis based on Australian Bureau of Statistics data for December 2015

The ERA places most reliance on the equity share ownership approach. It suggests a point estimate for gamma of 0.4.

Taxation statistics, using the ATO FAB data, suggest that the estimate of gamma could be lower, at 0.34. However, the Authority does not place much weight on the estimate, or on its ability to inform a point estimate of the utilisation rate, given concerns about the robustness of the taxation data used for estimating the utilisation rate.

Similarly, the DDO estimate suggests that the estimate of gamma could be higher or lower than 0.4, although the mid-point of the estimate range is reasonably consistent with an estimate of 0.4. The Authority gives only limited weight to the estimated range, and to the point estimate, given its concerns with regard to the sensitivity of the estimates to the dividend sample, parametric form of the regression equation and regression technique used.

Based on this, the ERA considers that the evidence supports a gamma estimate of 0.4.

The Water Corporation supports a gamma of 0.25 consistent with the Australian Competition Tribunal ruling for ATCO Gas in 2016. The Water Corporation also notes that Dampier to Bunbury Natural Gas Pipeline Transmission Pty Ltd is currently contesting the ERA's determination of gamma (0.4) for its recent Access Arrangement. However, the ERA is contesting DBP's appeal. The ERA's view is that a gamma of 0.4 is the best estimate, given the evidence. The recent Federal Court decision also supports the use of an estimate of 0.4 for gamma.[573]

Inflation

The expected rate of inflation for the coming 5 year period is estimated using the procedure outlined in the Rate of Return Guidelines over the 60 day averaging period.[574] The estimated expected rate of inflation for the coming 5 year period based on this method is 1.79 per cent.

[573] Federal Court of Australia, Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79 and Australian Energy Regulator v Australian Competition Tribunal (No 3) [2017] FCAFC 80, 24 May 2017

[574] Economic Regulation Authority, *Rate of Return Guidelines*, 16 December 2013, pp. 32-33.

Appendix 10 The asset base and roll forward method

This Appendix explores the implications for efficient costs and tariffs of alternate approaches to establishing a regulatory asset base (**RAB**).[575] It also considers alternative approaches to rolling forward the RAB, with specific reference to different methods of depreciation.

The Appendix begins by summarising the ERA's and the water corporations' approach to valuing assets in their relevant models for determining required revenue. There is a principal focus on the Water Corporation.

The Appendix then considers the implications of the various approaches for efficient tariffs.

The ERA's approach

The following provides a chronology of the ERA's approach to valuing the water corporations' asset bases for the regulatory purpose of setting efficient tariffs.[576]

The 2005 RAB determination

In the ERA's first inquiry into efficient tariffs, the Water Corporation's initial asset value for regulatory purposes was determined as at 30 June 2005 using a 'line in the sand' deprival value approach (that is, the RAB was determined to deliver the revenue projections for the ten years after the review, given estimated efficient costs, rates of return and the tariffs of the time – Appendix 10A provides an overview of approaches for valuing the RAB).

The deprival value approach established an initial RAB that would not require significant changes in tariffs or net payments to government for the immediately ensuing period. Initial asset values were determined for each 'line of business', calculated based on the existing

[575] A RAB is defined as the asset base that delivers economically efficient costs and tariffs.

[576] There have been three sets of water pricing inquiries to date (leaving aside annual updates):

- The third inquiry was published on 28 March 2013. It recommended tariffs for the three year period commencing 1 July 2013 (that is, for 2013-14, 2014-15 and 2015-16). The Authority had robust *actual* data up to the end of 2010-11. The opening capital base for 2013-14 was estimated, based on the closing capital base for 2010-11, rolled forward with estimated and forecast capital expenditure and applicable depreciation.
- The second inquiry was published on 16 September 2009. It recommended tariffs for the three year period commencing 1 July 2009 (that is, for 2009-10, 2010-11 and 2011-12).
- The first inquiry was published on 4 November 2005. There were existing tariffs for 2005/06 by the time the final report was published. The report recommended tariffs for the nine year period commencing 1 July 2006 (that is, for 2006/07 to 2014-15).
- The ERA's initial inquiries were published in 2005 and 2006, the first report of which related to urban water and wastewater pricing for Perth, Bunbury and Busselton. As there were existing tariffs for 2005/06 by the time the first report was published, the report recommended tariffs for the nine year period commencing 1 July 2006 (that is, for 2006/07 to 2014-15). The closing asset bases for all three water businesses were determined as at 30 June 2005, using the deprival method.
- Shortly thereafter, the Authority published its inquiry into Water Corporation's country potable water and wastewater (sewerage) prices.

tariffs for the line of business.[577] An input to the calculation was that all assets in 2005 capital base had an average remaining life of 41 years. This average life was applied to all lines of business in order to calculate the depreciation building block contributing to the deprival value calculation.

The resulting initial asset value determined for the Water Corporation in the 2005 review was $10,599 million (at 20 June 2005, in dollar values of 30 June 2005).[578]

Developer contributions of gifted assets were included in the RAB, and recognised as revenue in the year received. Cash contributions for capital expenditure also were treated as revenue in the year in which they were received, while the assets the cash contributions funded were included in the RAB. These two elements are commonly referred to as 'contributed assets'. The approach to treating developer contributions is discussed further in the next section.

The 2009 RAB revisions

The 2009 inquiry did not adjust the Water Corporation's RAB determined in 2005, other than to roll it forward in real terms, accounting for depreciation and intervening new capital expenditure.

However, the report did consider the issue of contributed assets. The 2005 RAB estimate, and previous updates to efficient tariffs through to 2008, utilised the 'Queensland method' to account for contributed assets. The Queensland method:

- includes gifted assets and capital expenditure funded by cash contributions in the RAB, as equivalent capital expenditure, in the year the assets are contributed;
- provides for a subsequent annual return on and of those assets over their effective life, just like any other asset;
- recognises the value of the contributed assets as revenue in the year the assets are received;
    - this revenue deduction then exactly offsets the stream of future returns on those assets resulting from their capitalisation in the regulatory asset base, satisfying the 'NPV=0' principle.

In 2009 the Queensland method was discontinued, in favour of excluding contributed assets from the approved capital expenditure added to the RAB, from that point in time going forward.

The ERA elected for a changed approach on the basis that the advantages of the change outweighed the disadvantages:[579]

> There are both merits and potential disadvantages in changing the treatment of developer contributions. The merits include the reduction in tariff volatility, particularly for small schemes. The potential disadvantages include the impact on tariffs and the potential long

[577] There are seven 'lines of business' in the Water Corporation. These are Metro Water, Sewerage and Drainage and Country Water, Sewerage, Drainage and Irrigation.

[578] Economic Regulation Authority, *Final Report on the Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, p. 74.

[579] Economic Regulation Authority, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Final Report*, 16 September 2009, p. 118.

term financial implications for the service provider and owner. The Authority does not consider that there is an argument on intergenerational equity grounds for changing the existing approach.

The Authority has produced its tariff recommendations on the basis that the treatment of developer contributions is changed to the approach recommended by the Water Corporation (excluding gifted assets and offsetting cash contributions from capital expenditure).

An important outcome of the changed treatment is that there is no (regulatory) tax revenue provided for the contributed assets.[580] With a pre-tax rate of return, as is used here, this is straightforward: the contributed assets are excluded from the RAB, and hence do not receive the pre-tax return.[581]

A further important implication of the changed treatment relates to the valuation of the RAB itself in 2005. Under the former approach, the return on and of contributed assets was incorporated into tariffs going forward from 2005, which informed the deprival value estimate of the regulated asset base.

The Water Corporation pointed out that the changed treatment of contributed assets might warrant revision to the 2005 valuation regulated asset base.[582] The ERA noted that excluding contributed assets from the 2005 valuation would lower the RAB. If the ERA had applied the revised treatment of contributed assets to the Water Corporation at the time of the 2005 inquiry, the initial asset value would have been lower. Instead of $10,599 million, the initial asset value would have been $9,603 million.[583]

While the two approaches to the treatment of contributed assets are the same in net present value terms over the asset life, excluding contributed assets from the asset base can result in higher tariff revenues for current customers, compared to when contributed assets are included. Conversely, tariff revenues for future customers are lower when contributed assets are excluded.

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[580] To clarify, there are no implications in terms of the 'regulated' tariff setting. Nevertheless, there may be tax implications for the water corporation, on its statutory account, associated with the contributed assets. The tax office would interpret the gifted asset as revenue in that year, and hence would seek to tax the resultant increase in profits.

As the ERA does not account for gifted assets under the revised approach, it is incumbent then for the water corporation to negotiate payment, with developers, for any tax liabilities it may incur on receipt of gifted assets. The ERA's view is that the water corporation and the contributor are best placed to establish the commercial terms of any such contribution (see for example the extensive discussion of this issue at Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012, p. 250).

[581] Under a post-tax method, there is the need to ensure that the gifted assets are excluded from the tax asset base used to calculate the tax building block revenue. This aligns the underlying fixed asset data contributing to the regulatory and tax asset bases. However, it is important to recognise that the depreciation method applied to each asset base may differ, meaning that one cannot be readily used for the other. Generally, current cost accounting is used for the regulatory asset base, while historic cost accounting is used for the tax asset base (see Appendix A for a summary of approaches to valuing and rolling forward asset bases).

[582] Economic Regulation Authority, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Final Report*, 4 November 2005, p. 153.

[583] Economic Regulation Authority, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Final Report*, 16 September 2009, p. 117, and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board Revised Final Report*, 28 March 2013, p. 36.

This situation is clearly illustrated in the Water Corporation's case. In seeking to *back out* the 'Queensland method' – which had been utilised over the period 2005 to 2009 – two separate effects need to be accounted for:

- first, the RAB is reduced as contributed assets are removed;
  - leading to a lower return on and of capital, lower regulated revenue, and lower tariffs;
- second, there is a need to restore the revenue 'deductions' made over the period 2005-09 which offset the addition of the contributed assets to the RAB;
  - adding back in this revenue may lead to a potential price shock in subsequent tariffs, if these deductions were significant;
  - recouping the deductions over a longer period would, in effect, simply restore the approach of the 'Queensland method', thereby not achieving much change.

On that basis, to avoid a price shock, the ERA in 2009 deferred the recovery of the higher initial tariff revenue resulting from the exclusion of contributed assets (which it calculated amounted to $973 million in 2005 dollars):[584]

This approach would result in the Water Corporation receiving the higher revenue over a period of 50 years, as it would have required a 'true up' for revenue deducted for contributed assets over the period 2005-09, which would have led to a price shock.

In effect, the existing 2005 – 2009 contributed assets were left in the RAB in 2009, even as contributed assets going forward from 2009 were excluded. The 'deprival value' RAB was left at the (contributed assets inclusive) valuation of $10.6b originally estimated in 2005.

The pre-2005 contributed assets are not affected by the change in method. There is no need to add back in any revenue for previous deductions, as these matters pre-date the 2005 'line in the sand' deprival value.

The ERA indicated, at the time, that it intended to review the asset value and consequently the deferred issue of developer contributions at a later stage.[585] Specifically, at that time, the recovery of this 2005-09 'deferred account' was intended to commence after the next regulatory review and continue over the average life of the Water Corporation's capital (50 years).

Aqwest and Busselton Water

It is also worth noting that the ERA in its 2009 report re-set the RABs for AQWEST and Busselton Water:[586]

> The initial asset values for the Water Boards were not set by the Government following the 2005 inquiry. These initial asset values therefore have to be set as part of this inquiry. The Authority considered the proposal by Aqwest to simply set the initial regulatory asset value as the book value. However, the book value includes assets that were contributed by developers and for which the service providers are not entitled to profit from.

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[584] Economic Regulation Authority, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Final Report*, 16 September 2009, pp. 118 – 119.

[585] Ibid, p. 118.

[586] Ibid, pp. 154-155.

As alternatives, the Authority has considered the appropriateness of:

- an estimate of the deprival value that has been calculated using Aqwest's current financial projections (and reflecting the change to the treatment of developer contributions); and
- an estimate of the book value excluding assets that were either contributed or funded by developers (using the same method as was applied to the Water Corporation).

The resulting asset values as at 30 June 2008 (in dollar values of 2009) are:

- $35.9 million for the deprival value; and
- $30.4 million for the book value excluding contributed assets.

The Authority has investigated the financial impacts on Aqwest from setting the initial asset value at either of these levels...

Overall, the Authority recommends that the initial asset value for Aqwest be set at $30.4 million as at 30 June 2008 (in real dollar values of 2009).

Busselton Water had symmetric treatment.

The 2013 RAB revisions

The ERA removed contributed assets completely from the original 2005 deprival value RAB in 2013. The ERA stated:[587]

> An adjustment to the Water Corporation's asset value has been made to remove developer contributions from its regulatory asset base. In past inquiries, the Authority has mistakenly included assets that have been already paid for by developers and gifted to the Water Corporation in its regulatory asset base. The removal of these developer contributed assets in this inquiry has corrected for this error and is consistent with a proposal put to the Authority by the Water Corporation in the 2009 inquiry that argued that such a course of action be considered. By lowering the asset base at 1 July 2013, the ERA's calculation of Water Corporation's revenue requirement is reduced by approximately $356 million over the three year period.

However, the ERA retained the deprival value approach:[588]

> Unlike the situation in 2005, the Authority now has sufficient data to calculate the Water Corporation's initial regulatory asset value using an historical cost methodology. Using this methodology, the initial regulatory asset value has been calculated by starting with the Corporation's 1995 book value of assets. Additional capital expenditure is then added in the year that it occurs and asset depreciation for that year is deducted. This process is repeated for each year up until 2005, so that an initial asset value can be calculated for 2005. Developer contributions can be excluded from such a calculation. The historical cost methodology is not subject to the problems of circularity or reliance on forecasts that are inherent with the deprival value methodology and hence delivers a more accurate estimation of an initial regulatory asset value...
>
> The option of adopting an historical cost methodology that excludes developer contributions is the most technically correct approach to determining an initial regulatory asset value for the Water Corporation. This is because it is derived using a robust methodology and using the most up to date data available. The historical cost methodology delivers an initial regulatory asset value of $8.9 billion (when calculated over the period 1995 to 2005 and excluding developer contributions).

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[587] Economic Regulation Authority, Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board Revised Final Report, 28 March 2013, p. 11.

[588] Ibid, p. 38.

> However, in the draft report the Authority chose not to adopt the historical cost methodology as it was conscious that a change in the methodology used to calculate an initial regulatory asset value can be problematic due to the creation of regulatory risk.
>
> Still, the case for the removal of developer contributions from the Water Corporation's initial regulatory asset value was considered to be robust and is a case that has been argued by the Water Corporation in previous reviews. In the draft report, the Authority came to the conclusion that the inclusion of developer contributions in the Water Corporation's existing regulatory asset value had the effect of placing an inappropriate financial burden on Western Australian consumers.
>
> For this reason, in the draft report the Authority elected to revise the Water Corporation's initial regulatory asset value from the existing $10.6 billion to $9.6 billion. The value of $9.6 billion is the value which has been derived using the same methodology and data as used in the 2005 and 2009 inquiries but excluding developer contributions. The asset value of $9.6 billion has also been used in the calculation of recommended tariffs for this final report.

In 2013 the view was taken that – by re-estimating the 2005 'line in the sand' value of the RAB, excluding contributed assets – the RAB would be lower, and there was no resulting revenue (the $973 million) 'foregone'.

Roll forward method to the present

The ERA's roll forward method for updating the annual RAB entails summing – all in real terms:

- the closing RAB from the previous year; plus
- annual depreciation based on the straight line method; and
- approved, efficient, new capex.

Estimating the annual RAB

The last available closing *actual* RAB is that from the 2013 inquiry, which gave the real value of the RAB in 2010-11 (for the purpose of the 2013 inquiry it was rolled forward to the review years – 2013-14 to 2015-16 – with *forecast* real capex and depreciation).

Depreciation

The roll forward method adopted for the ERA's previous reviews utilised straight line depreciation within a real revenue modelling approach. Such real straight line depreciation is consistent with the ERA's preferred Current Cost Accounting approach (this is discussed in more detail in below).

Inflation

A real modelling approach was applied under the ERA's previous approach. Hence a forecast of inflation is not required for the modelling per se.

However, a forecast of inflation is required to produce estimates of nominal tariffs in the out-years' dollars of the day, as part of the reporting tables. Over time, such forecasts may be adjusted readily for actual inflation, to return the nominal estimates to their correct out-year values, in light of actual inflation.

The Water Corporation's approach

The Water Corporation developed its own 'Revenue Requirement Model' (**RRM**) in 2014, subsequent to the ERA's last inquiry.

The model diverges from the aggregated capital 'asset class' approach typically used by the ERA for revenue modelling.[589] Instead, the RRM allocates *costs* to a scheme level, inclusive of direct costs and indirect 'common' costs.[590] The Water Corporation's objectives in developing the RRM were to:[591]

- inform the setting of prices;
- assess cost reflectivity;
- determine operating subsidies at a scheme level; and
- assess the impact of proposed tariff reforms.

Importantly, the RRM informs the level of efficient costs, and the level of operating subsidies required to subsidise its country schemes. Operating subsidies by scheme are calculated by allocating all the Water Corporation's direct and indirect 'common' costs to the various schemes. These costs can then be compared with revenues calculated from volumes and the proposed tariffs set by the State Government. Any shortfall then informs the required operating subsidy for that country scheme.

The RRM's RAB valuation

The RRM utilises the Water Corporation's 'Book 25' asset base, which provides for a replacement cost valuation of the assets, excluding contributed assets. The Book 25 starting values are derived from a 'Fixed Asset Register', which contains the historic cost of assets dating back to 1901 (which Water Corporation calls 'Book 1').

The following steps are taken to produce the 'Book 25' replacement values from the Book 1 historic cost values:

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589 For example, dams, pipelines, buildings etc.

590 A particular feature of the RRM is that each 'scheme' aggregates a range of different assets allocated to the scheme. Correspondence from Water Corporation, 'Revenue requirement model', received 14 December 2016 states:

> The Asset Allocation model is designed to allocate asset values for cost centres not directly linked to the provision of customer services (schemes). These are predominately support areas and shared infrastructure business units (e.g. water sources shared between schemes). This allows all assets to be identified by scheme, which is important for scheme pricing and the operating subsidy calculation.
>
> The model assigns the cost/acquisition value, accumulated depreciation and the net book value for both:
>
> - Book 01: Accounting Value (Historic cost)
> - Book 25: Replacement Value (Capital Cost Index inflated historic cost).
>
> The Revenue Requirement Model uses the Book 25 values.
>
> Similar assets in different schemes may have different lives, different accumulated depreciation, and different current written down asset values. As a result, the RRM approach is not readily amenable to being re-aggregated to the typical 'asset class' approach used by the ERA. Busselton Water and AQWEST adopt a broadly similar approach (although with a very much reduced set of 'schemes' or 'projects').

591 Correspondence from Water Corporation, 'PM-#16136834-v2-Revenue_Requirement_Model_-_Overview', received 3 January 2017.

- First, in preparation for corporatisation in 1994, all existing assets were revalued. Water Corporation revised all fixed assets, as at 1 July 1994, 'at current replacement value'.[592] This method was in accord with the 'Guidelines in Accounting Valuation of Government Trading Enterprises – using current valuation methods', issued in October 1994 by the Steering Committee on National Performance Monitoring of Government Trading Enterprises.[593]
  - The method recommended by the Steering Committee was defined in the following terms:[594]

    > a. where the service potential or future economic benefits embodied in the asset would be replaced if the GTE was deprived of the asset, the primary bases for valuation of assets are:
    >
    > (i) current market (buying) price of a similar asset - where a similar asset can be purchased;
    >
    > (ii) current replacement cost of the same service potential or future economic benefits of the existing asset - where a different asset having a similar purpose can be purchased; or
    >
    > (iii) current reproduction cost of the same service potential or future economic benefits of the existing asset where the above techniques are not applicable.

  - The ERA infers that the resulting valuation was effectively a replacement cost valuation – as at 1994 – whereby the written down values of each asset in the historic Book 1 Fixed Asset Register were indexed to current values, based on an estimate of the CPI over the period 1901 to 1996.[595]
- Second, from 1998 on, almost all the major assets were adjusted each year utilising the Water Corporation's Capital Cost Index (**CCI**).[596]

Roll forward method

The roll-forward method adopted by Water Corporation is consistent with the Replacement Cost Method valuation approach. That is, the closing value of the RAB in each year is the sum of:

- the opening asset base, which is the (CCI) indexed value of the historic written down asset base;

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[592] Water Authority, *Final Report Six Months Ending 31 December 1995*, p. 28', provided as part of correspondence from Water Corporation, 'WC11-13' received 10 March 2017.

[593] Ibid.

[594] Steering Committee on National Performance Monitoring of Government Trading Enterprises, *Guidelines in Accounting Valuation of Government Trading Enterprises – using current valuation methods*, October 1994, p. 44.

[595] Information provided to the Authority by the Water Corporation (at tab CCI of PM-#16300653) indicates the estimate of annual inflation assumed for the period 1901 to 1996 was 3 per cent per annum.

[596] Correspondence from Water Corporation, 'Response to WC3 – Depreciation', received 11 January 2017 states:

The CCI was introduced by the Corporation in 1998. It is a composite index using Australian Bureau of Statistics published indices. It is designed to reflect the Corporation's costs of delivering new capital. It is used to escalate new asset investment into nominal dollars and convert Fixed Asset Register costs into Book 25 replacement values.

- less the replacement cost depreciation, which is the straight line nominal depreciation of the historic written down value,[597] indexed by the CCI; plus
- new capex applied in the year.

Implications for efficient tariffs

This section considers the implications of the respective alternative initial regulatory asset valuation methods for the efficiency of tariffs. It also considers the impacts of the alternative methods for depreciating the asset base.

The ERA's approach

As noted above, the ERA in previous reports has valued the water corporations' assets using the deprival value method (as at 30 June 2005). Those asset values are then rolled forward using a real depreciation approach. Under the real valuation methodology, new capital expenditures are introduced in real dollar terms, and then depreciated – based on approved asset lives – in straight line real terms.

There are two elements to consider with regard to the efficiency of the resulting return on and of capital:

- first, whether the deprival value reflects an efficient capital asset base; and
- second, whether the roll forward method using real straight line depreciation leads to efficient tariffs.

The ERA's asset valuation method

The 2005 report set out the ERA's view at the time as to why a deprival value was preferred for establishing the RAB:[598]

> Determination of an initial asset value for the assets of an established business is not a straightforward exercise. Economic principles do not provide unambiguous guidance for the setting of an asset value for monopoly network assets at a particular point in time, but rather are typically interpreted as providing a feasible range.
>
> - A lower limit for the asset valuation is that which is consistent with generating returns to the owner sufficient for the owner to have the incentive to continue to use the asset for the particular activity, which implies that the owner must receive a return at least as good as it would if the asset were used in its next best use. The asset value meeting this criterion is commonly referred to as "scrap value". Except for assets like freehold land, the value of network assets in alternative uses is typically very low.
> - An upper limit that is typically posed is the value that is consistent with the price that would be charged by a hypothetical (efficient) new entrant. The rationale for this valuation derives from the observation that, in a perfectly contestable market, prices would reflect the cost structure of the efficient new entrant. Thus, it is argued that prices would contain monopoly rents if they were higher than would be earned in a contestable market, and so this should place a cap on the regulatory valuation. A depreciated optimised replacement cost (**DORC**) valuation – if implemented correctly – provides an estimate of the regulatory value for an existing asset that is consistent with the cost

[597] Nominal depreciation of the historic cost is referred to as 'historic cost accounting'. It is typically used for accounting purposes.

[598] Economic Regulation Authority, *Final Report on the Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005, p. 16.

structure and prices of the hypothetical (efficient) new entrant that operates with a new asset.

While economic principles suggest that regulated assets should not be valued at less than scrap value or more than a (correctly-determined) DORC value, the appropriate value in any particular circumstance will depend on the impact on economic efficiency of the valuation. In general, it can be shown that price outcomes generated by a competitive market will be consistent with the valuation of assets at DORC.

There are, however, many examples of asset values for utility businesses being set at values lower than the estimates of DORC to reflect other concerns, the primary concern being a desire for the introduction of price regulation to not lead to a rise in prices from those previously prevailing. Thus, the asset values for the predominantly rural Victorian electricity distributors were determined at a discount to DORC to limit the magnitude of potential price increases experienced by end users of electricity. A similar approach was adopted for the AlintaGas gas distribution networks in Western Australia, and AGL Gas Networks in New South Wales. These valuation methodologies are generally presented as a version of a deprival value, being an asset value that is implied by existing prices for, and revenues from, the relevant services. The deprival value approach to setting an initial asset value has been given particular attention by the Authority for the reason that this approach (in one form or another) has been adopted in a number of instances where cost-based price regulation has first been implemented for government-owned utility businesses (including for the New South Wales urban water businesses, the predominantly rural Victorian electricity distributors, two of the three Victorian gas distributors, and the AlintaGas gas distribution business in Western Australia)[599]...

Taking into account relevant precedents in Australia for determining initial regulatory asset values for regulated utility business, the Authority has determined that the initial regulatory asset values for all of the three water businesses that are the subject of this inquiry should be determined using a deprival value methodology and as the values implied by, or consistent with, current forecasts of prices and revenues.

The ERA's 2013 report noted the following concerns with the deprival value methodology:[600]

Whilst effective in generating an initial regulatory asset value where previously there was none, the use of the deprival value methodology is problematic for two reasons:

- The deprival value methodology suffers from problems of circularity. Forecasts of costs and revenues are used to calculate an initial regulatory asset value. This asset value is then used as the basis for determining appropriate projections of revenues and costs for the service provider. It inevitably follows that the projected revenues and costs are at least very similar (if not equal) to the original forecasts of revenues and costs that were used to determine the initial regulatory asset value.
- The deprival value methodology is dependent on forecast data, which is inherently unreliable. This problem becomes especially apparent when it is considered that at the time of the 2005 calculation of the initial asset value, Water Corporation forecasts of revenues and costs were to a large extent unscrutinised by parties other than the Water

[599] Deprival value is the amount that would need to be paid to an asset owner in compensation for being deprived of an asset. Optimised deprival value (**ODV**) is therefore viewed as the lesser of the replacement cost of an asset and the net present value of cash flows generated by use of that asset. If an asset owner is deprived of an asset, it is not possible for them to physically build (and pay the cost of) an equivalent aged and depreciated asset. Instead, they must build a new asset. That is, the asset owner, when deprived of the asset, must bear the cost either of forgoing the future cash flows, or alternatively, invest an amount to required to build a new replacement asset. The ODV methodology recognises that the net present value of the future cashflows from a new asset are greater than those from an old and partially depreciated asset. The ODV valuation is therefore corrected to be a depreciated replacement cost.

[600] Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board Revised Final Report*, 28 March 2013, pp. 35–38.

> Corporation, or at least not scrutinised to the same level of detail and with the same level of sophistication as they are today.

It is clear that the deprival value initial capital base will have had some inefficiency associated with the ten year forecast of revenues. There will also have been valuation effects stemming from the accuracy of the estimate of the rate of return, which was used to discount the forecast cash flows at the time of the valuation.

As an alternate method, the ERA's 2013 report also considered the historic cost method for valuing the RAB, as compared to the deprival value method:[601]

> In the final report of the 2009 inquiry, the Authority stated that if it had excluded developer contributions from the initial regulatory asset value calculated in the 2005 review, then the derived value would have been $9.6 billion rather than $10.6 billion. An alternative book value methodology was also developed by the Authority to provide context to the existing estimates. This approach delivered an initial asset value for the Water Corporation of $12.9 billion [*edit note – this value includes developer contributions*]...
>
> The option of adopting an historical cost methodology that excludes developer contributions is the most technically correct approach to determining an initial regulatory asset value for the Water Corporation. This is because it is derived using a robust methodology and using the most up to date data available. The historical cost methodology delivers an initial regulatory asset value of $8.9 billion (when calculated over the period 1995 to 2005 and excluding developer contributions). However, in the draft report the Authority chose not to adopt the historical cost methodology as it was conscious that a change in the methodology used to calculate an initial regulatory asset value can be problematic due to the creation of regulatory risk.

Conclusions regarding the ERA's asset valuation approach

Taking the foregoing into account, the ERA is of the view that the deprival value adopted in 2005 remains appropriate:

- The initial asset base provides a starting point. It is then rolled forward by adding new efficient capital expenditure and subtracting depreciation. It follows that any subsequent tariff changes will reflect efficient variations in capital and operating costs. Importantly, new assets added to the asset base are scrutinised for efficiency. Historic assets will be fully depreciated over time and removed from the asset base. In that way, with the passing of time, the asset base will increasingly reflect efficient values.
- Principles of regulatory certainty suggest that there is limited benefit to changing the asset base, even where a more technically correct method – such as a real historic cost valuation – is available. Arbitrary tariff shocks are thereby avoided.

The exclusion of contributed assets, which was undertaken in the 2013, is also reasonable. The revised treatment ensures that current consumers are paying their share of costs, rather than deferring a portion of costs onto future consumers.

The roll forward method

The ERA has utilised a real pre-tax modelling approach to estimating required revenues and efficient tariffs for the water corporations. The resulting roll forward of the asset base in real terms, with associated real straight line depreciation, leads to an implicit Current Cost

[601] Ibid, p. 36 and p. 38.

Accounting (**CCA**) approach.

The ERA in its recent Goldfields Gas Decision endorsed the CCA real straight line depreciation method as the best means to deliver efficient revenue that is in the long term interest of consumers, principally because the CCA method provides for a more even allocation of capital costs over time. The CCA method:[602]

- provides signals for efficient use, which reflect the opportunity cost of the capital employed in the pipeline;
- discourages replacement investment before the end of the useful life of the assets; and
- balances the requirement for the service provider to have reasonable opportunity to recover the efficient costs of providing reference services, with the need to address the long term interests of consumers, including current and future consumers.

Application of a real rate of return to the resulting CCA regulatory asset base then delivers efficient revenue. It satisfies the principles of 'financial capital maintenance', ensuring that investors are 'made whole' on their investment over time (also called the 'NPV=0' principle).[603]

Implementing the ERA method

The ERA's real modelling method is based on a 'line in the sand' deprival asset valuation that excludes capital contributions. It provides for an estimate of the cost of service, and hence required revenue, commensurate with the assumption that the existing costs and tariffs in 2005 were efficient. Importantly, as noted above, the efficiency of the estimated costs and revenues will improve over time, as new, efficient capital expenditure is rolled into the capital base.

To that end, the ERA has determined that this inquiry should base efficient tariffs on the roll forward of the 'line in the sand' 2005 RAB.

The Water Corporation's approach

The Water Corporation's RRM is a nominal model.

The RRM's asset valuation method

The RRM utilises the Water Corporation's 'Book 25' asset base, which provides for a replacement cost valuation of the assets.

The RRM's roll forward method

The roll-forward method adopted by Water Corporation is consistent with the replacement

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602 Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June 2016, p. 381.

603 The present value principle – also known as the financial capital maintenance principle – ensures that the present value of expected capital charges for an asset over its economic life should be equal to the initial value or purchase costs. The capital charge relating to assets comprises both the return on and the return of capital. See for example Queensland Competition Authority, *Financial Capital Maintenance and Price Smoothing*, February 2014.

valuation approach. That is, the closing value of the RAB in each year is the sum of:

- the opening asset base, which is the Capital Cost Index (**CCI**) indexed value of the historic cost written down asset base;[604]
- less the replacement cost depreciation, which is the straight line historic cost depreciation, indexed by the CCI; plus
- new capex applied in the year.

The Water Corporation's roll forward method has some characteristics of a real current cost accounting (**CCA**) approach, albeit combined with some characteristics of nominal historic cost accounting (**HCA**):

- Straight-line depreciation with CCA – also known as 'indexed' straight-line depreciation – indexes the closing value of the asset/asset class for inflation (bringing it each year to 'current cost'). The current cost is then divided by the remaining economic life to determine the annual depreciation. Finally, a deduction is made for the inflation on the previous closing asset base, so as to remove the double count for inflation that would otherwise be present in the nominal model.
- The CCA method is equivalent to straight line depreciation in real terms.
- Straight line depreciation with CCA recovers depreciation more evenly over an asset's life on a real basis.
- In contrast, straight-line depreciation with HCA starts with the initial nominal historic value of an asset/asset class and, for each year of the economic life, subtracts from the initial value of the asset/asset class the initial (unadjusted, nominal historic) value of the asset/asset class divided by the economic life

Australian energy regulators generally adopt the CCA indexed straight-line method for depreciating the regulatory asset base.

However, the Water Corporation utilises neither CCA nor HCA, but replacement cost accounting. Under the replacement cost accounting approach, the Water Corporation re-values its assets to current replacement cost, similar to CCA. However, unlike CCA, the replacement cost approach does not deduct – from the indexed value of the depreciation – an amount for the inflation on the previous closing asset base.

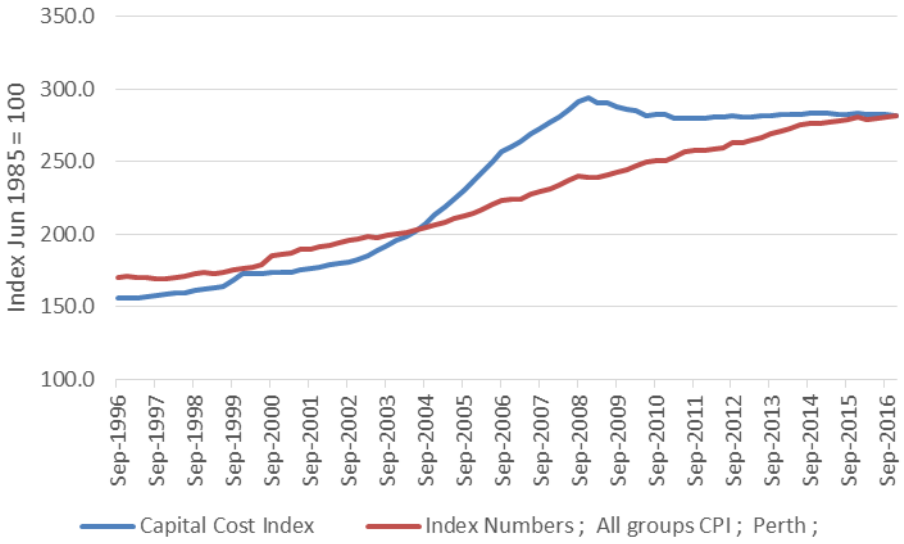
A further distinction in the RRM is the use of the CCI to index the assets.

The use of the CCI is different to the indexation approach adopted by regulators for the CCA method. For example, the ERA's CCA method uses the Australian Bureau of Statistics' consumer price index (**CPI**) inflation for 8 capital cities.[605] The CCI diverged markedly from the CPI during the course of the 2005 – 2012 resources boom (Figure 108). This reflected the rapid increase in wages and materials related to infrastructure provision at the time.

[604] As noted at footnote 596 above, the CCI is a composite of indices published by the Australian Bureau of Statistics, selected to reflect the composition of the Corporation's capital programs.

[605] The use of the CPI recognises that it closely reflects the difference between the nominal and real rates of return for the Australian economy.

Figure 108 Water Corporation's Capital Cost Index and the CPI compared



Source: Water Corporation data from PM-#11348654-v16-WaterNet_CCI, provided 9 March 2017; ABS Cat. No. 6401

The final step in the RRM is to estimate the return on capital. The nominal WACC is applied to the closing asset value in each year to determine the return on capital in that year.[606]

As observed above, the Water Corporation's method diverges from the CCA method of accounting.

- Specifically, in a typical nominal CCA revenue model, a deduction is made – from the value of the indexed depreciation – for the effect of inflation on the asset base. This step is important to remove the 'double count for inflation' that would otherwise occur with the application of a nominal rate of return to the indexed capital base.
- The deduction ensures that the 'NPV=0' condition is met. Without it, the asset is over-recovered, providing a windfall to equity holders, penalising customers.

As no deduction is made in the RRM, there is a potential double count for inflation in the Water Corporation's RRM costings for each scheme: a return for inflation is included twice, first in the indexation of the RRM asset base, and second, in the nominal rate of return.[607]

This double count is estimated by the ERA to result in costs that are as much as 15 per cent greater than otherwise would be the case, given current rates of return.

The double count results in inefficient costs, because it violates the 'financial capital maintenance' principle outlined above (or in other words, NPV=0). This will lead to inefficient operating subsidies.

Furthermore, in addition to the double count issue, the RRM replacement cost roll forward method has revenue characteristics similar to, *or in excess of*, a nominal HCA depreciation approach. This is illustrated in the following simple example. It illustrates the revenue (or

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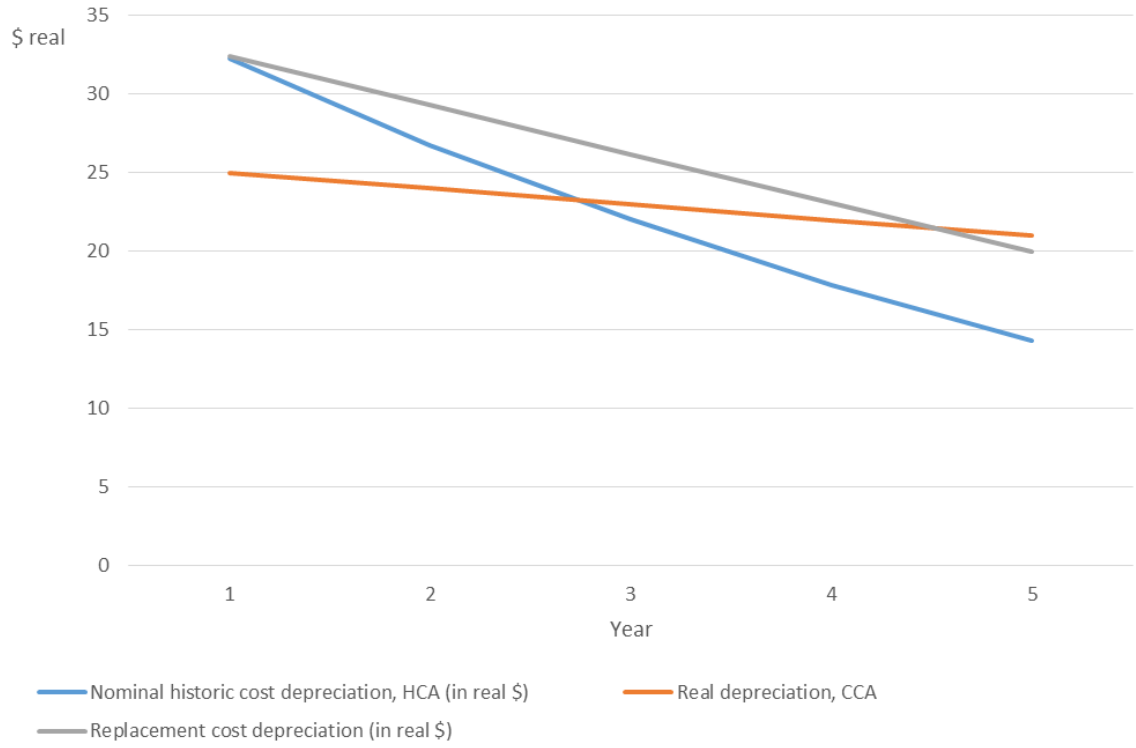
[606] This provides for a further distinction to the regulators' approach. To ensure NPV=0, regulators apply the rate of return to the *opening* asset value to calculate the return on capital in any particular year.

[607] The Western Australian CCI and the CPI are correlated to an extent, as the same factors (for example, wage costs) are inputs both indices.

return on and of) an asset costing $100, with a useful life of 5 years, given an assumed rate of return of 5 per cent and inflation of 10 per cent (Figure 109):

- The HCA method accelerates capital recovery as compared to CCA.
- The replacement cost method used in the RRM accelerates capital recovery as compared to HCA and CCA.
- The replacement cost method over-recovers capital, as the allowance for inflation is double counted.

Figure 109 Revenue under different depreciation methods



Notes Both the HCA method and the CCA method achieve NPV=0. The replacement cost method used in the RRM does not achieve NPV=0 when used with a nominal rate of return. It over-recovers revenue.

Source ERA analysis

The ERA in its recent Goldfields Gas Decision rejected the HCA nominal depreciation method, as:[608]

- HCA accelerates depreciation markedly – with typical rates of return, HCA recovers around 80 per cent of the net present value of a typical asset within 15 years, whereas CCA only recovers 65 per cent over the same timeframe;
- HCA therefore leads to significant transfers of costs from future consumers to current consumers, which is not in the long term interests of (all) consumers.
- HCA may result in unnecessarily high prices in the short to medium term – these could discourage gas usage and upstream and downstream investment.

[608] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 30 June 2016, p. 381.

- HCA depreciation schedules provide for price paths that encourage inefficient utilisation of assets – that is, under or over utilisation of the asset – at different times in its life cycle.
    - For example, under the HCA approach, there may be an incentive for a service provider to dispose of assets or ignore maintenance near the end of the useful life because the return on and of this asset would be relatively small and considerably lower at that time than under the CCA approach.
    - This may be facilitated by the artificially low tariffs induced by the HCA method near the end of the assets life. Downstream users may be induced to invest on the basis, only to find that such tariffs were unsustainable.

Under the HCA method, the early replacement of the asset would provide a higher return on and of the asset to the service provider than it was getting on the previous asset.

The extent that the replacement cost method accelerates revenue, as compared to even the HCA method, means that it is not preferred, for similar reasons to those set out in the Goldfields Gas Decision.

Furthermore, the HCA method and the CCA method achieve NPV=0. However, the replacement cost method does not achieve NPV=0 when used with a nominal rate of return. It over-recovers revenue. This means that it cannot be used to determine efficient costs and tariffs.

Utilising the RRM for this inquiry

The RRM incorporates a detailed dataset. This dataset includes:

- a fixed asset register, which itemises every asset, its indexed replacement cost and its expected life;
- identification of contributed assets (Works Handed Over and Significant Infrastructure Contributions);
- detailed treatment of capital expenditure;
- identification of Assets Under Construction;
- a comprehensive Asset Allocation Model which allocates common assets to schemes, based on underlying drivers (staffing levels, kilometres of pipe, volumes, number of connections);
- a resulting estimation of the Cost of Service by scheme, incorporating building blocks for the return on assets, depreciation of assets, and operating expenditure.

Given this depth of information, the ERA has sought to use the RRM as far as possible for this inquiry. However, a number of adjustments are required, to enable the model to be used for estimation of efficient costs and revenue.

Removing the double count for inflation

First, there is a need to remove the double count for inflation implicit in the RRM. To address this, one option is to implement ‘economic depreciation’ within the (otherwise unadjusted, nominal return) RRM. In this case, the annual inflation on the RAB would be deducted from

depreciation, removing the double count.[609]

An alternative option is to convert the RRM's fixed asset register to real terms, and then to use a real rate of return in the RRM.

The two options are equivalent.

The ERA's preference is to base its estimates for this inquiry on a real model. First, the ERA considers that a real model is simpler. Second, the ERA is utilising a pre-tax rate of return, so nominal modelling is not required for tax purposes. Finally, tariffs may be converted from real to nominal terms at the final stage, using the CPI, rather than to base all values in the model in nominal terms.

Implementing indexing with the CPI rather than the CCI

The ERA's convention is to account for values at the end of financial year. All reported dollar values in the model are expressed in real '2016 $', valued as 30 June 2016.

Historic values – such as the written down value of assets – are indexed to real 2016 $ using the Consumer Price Index (**CPI**).[610] As reported above, the Water Corporation used its own 'Capital Cost Index' for indexing the asset base under its replacement costs method. The ERA has backed this index out and replaced it with the eight cities CPI. The ERA considers that the CPI is more representative of the water corporations' capital cost escalation, and less subject subjective in the construct of the index. In any event, the two indexes appear to have returned to the alignment observed prior to 2005 (refer to Figure 108 on page 406 above).

A forecast of inflation is developed to convert the model outputs for the review period – in real 2016 $ – to nominal 'dollars of the day', for reporting purposes. The inflation forecast used for this inquiry is 1.79 per cent (see the rate of return section 2.2.1.4, and also Appendix 9 for the method used to determine the forecast CPI).

Aligning the fixed asset register with the 2005 deprival valuation

A final issue is the need to ensure that the RAB is consistent with the ERA's 2005 deprival valuation of the Water Corporation's asset base, as discussed above (page 403).

To address this, the ERA has developed a real fixed asset register which provides 2016$, CPI-indexed values of the Water Corporation's assets, but pro-rated to the 2005 deprival value.

It achieves this by adjusting the individual asset entries in the Water Corporation's 'Book 25' fixed asset register. The 'Book 25' reports the replacement cost CCI indexed acquisition value, acquisition date and expected life of each asset used by the Water Corporation. The following steps are taken to develop the CPI-indexed $2016 real fixed asset register.

First, all assets that existed *as at 2005* are:

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[609] This is the method used by the ERA in the nominal post-tax revenue models used for its recent gas decisions (see for example Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020*, Appendix 4 Rate of Return, 30 June 2016).

[610] Australian Bureau of Statistics, *Consumer Price Index*: *Weighted Average of Eight Capital Cities*, Catalogue 6401.0, March 2017.

- converted from their Book 25 replacement cost valuation, as at 30 June 2016 (that is, their 2016$ value), to their 30 June 2005 $ Book 25 replacement cost written down value, using the Water Corporation's Capital Cost Index;
- this 2005$ replacement cost adjustment provides information on both the acquisition value and the written down replacement value;
- these 2005$ values are taken as the starting values for the ERA's RAB;
    - the year 2005 is chosen, as the Water Corporation provides data which enables contributed assets to be distinguished in the fixed asset register from that time on;
    - this is important, as the ERA excludes contributed assets from its calculation of efficient assets (see appendix 13);

Second, these pre-2005 assets – excluding contributed assets – are then indexed from their 2005 acquisition value to 2016$, using the 8 cities CPI – this returns the 2016$ acquisition value from a Capital Cost Index value to a CPI indexed value.

Third, those assets acquired *post 2005* – excluding contributed assets – are indexed from their historic acquisition cost to 2016$ value using the 8 cities CPI.

Fourth, the cumulative depreciation of all assets to 2016 in real 2016$ is then calculated, based on:

- the expected life of the asset in years;
- the resulting annual depreciation in real 2016$ terms (which equals the real indexed acquisition value in 2016$, divided by the expected life of the asset); and
- the number of years in 2016 that have passed since the acquisition of the asset, which is multiplied by the real annual depreciation to give the cumulative depreciation;
- importantly, the forecast depreciation that was provided for new assets from capital expenditure over the period 2012 to 2016, in the ERA's former revenue model, is used to roll forward the post-2012 assets, to allow a true up for the period 2012 to 2016;[611]
    - the difference between the forecast depreciation and the actual depreciation may have resulted from either under- or over-estimated capital expenditure over the 2012-16 period.

Finally, subtracting the cumulative depreciation from the acquisition value then gives the real written down value as at 2016 of the individual assets in the fixed asset register in 2016$, excluding contributed assets.

For assets acquired after 2005, this gives a true picture of the written down value in 2016 in 2016$ terms.

However, for assets acquired before 2005, indexing the 2005 replacement cost values – as these stood at 2005 – may imply some difference to underlying CPI-indexed values in real terms. This is because the historic cost of assets were indexed using the Water Corporation's Capital Cost Index between 1994 and 2005.[612] However, the differences

[611] This is standard ERA regulatory practice.

[612] Prior to 1994, the indexation method to develop the deprival valuations at

between the two indexes over the period 1994 and 2005 are not pronounced (as may be observed in Figure 108 on page 406 above), such that this is unlikely to introduce significant errors. The ERA is therefore satisfied that the resulting real RAB, calculated in $2016 terms:

- is consistent with the 'line in the sand' deprival value for 2005;
- excludes contributed assets on a consistent basis;
- only includes efficient capital expenditure approved since 2005;
- accounts for the forecast depreciation awarded over the period 2013 to 2016.

Asset disposals

As a further step, the ERA has accounted for recent asset sales and disposed assets in the roll forward.

In regulatory modelling, there are two approaches for dealing with an asset sale:

- leave the asset in the RAB, but net off revenue in the year of the disposal equal to the sale proceeds (this is equivalent to the 'Queensland method' for accounting for contributed assets – see the discussion in the section The 2009 RAB revisions on page 394); or alternatively
- deduct the asset sale proceeds from the relevant RAB asset class (as a form of 'accelerated depreciation').[613]

The ERA in the 2012 inquiry adopted the second method. The resulting accelerated depreciation was based on actual asset sales data to 2009, and on estimates and forecasts through 2016 thereafter (Table 156).

Disposed assets are treated differently to asset sales, as no sales revenue is received. Disposed assets are those redundant assets which are simple retired prior to the end of their expected effective life. The ERA's regulatory treatment of such redundant assets is to leave them in the asset base, so as to avoid tariff shock.[614]

[613] The modelling then also accounts for the fact that the accelerated depreciation is reflected as revenue in that year of disposal. To ensure revenue neutrality, an amount equivalent to the sale proceeds is deducted from revenue in the same year, to offset the impact on revenue of the accelerated depreciation.

[614] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012, p. 148.

Table 156 Asset sales as accelerated depreciation ($m real 2012)

	2008 (actual)	2009 (actual)	2010 (est.)	2011 (est.)	2012 (est.)	2013 (est.)	2014 (est.)	2015 (est.)	2016 (est.)
Metro									
Water	1.550	0.503	0.940	0.400	1.927	0.649	0.621	0.595	0.569
Wastewater	1.033	0.335	0.627	0.266	1.285	0.433	0.414	0.396	0.379
Drainage	-	-	-	-	-	-	-	-	-
Total	2.584	0.838	1.567	0.666	3.212	1.082	1.036	0.991	0.948
Country									
Water	0.664	0.215	0.403	0.171	0.826	0.278	0.266	0.255	0.244
Wastewater	0.443	0.144	0.269	0.114	0.551	0.186	0.178	0.170	0.163
Drainage	-	-	-	-	-	-	-	-	-
Irrigation	-	-	-	-	-	-	-	-	-
Total	1.107	0.359	0.672	0.285	1.377	0.464	0.444	0.425	0.406
Total	3.691	1.197	2.238	0.952	4.589	1.546	1.479	1.416	1.355

Source ERA modelling, 2012

As both types of assets – disposed and sales – are excluded from the Water Corporation's fixed asset register, the ERA requested data for recent years, so as to bring the fixed asset register up to date, consistent with the ERA's treatment (in particular, to add back in disposed assets).

Furthermore, the ERA required asset sales data to ensure that the roll forward of the ERA's 2012 model was updated for actual asset sales to 2015-16 (the model currently only has asset sales forecasts from 2009 on).

However, the Water Corporation indicated that the request was difficult to meet, without considerable work.

Accordingly, the ERA did not pursue the matter. Given the small amounts involved, the ERA has not re-estimated asset sales or disposals since 2009, which was the last time Water Corporation provided actual data. This implies some error in the resulting estimate of the ERA's modelled Water Corporation RAB at 2015-16. However, the impact on

revenue is estimated to be small – less than 0.25 per cent per annum of total revenue.[615] For similar reasons, the ERA has not accounted for asset sales or disposed assets going forward to 2022-23.

Nonetheless, the Water Corporation should ensure that it is able to identify those assets in the 'Book 25' fixed asset register which are either sold or disposed of (see recommendation in chapter 2). For asset sale items, the revenue from the sale should also be recorded. The ERA recommends these two sets of data (sales and disposals) be collected for 2015-16 and for future years. The information should include acquisition value and date, life, and accumulated depreciation for each of the two classes of assets.

These estimates will assist in trueing up the value of the RAB at the next inquiry. The RAB will also need to be adjusted for the actual recorded assets sales revenue from 2018-19, in future value terms, in the revenue for the period 2023-24 forward. This is because, absent this adjustment for the period 2018-19 to 2022-23, revenue will be either under- or over-stated. An NPV neutral adjustment will ensure that neither customers nor the utility is penalised for this omission.

The total written down replacement cost value of the Water Corporation's fixed asset register as at 30 June 2016, following the above method, is 2016$ 17,381 million.

The 2016 regulatory asset base

A final step is to pro-rate the resulting RRM asset base to align with the ERA's modelled RAB for 2015-16. The latter accounts for the 2005 'line in the sand' estimate (2005$ 9.6 billion), rolled forward in the ERA's model for actual approved capital expenditure to 2016. This ensures that the resulting estimate of efficient tariffs aligns with the ERA's standard regulatory approach, which is to maintain a consistent asset base over time.

The ERA's modelled RAB, rolled forward to 2015-16, is 2016$ 16,934 million. That means that the RRM asset base needs to be inflated by a factor of 0.974 to achieve the same value. All assets in the RRM asset register are deflated by that amount. The RRM asset register is thus considered to be consistent with the 2005 deprival value estimation. It is therefore fit for purpose for estimating efficient costs. The resulting adjusted tariff base can now be rolled forward, without further adjustment, provided that deprecation, disposed assets, and new approved capital expenditure are accounted for.

Conclusions

This Appendix finds the following:

- The ERA's existing deprival valuation of the water corporations' regulatory asset base should be retained.

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[615] Some indicative figuring informs the impact of this. If asset sales are underestimated by, say, 2016 $10m per annum over the seven years from 2009 to 2016, then this would imply that 2016 $70m of 'sold' assets remain in the ERA's Water Corporation asset base at 2015-16. Given the current real rate of return of just over 4 per cent, that implies an excess return on the RAB of around $3 million in 2015-16. With an average asset life of around 40 years, there would also be excessive depreciation revenue of around $2m. The total impact on revenue is therefore around $5m. However, as total annual revenue exceeds $2b in 2015-16, the over-statement of revenue is less than (5-2,000=) 0.25 per cent per annum.

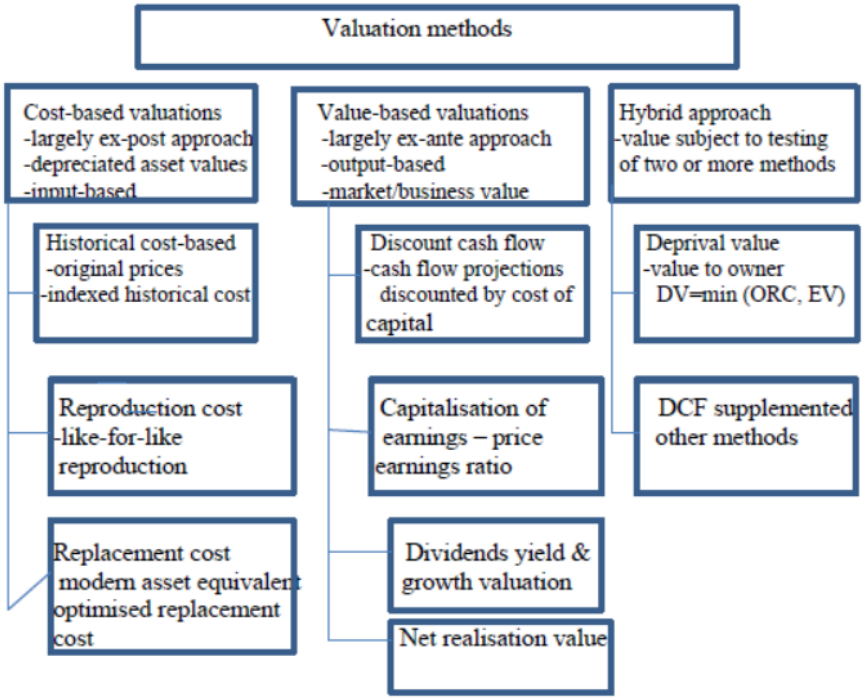
On the other hand, Water Corporation has omitted disposed assets from the RAB, which then provides for an *underestimate* of the correct value for regulatory purposes. This offsets the asset sales error, to a degree. As the level of disposed assets, not sold, is unknown at this point, it is difficult to be sure of the overall net effect on the RAB.

- The Water Corporations RRM model is likely to have biases in its estimates of required revenues and CSOs. These biases may be able to be corrected through implementation of an appropriate asset base and depreciation method.

Appendix 10A Asset valuation approaches

Generally, asset valuation approaches are derived from either asset purchase costs or some type of value based approach (Figure 110). A third, 'hybrid' approach is also described in the following Figure 110 – the deprival value method.[616]

Figure 110 Valuation method



Source M. Abbott and A. Tan-Kantorp, *Asset valuation of government business enterprises: a re-evaluation of pricing issues*, July 2014, p. 12.

In Australia, the Australian Accounting Standards apply:[617]

> Under the Australian Accounting Standards, paragraph 62 of the AASB 13 or IFRS 13 Fair Value Measurement (September 2011) and paragraph 33 of AASB 116 or IAS 16 Property, Plant and Equipment (June 2009) state that fair value is permitted to be estimated using either an income or a depreciated replacement cost (**DRC**) in circumstances where there is no market-based evidence of fair value.

The income (business cash flow valuation) approach considers the economic value generated by the assets and the business, provided that sufficient reliable cash flow or earnings information is available; whereas the DRC approach considers the cost of

[616] The deprival value method may be described as 'hybrid' because it tends to lie between two alternate bounds:

- the first bound, generally a ceiling, is based on the optimised replacement *cost* method; and
- a second bound, generally lower that the replacement cost, based on the expected *value* of future cash flows.

[617] M. Abbott and A. Tan-Kantorp, *Asset valuation of government business enterprises: a re-evaluation of pricing issues*, July 2014, p. 2.

replacing the assets.[618]

Cost based methods

Historic cost

Historic cost accounting (**HCA**) introduces assets into the asset base at cost in dollars of the day at the time the asset was purchased. Straight line depreciation is then often implemented in nominal dollar terms, which then front end loads the depreciation schedule in real terms.

HCA is typically used for the statutory accounts. An advantage of HCA is that it can be verified through the standard financial records.

HCA is recognised as having shortcomings. The front end loading of revenue is in proportion to the degree of inflation. With non-zero rates of inflation, this may lead to cash flow shortfalls later in an asset's life, around the very time it needs to be replaced.

Replacement cost

The depreciated replacement cost (**DRC**) approach determines the replacement cost of existing assets', at the current time. In other words, DRC records the value of the assets as the cost of replacing the service capacity of the assets.

Modern equivalent asset

The 'modern equivalent asset' approach allows the productivity of replacement assets to be taken into account, thereby incorporating state of the art technology. As a result, the modern equivalent asset may be much cheaper than the original asset (for equivalent output and configuration).

Depreciated optimised replacement cost

Replacement cost may be optimised for the scale of the current task, given the advances inherent in modern equivalent assets. As a result, over- or under-capacity, technological change, redundancy and network effects may all be taken into account. A depreciated optimised replacement cost (**DORC**) is more consistent with the valuation which would be employed by an efficient new-entrant pricing.

Income based approaches

Income based approaches work backwards from the value of cash flows, essentially providing a discounted cash flow valuation. Such valuation is sensitive to the expected future cash flows and the rate of return estimate.

Deprival value

A third, 'hybrid' approach is termed deprival valuation. It is a hybrid because the valuation is either based on the *cost* approach (generally an upper bound) or the *income* approach (generally a lower bound).

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[618] Ibid, p. 3.

The upper bound value of an asset under the deprival value method is its replacement *cost*. That maximum value can be based on a DORC.

However, with the deprival value method, if the replacement value is more than the amount that can be derived from owning the asset, then the asset should be valued at no more than its 'recoverable amount', which in turn is the greater of the net selling price of the asset and the discounted value of expected future cash flows (*income*) in use.

A deprival value defined as the lesser of the net present value of the income able to be generated by the asset and the DORC value of the asset, is also referred to as an optimised deprival value (ODV).[619]

In practice, many publicly owned assets in Australia were corporatised with a valuation which reflected a discounted stream of the existing and future tariffs. Such valuations were generally neither the DORC, nor a 'recoverable amount' (which might be realised on sale). They have been referred to as 'line in the sand' valuations. The resulting valuation is interpreted as a deprival value.

Infrastructure renewal accounting

Infrastructure renewal accounting was developed in the United Kingdom in response to a view that estimates of capital spent for renewal were significantly less than current cost accounting depreciation. In other words, current cost accounting either involved valuations of capital that were too high or asset lives that were too short:[620]

The basic premise underlying the renewal accounting approach is that infrastructure assets have infinite lives, which means that their operating capacity can be maintained in perpetuity. Infrastructure renewal expenditure is therefore charged against the profit and loss statement of the firm for the maintenance of the operating capability of the infrastructure. This charge to the profit and loss account for infrastructure renewals expenditure then takes into account the planned expenditure on the maintenance of the serviceability of the assets in accordance with the operational policies and standards underlying the firm's investment program. It is indexed to reflect the impact of price changes since the program was established. Any expenditure during the year is charged to the infrastructure renewals provision section of the organisation's accounts.

Regulation in Australia

The most common approaches for regulation involve either the historic cost, replacement value or 'line in the sand' methods. Generally, initial asset valuations have been based on a pragmatic determination having regard to issues such as price shocks, reasonable costs, and forward implications for budget bottom lines, including where payments for Community Service Obligations are made.[621] Such valuations then tend to be less than optimised replacement cost, becoming a 'line in the sand'.

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[619] The Allen Consulting Group, *Review of Asset Values, Costs and Cost Allocation of Western Australian Urban Water and Wastewater Service Providers General Principles and Methodology*, March 2005, p. 9.

[620] M. Abbott and A. Tan-Kantorp, *Asset valuation of government business enterprises: a re-evaluation of pricing issues*, July 2014, p. 20.

[621] A higher valuation may lead to a requirement for higher subsidies for certain classes of consumers in the future.

Roll forward approaches

Once the asset base is established, there are a number of ways of carry forward its value through time. Generally, the roll-forward will account for:

- the existing capital base;
- new capex;
- annual depreciation;
- any asset sales or redundancies.

Historic cost accounting

Inclusion of assets in the asset base at their historic nominal cost, with subsequent depreciation in nominal (dollars of the day), provides for the historic cost accounting (**HCA**) method.

Current cost accounting

Current cost accounting (**CCA**) indexes the asset base to maintain the value in nominal terms, thereby accounting for the effect of inflation. Nominal straight line depreciation on the indexed asset base delivers an indexed value of the depreciation.

Backing out the effect of inflation from the indexed depreciation then provides for 'economic' depreciation. The economic depreciation approach is now common in regulatory modelling, with a salient example provided by the Australian Energy Regulator's Post Tax Revenue Model. It provides for depreciation – in nominal terms – that is equivalent to straight line depreciation in real terms.

Application of economic depreciation has the result that that the written down value of the asset at any point in time is equal to the net present value of the cash flows it will generate in the future, thereby ensuring 'financial capital maintenance' for the investor.[622] Economic

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[622] In particular, economic depreciation is the change between the economic value of the asset through time, where that value at any point is given by the discounted present value of its future cash flows. An economic depreciation schedule therefore reflects the decline in earnings potential over time. Hence, the written down asset value with economic depreciation should reflect the value of the asset that would accrue on its sale at any point in time.

There is a range of economic depreciation schedules possible. The exact form of the depreciation schedule depends on the degree to which the asset deteriorates in its productive performance, as well as any risks of asset stranding. These factors may affect the asset's resale value prior to the end of its useful life.

With regard to asset deterioration, polar extremes are illustrated by:

- an asset retaining its productive capacity through to the end of its expected life;
  - this requires the so-called 'one hoss shay' or 'light bulb' economic depreciation schedule – which is 'back end loaded' in real terms;
  - the back-end loaded schedule then captures the decline of the present value of future cash flows over time, given appropriate discounting, but there is no effect on those cash flows arising from productivity or demand declines;
  - much of the depreciation occurs at the end of the asset's useful life;
  - it results in an 'annuity' style constant payment of capital costs in each period;
- an asset which depreciates rapidly, delivering a reduced output over time;
  - an example of such an asset might be a laptop computer, which presents increasing slowness and reducing application through time as software upgrades are implemented;

depreciation therefore maintains the asset value, at any particular point in time, consistent with that value that it would obtain on the sale of the asset.

It follows that economic depreciation reflects the forward looking opportunity cost of making the asset services available.[623]

- in this example, economic depreciation will be 'front end loaded' in real terms, to capture the decline in value associated with productivity, as well as diminution of the discounted future value of output flows with the passing of time.

[623] For a detailed exposition, see Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, as amended on 21 July 2016, p. 375.

Appendix 11 Managing material variations

The terms of reference require the ERA to recommend an approach for managing material variations in capital or operating expenditure that may be encountered over a five-year review period.

Unexpected events may cause the water corporations to incur additional operating or capital expenditure than forecast. As water tariffs are set at the beginning of the review period, the water corporations are not able to recover these additional costs during this period. Similarly, if costs are lower than forecast, customers will pay a higher tariff than is required to meet the efficient costs of providing water services.

Previous inquiries have covered a three-year review period. As directed by the terms of reference, this inquiry recommends tariffs for a five-year review period. Over a longer period, there is greater scope for circumstances to change because the forecasting of expenditure and demand is more difficult and there is more time for operating environments to change, introducing unexpected events. However, the benefits of a longer review period may include stronger incentives for the water corporations to achieve cost efficiencies, which are retained by the corporations. The ERA has considered approaches to managing material variations for unexpected costs to maintain these incentives.

In the 2012 inquiry, the ERA recommended that the State Government establish a formal arrangement that obliges the water corporations to not pass on the costs of any inefficient expenditures to consumers. The ERA recommended that a "charter" be established between the State Government, the water corporations and the ERA. The charter would be an open and transparent document that set clear guidelines about what is expected of the water corporations, including the amount of revenue that each are able to earn. The State Government did not implement this recommendation.[624]

The ERA now recommends that material variations in capital expenditure be managed through an "options test" and "expenditure test" approach, and that any adjustment to water tariffs to account for these variations occur at the next review (inquiry) period. The ERA recommends material variations in operating expenditure be managed through an annual cost pass-through mechanism.

This appendix:

- defines material variations in operating and capital expenditure;
- identifies the purpose and characteristics of approaches to managing material variations;
- considers preferred approaches to manage material variations; and
- outlines the ERA's recommended approach.

What are material variations?

Material variations are significant and unexpected expenditures incurred (or expected forecast expenditure not incurred) by the water corporations during the regulatory period. Material variations occur if actual events differ from what was expected when tariffs were

[624] Economic Regulation Authority, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Revised Final Report*, 28 March 2013, pp. 31-33.

determined. In its submission to the ERA's Issues Paper, Aqwest considered material variances to be $250,000, which is approximately equal to 0.25 per cent of the written down value of its consolidated fixed assets and investments.[625] Aqwest considered that this was an appropriate materiality threshold as it approximately equalled the value required for ministerial approval prescribed under the *Water Corporations Act 1995*.

Ideally, the water corporations' efficient level of expenditure for the forecast review period would be assessed once, at the review, and the water corporations would then provide services without exceeding this level of forecast expenditure. In this instance, water tariffs would be set to recover the water corporations' efficient level of expenditure and no variations would be necessary. However, forecasting demand and the expenditure – required over a five-year period – is difficult and some variations from the approved forecast can be expected. When this variation is material, it may be appropriate to adjust the revenue requirement and tariffs to allow the water corporations (or customers) to recover the increased (or decreased) expenditure.

Material variations are most likely to occur because of a change in legislation or unexpected events.

- The water corporations may be required to spend more, or less, money if legislation changes. For example, if the State Government decided to introduce new mandated service standards for the water corporations, this could have a material effect on costs.
- An event that was unforeseen at the time tariffs were determined may affect costs. For example, the Water Corporation may need to incur additional capital expenditure to construct a desalination plant if it needs to supply significantly more water than expected.

What should be achieved?

The main objective of any approach for managing material variations should be to maintain incentives for the water corporations to incur only efficient and prudent expenditure. The ERA considers that a move to a five-year review (inquiry) period strengthens the water corporations' incentives to accurately forecast demand and expenditure, and to realise further efficiencies during the longer period if available. For example, by not adjusting tariffs during the review period, the water corporations are incentivised to realise further efficiencies as they are able to retain higher tariff revenue than necessary for efficient costs. During the following regulatory period, the asset base is adjusted and operating expenditure levels reset to return the savings to customers. The overall result is that both customers and the water corporations share in the benefits of realising efficiencies from expenditure levels over the review period.

The ERA considers that any approach should complement the incentive properties of setting prices over a regulatory period. Any compensation mechanism through tariffs for material variations should therefore only apply if actual total expenditure for the regulatory period exceeds forecast total expenditure, and the expenditure is deemed efficient and prudent.

In response to the ERA's Issues Paper, Aqwest considers that the approach for managing material variations should allow for:

[625] Aqwest, *Submission – Inquiry into the efficient costs and tariffs of the Water Corporation*, *Aqwest and Busselton Water*, 23 January 2017.

- the review of expenditure either before or after it is incurred;
- the impact on operating efficiency targets;
- the impact on revenue requirements;
- a mechanism for changing water tariffs if required; and
- assigning responsibility for the management of variations.

The ERA considers the approach to managing material variations should assess the necessity and efficiency of the expenditure. Material variations should only be considered and reflected in water tariffs if the variations are necessary, efficient and beyond the control of the water corporations. For example, variations should not lead to tariff adjustments if they:

- were within the control of the water corporations (or would have been in the control of a service provider that was acting efficiently);
- were known, or should have been known, at the time the existing tariffs were implemented;
- could have reasonably been foreseen by the water corporations;
- should have been planned for or managed by the water corporations; and/or
- reflect inefficient expenditure.

Approaches for managing material variations

Regulatory test and new facilities investment test

The ERA regulates Western Power's electricity network in Western Australia under the *Electricity Networks Access Code 2004* (**Access Code**). When Western Power incurs unexpected capital expenditure during a regulatory (access arrangement) period, it may apply to the ERA to assess that expenditure through a "regulatory test" and/or "new facilities investment test".[626]

- The regulatory test aims to assess whether Western Power has considered all feasible options to determine the best solution to a network problem it faces and that the selected option (and associated expenditure) results in maximum net benefits.
- The new facilities investment test aims to assess the efficiency of expenditure and how much of the expenditure should be included in Western Power's regulated asset base and recovered through electricity tariffs.

These tests are undertaken either at the time of an access arrangement review, or during an access arrangement period for unexpected capital expenditure. The tests aim to provide some certainty to Western Power around their expenditure. If unexpected expenditure passes the regulatory and new facilities investment tests, it is included in Western Power's regulated asset base for the next access arrangement period.

[626] The 'regulatory test' and 'new facilities investment test' are terms used within the *Electricity Networks Access Code 2004*.

The ERA notes the more involved regulatory and new facilities investment test approaches are suitable for assessing variations in capital expenditure. However, they are less suitable for evaluating variations in operating expenditure.

- Capital expenditure generally consists of high value asset investments that have lengthy planning times. There is a need to consider a range of investment options before an investment commitment is made. Given the investment options, the level of capital expenditure can be discretionary. For these reasons, the assessment of options and costs can and should be done before any capital investment is made, or before costs are incurred. Such assessment should determine which capital investment is the best option, and whether the associated costs should be recovered from customers through higher tariffs, or from other users who derive sole benefit from the investment.
- Operating expenditure is the cost of providing services. For a business that provides regulated services, there may be some operating costs which are influenced by events outside of the business's control. Such variations cannot be managed or mitigated (for example, operating costs relating to a change in regulation or tax law). In this situation, a business should be able to recover increases in operating expenditure through higher tariffs (or pass on decreases through lower tariffs) as necessary.

Regulatory test

The regulatory test is used to assess whether proposed capital expenditure is the best way of increasing the capability of Western Power's electricity network to provide regulated electricity services. The purpose of the regulatory test is to ensure Western Power has considered the alternative options available (and the net benefits of each option) to it before it commits to any capital investment.[627]

The regulatory test is designed to:

- ensure that major capital expenditure is properly assessed to determine whether it maximises net benefits after considering alternative options;
- provide an incentive to select the option which maximises the net benefit (this may include not proceeding with any option); and
- minimise delays to projects and developments, administrative and regulatory costs and any other barriers to entry.

The Access Code requires Western Power to provide a statement to the ERA that demonstrates it has complied with the regulatory test. There are a number of considerations that Western Power needs to address in its statement to the ERA, including testing for different scenarios and sensitivity analysis (for example, whether the proposed expenditure is likely to be effective at varying levels of demand). Western Power's proposed capital expenditure satisfies the regulatory test if it is able to provide evidence to the ERA that the proposed expenditure is the best option.

Where the ERA is satisfied Western Power's proposed capital expenditure is the best option to address a network issue, Western Power may choose to have the capital expenditure

[627] For example, in the case of a water corporation, instead of constructing a desalination plant to source more water, it may be more efficient for a water service provider to undertake demand management activities. The water corporation should select the option that maximises the net benefit to its water customers.

assessed for efficiency (using the new facilities investment test) prior to actually undertaking the expenditure, or wait until the next access arrangement period and have the expenditure reviewed at that time.[628]

New facilities investment test

The purpose of the new facilities investment test is to determine the extent to which investment in capital assets (new facilities) is efficient and can be added to the capital base and recovered through regulated tariffs. Any amount that does not meet the test (i.e. any amount determined to be inefficient) would need to be financed through other means, such as capital contributions.

The new facilities investment test is composed of four individual tests. To satisfy the new facilities investment test, the investment must pass an "efficiency test" and one or more of another other three tests – the incremental revenue test, net benefits test or safety and reliability test.

- The "efficiency test" is an assessment of the efficiency of the investment. The investment is deemed efficient if it does not exceed the amount that would be invested by a service provider efficiently minimising costs.
- The "incremental revenue test" requires that the anticipated incremental revenue from the capital assets are expected to at least recover the investment (capital) costs.
- The "net benefits test" requires that the capital assets provide a net benefit in the regulated network over a reasonable period of time that justifies the approval of higher regulated tariffs.
- The "safety and reliability test" requires a demonstration that the capital assets are necessary to maintain the safety and reliability of the regulated network, or its ability to provide regulated services.

Cost pass-throughs

Unexpected events may also result in changes to a business's operations or obligations and therefore its operating expenditure. Cost pass-throughs are used in regulation to allow regulated businesses to recover unexpected operating expenditure. A cost pass-through allows the business to recover operating costs that occur as a result of events beyond its control. The regulator generally assesses the cost pass-through event and determines whether tariffs will be adjusted to reflect the increase in operating expenditure.

A number of Australian regulators adjust prices through cost pass-throughs,[629] which arise due to predefined "cost pass-through events" within a revenue determination. The ERA administers cost pass-throughs for the gas service providers it regulates. These service providers are able to apply to the ERA on an annual basis to assess any cost pass-through

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[628] Under the Access Code, Western Power may apply to the ERA at any time for it to determine whether actual (or forecast) new facilities meet (or will meet) the new facilities investment test. Where the ERA makes a determination outside an access arrangement review process, the determination binds the ERA in allowing the addition of the actual new facilities to the capital base, provided the investment is made consistent with the ERA's determination.

[629] Including the ERA for gas businesses, the Australian Energy Regulator for gas and electricity network businesses, the Essential Services Commission of South Australia for water businesses and the Queensland Competition Authority for electricity networks.

events that occur during a year. The ERA assesses cost pass-through applications by considering whether:[630]

- the event is classified (defined) as a cost pass-through event in the service provider's access arrangement;
- the expenditure is an obligation or requirement of the business; and
- the expenditure was reasonably excluded from the approved forecast operating expenditure at the time of the access arrangement decision.

Cost pass-throughs allow a business to recover operating expenditure in the year after the expenditure was incurred. This results in tariffs that are more reflective of the current operational cost of providing a regulated service. If the adjustment is made at the beginning of the next regulatory period (which can range from three to five years), then tariffs may not reflect the efficient cost of providing a regulated service at a given time. For example, if an unexpected event occurs early in the regulatory period, but tariffs are not adjusted until the next regulatory period (five years later), then customers will pay below the efficient cost of providing a service in one regulatory period and above the efficient cost in the next to recover the difference.

The ERA notes that the assessment of cost pass-throughs on an annual basis increases administration costs because the regulator undertakes more reviews. Despite increased administration costs, the ERA considers an annual adjustment for cost pass-throughs to be an effective way of managing material variations in operating expenditure because:

- pass-through events are limited to events that are beyond the control of the business;
- cost pass-throughs allow a business to recover unexpected costs (or pass on unexpected savings) earlier than adjustments to operating expenditure that are done at the end (or start) of a regulatory period; and
- tariffs more closely reflect the efficient operating costs of a business at any point in time.

Re-open determinations

Regulated businesses may be permitted to apply to the regulator to re-open a determination. This typically occurs if uncontrollable events lead to a significant reduction in revenue or increase in costs that may have an adverse financial effect on the business.[631] In this situation, the regulator would commence a new regulatory period, undertaking a full review of revenue and tariffs. For a determination to be re-opened, the advantages of varying current tariffs before the end of the regulatory period would need to outweigh the disadvantages.

Provisions to re-open determinations are common for regulated utility businesses. Access arrangements and price determinations of water businesses made by OfWat, the Essential Services Commission of South Australia and the Essential Services Commission of Victoria

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[630] Economic Regulation Authority, *Assessment of Mid-West and South-West Gas Distribution System Reference Tariff Variation Report for 2011-12*, 17 June 2011, p. 9.

[631] See for example Western Power, *Amended proposed revisions to the Access Arrangement for the Western Power Network*, June 2015, p. 55.

all include provisions to re-open determinations in response to substantial unforeseen events. [632]

End of period adjustments

Some regulators make adjustments in tariff determinations to reflect changes in costs from the previous regulatory period. During a regulatory period, businesses may spend more or less than was approved at the time the regulator made its determination. Variations occur because of differences between the forecasts, assumptions and actual events. For example, a business may intend to undertake a capital project during the regulatory period, but actually undertakes a different project with a different cost (or decides not to undertake the project at all). Regulators may adjust for these differences in the next regulatory period, provided the business's expenditure is efficient.

Assessments of actual and forecast expenditure are undertaken as part of a regulatory determination. There are some examples where, if a business has earned more revenue than it should have (because it spent less than forecast on certain pre-defined expenditure) then tariffs for the following period will be lower to compensate customers for the higher tariffs they paid in the prior period. If a business spent more than forecast (and that expenditure was efficient on certain pre-defined expenditure), then tariffs will be higher in the following period to allow the business to recover its costs.[633]

In past inquiries, the ERA had adjusted the total revenue requirements of the water corporations to account for an under recovery of revenue that had eventuated from the previous pricing period. Under such an approach, any under recovered revenue is added to the total revenue requirement. Similarly, any over recovery of revenue would be subtracted from the revenue requirement.

In the 2012 Inquiry, the ERA stated that it considered any under or over recovered revenue from past pricing periods should not be taken into account when estimating the revenue requirement for a future period. That is, it was the ERA's intention that no adjustment for under recovery of revenue during the period 2013-14 to 2015-16 would be made at the time of the next pricing review. Under recovery can occur when a water service provider has sold less water than was forecast at the time the tariffs were calculated. The ERA considered that:[634]

> By adjusting the total revenue requirement to allow for an under recovery the [ERA] was acting to insulate the water service providers from demand risk. Under such a framework, the revenue of the water service providers is not affected by any discrepancy between forecast volumes of water sold and actual volumes of water sold, and the onus of any discrepancy is borne by consumers in the form of higher or lower tariffs.

The ERA considered that it had been appropriate to adjust the total revenue requirement of the water corporations in the past because of uncertainty about water inflows and water restriction policies. However, the ERA believed that water restriction policies were well established and unlikely to change in the near future. As such, demand forecast risk would be best managed by the water corporations (rather than consumers) as is the case in normal

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[632] Ofwat, *Interim determinations*, 2017 available at: http://www.ofwat.gov.uk/regulated-companies/price-review/interim-determinations/.

[633] An example of this is the Investment Adjustment Mechanism that applies to Western Power as allowed for under the *Electricity Networks Access Code (2004)*.

[634] Economic Regulation Authority, *Inquiry into the tariffs of the Water Corporation, Aqwest and Busselton Water: Revised Final Report*, 2013, p. 29.

commercial practice. This approach ensures that the water corporations have a greater incentive to ensure their demand forecasts are accurate.

ERA's recommended approach to managing material variations

The ERA considers that any approach to manage material variations should aim to promote incentives within regulation that are intended to ensure efficiency in any new expenditure and net benefits. The ERA recommends that:

- material variations be subject to a materiality threshold;
- material variations in capital expenditure be assessed using an "options test" and "expenditure test" approach; and
- material variations in operating expenditure be managed through a cost pass-through mechanism.

Materiality threshold

The ERA considers that a materiality threshold should be applied to variations in capital or operating expenditure that are to be independently assessed. There are administration costs associated with assessing variations in expenditure, and for this reason, the ERA considers variations should only be independently assessed if the variations exceed a set materiality threshold. Table 157 outlines the recommended materiality thresholds for the Water Corporation, Aqwest and Busselton Water.

Table 157 Materiality thresholds for variations in capital and operating expenditure

	Threshold for capital expenditure	Threshold for operating expenditure
Water Corporation	One per cent of annual required revenue (approximately $25 million)	0.25 per cent of annual required revenue (approximately $6 million)
Aqwest and Busselton Water	Five per cent of annual required revenue (approximately $800,000 and $530,000 respectively)	Two per cent of annual required revenue (approximately $320,000 and $210,000 respectively)

In recommending the materiality thresholds, the ERA has considered the thresholds applied to manage variations in expenditure in other industries and jurisdictions. Materiality thresholds are set to allow businesses to recover expenditure (or return savings) when required, but not if the administration costs are excessive when compared to the change in expenditure (or savings).

The ERA notes the materiality thresholds that exist within access arrangements for Western Power and Goldfields Gas Transmission.

- Western Power is required to apply for a regulatory test when proposed capital expenditure exceeds $36 million for a transmission augmentation and $12 million for a distribution augmentation.[635] These figures equate to 14 per cent and 1.2 per cent of Western Power's transmission and distribution revenue respectively.

[635] These amounts are indexed by CPI each year.

- Goldfields Gas Transmission is able to apply for a cost pass-through for expenditures that exceed one per cent of revenue.[636]

The ERA further notes that the Australian Energy Regulator adopts a one per cent threshold for some of the gas businesses it regulates.[637] The Essential Services Commission of South Australia has a one per cent materiality threshold for material variations in capital and operating expenditure for South Australia Water, which equates to approximately $8 million.[638] The Essential Services Commission of Victoria does not have a materiality threshold for assessments.[639]

Based on these figures, the ERA recommends a materiality threshold of one per cent be applied to the Water Corporation for unexpected capital expenditure. However, due to the smaller size of Aqwest and Busselton Water, the ERA recommends a higher percentage of revenue (five per cent) as the materiality threshold. This should ensure the administrative costs to assess material variations for Aqwest and Busselton Water do not exceed the expenditure being assessed.

Similar to the capital expenditure thresholds, the ERA recommends that the materiality threshold for material variations for operating expenditure is a higher percentage of revenue for Aqwest and Busselton Water (two per cent). The ERA recommends a threshold for material variations for operating expenditure of 0.25 per cent for the Water Corporation.

Managing material variations in capital expenditure

The ERA recommends a combination of an "options test" and "expenditure test" approach, with similar characteristics to the regulatory and new facilities investment tests, to assess material variations in capital expenditure. Such tests would assess whether the water corporations have considered all the options available (the "options test") and whether the expenditure the water corporations actually undertake is efficient (the "expenditure test"). The ERA considers there are a number of advantages to this approach including:

- The water corporations will be required to undertake thorough project selection and planning processes, and document these processes.
- The approach may be structured to provide certainty to the water corporations about their investment decisions (because they are able to apply to have their options and expenditure assessed prior to making the investment.
- The approach will ensure that neither the water corporations nor their customers pay for inefficient options or expenditure.
- Guidelines on how any proposed options and expenditure will be assessed under the approach could be prepared, further enhancing certainty.[640]

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[636] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 2016, p. 470.

[637] See for example, Australian Energy Regulator, *Approved – Access Arrangement for the Amadeus Gas Pipeline – 1 July 2016 to 30 June 2021*, 2016, p. 23.

[638] Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016: Final Determination*, 2016, pp. 50-52.

[639] Essential Services Commission of Victoria, *Metropolitan Melbourne Water Price Review 2013*, 2013, p. 11.

[640] A guideline for the application of the regulatory test under the *Electricity Networks Access Code* has been published by the ERA and is available at: https://www.erawa.com.au/electricity/electricity-access/guidelines/regulatory-test-guidelines.

The ERA considers that tariffs should not be adjusted during the review period for material variations in capital expenditure. This is to complement the incentive properties of setting prices over a longer review period – compensation for material variations in capital expenditure should only apply in the next review period. This is similar to the ERA's treatment of material variations in capital expenditure for gas service providers under the *National Gas Rules*. By taking this approach, variations in capital expenditure will not be depreciated until the next review period and the water corporations will not receive the full value for the *return of* and *return on* the asset.

While the water corporations will miss out on some time value of money for the *return on* and *return of* their assets, the ERA does not recommend the *Investment Adjustment Mechanism* (**IAM**) that is used for Western Power (which compensates it for this time value of money difference) be adopted. The ERA considers the IAM to be specific to regulated electricity service providers in Western Australia and is required by the Access Code. The ERA notes that the IAM that is applied to Western Power is restricted to certain categories of new facilities investment.[641, 642]

The "options test"

The water corporations should be required to demonstrate that any proposed capital expenditure satisfies an options test before committing to a major investment. The purpose of the options test is to assess whether an investment in capital assets (capital expenditure) is the best option when net benefits are considered.

Alternative options

The water corporations should be required to identify all feasible options, either individually or combined, that may provide a greater net benefit than a proposed capital investment. As part of this process, the water corporations should consider:

- how different projects could be combined;
- how operating expenditure projects could be combined with capital expenditure projects to present an alternative option; and/or
- options that, if implemented, could result in changes in customer behaviour.

The water corporations should include all options that will achieve the same (or very similar) outcome as the proposed capital investment. The net benefits of each of the options should then be assessed.

Net benefits

Net benefits are the difference between the costs and benefits of a proposed option. In calculating the net benefits of various options, the water corporations must ensure that the methodology applied to estimating costs and benefits is consistent across all alternative options.

The costs of the proposed capital expenditure and each identified alternative option should be set out. These costs will generally include:

- the costs incurred in constructing or delivering the option; and

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[641] Western Power, *Amended proposed revisions to the Access Arrangement for the Western Power Network (incorporating approved variations of 4 June 2013 and 3 April 2014)*, June 2015, p. 44.

[642] See also, Section 7.3.7 of the *Electricity Networks Access Code*.

- any operating and maintenance costs over the operating life of the option.

The estimated benefits of the proposed capital expenditure and each identified alternative option should be set out and quantified where possible so comparisons can be made.

Assessing the options test

To undertake any formal expenditure assessment, the Treasurer would need to issue a review body with terms of reference.

The water corporations would need to demonstrate to the review body's satisfaction that the proposed capital expenditure achieves the maximum net benefit after considering other feasible options. In order to do so, the water corporations would need to consider key aspects of its business, including its governance and planning processes, demand growth forecasts and project timings.

Given the recommended materiality thresholds (as set out in Table 157 above), an options test would need to be conducted prior to the water corporations committing to capital expenditure where the proposed expenditure exceeds the relevant threshold. As such, options tests would be conducted as required.

The "expenditure test"

If a proposed investment in capital assets (capital expenditure) satisfies the options test, an expenditure test should be conducted to assess whether the capital expenditure actually incurred is efficient and does not exceed an amount that would be invested by a business efficiently minimising costs.

The expenditure test could be considered during the review (inquiry) period, and as part of the water corporations' annual budgetary processes, to provide certainty to the water corporations about the investments they intend to make during the year, or at the time of the next review (inquiry) period. However, as indicated above, the ERA recommends that water tariffs are not adjusted for capital variations until the next review period to complement the incentive properties of setting tariffs over a longer period.

The overall purpose of an expenditure test is to assess whether the capital expenditure incurred (or to be incurred) by the water corporations and recovered from customers through water tariffs is efficient and provides some benefit. The test should therefore comprise an "efficiency test" and other benefit tests like the new facilities investment test, which applies to Western Power's regulated electricity network. The new facilities investment test contains:

- an efficiency test;
- an incremental revenue (or income) test;
- a net benefits test; and
- a safety and reliability (or standards) test.

For capital expenditure to satisfy the new facilities investment test, it must satisfy the efficiency test and one of the other three tests. The ERA considers the water corporations should be subject to similar requirements (these are set out in Box 8 below). The capital expenditure of the water corporations would satisfy the expenditure test if the expenditure satisfied the requirements of an efficiency test and one or more of three benefits tests – an income test, net benefits test or standards test.

Inclusion of unexpected capital expenditure in the asset base

The ERA considers that an options test and expenditure test may be used by the water corporations to gain greater certainty around their investment decisions and whether those decisions would be deemed necessary and efficient by the ERA (or another body). Therefore, the ERA recommends that any unexpected capital expenditure that satisfies such tests be included in the water corporations' asset bases at the beginning of the next review period. If unexpected capital expenditure is so large that it may affect the financial viability of the water corporations, the State Government may decide investigate the matter itself or issue the review body with a specific terms of reference to undertake an inquiry into the matter at the time it occurs.

Box 8 – Components and Requirements of an "Expenditure Test"

An expenditure test should assess whether capital expenditure incurred and recovered from customers through tariffs is efficient and provides some benefit. The test therefore should comprise an *efficiency test* and other *benefit tests*.

Efficiency Test

The efficiency test is a test of whether the capital investment does not exceed the amount that would be invested by a service provider efficiently minimising costs. The water corporations may demonstrate the efficiency of their capital investment by demonstrating:[643]

- the optimal design and construction of the capital assets, taking into account future demand and economies of scale and scope;
- consistency between the cost of construction of the capital assets and the cost of construction of similar assets by other businesses, taking into account trends in productivity improvements and underlying costs; and
- the procedure of construction planning, contracting and cost control are consistent with best practice in minimising costs.

Where the capital expenditure is assessed to be efficient, it will be included in the asset base, allowing the water corporations to earn a return on their investments. Where it is determined that the investment in capital expenditure was an efficient decision, but could have been provided at a lower cost, it is the efficient (lower) cost that is included in the asset base. The water corporations will not be able to earn a return on expenditure over and above the efficient cost.

Other Benefit Tests

- The *"income test"* a test of whether the anticipated incremental revenue from the new investment is expected to cover the capital cost of the investment. Anticipated incremental revenue can be defined as:[644]

  the present value of the increased income from tariffs reasonably expected to arise because of the increased sales arising from the new investment,

  minus

  the present value of the expected increase in non-capital costs directly attributable to the increased sales.

  If the anticipated incremental revenue is positive, then the investment satisfies the income test. The incremental revenue test should be applied such that:

[643] Economic Regulation Authority, *Issues Paper New Facilities Investment Test Application for the Replacement of Overhead Customer Service Connections Submitted by Western Power*, 2011, p. 13.

[644] Ibid, p. 14.

  - the analysis is undertaken over a period no longer than the expected economic life of the new asset; and
  - the discount rate applied is the rate of return used in determining required revenue and tariffs.
- The *"net benefit test"* is a test of whether the new capital investment provides a net benefit to customers over a reasonable period of time that justifies the approval of higher tariffs. For the net benefits test to be satisfied, the present value of benefits should exceed the present value of the cost of the investment and the change in non-capital costs attributable to the investment.[645]

  An assessment of benefits would have already been conducted as a part of the options test. However, capital expenditure may be able to satisfy the options test without having a net benefit. This is because the business may be obligated by legislation to meet certain standards, which may or may not have a net benefit, or have benefits that are difficult to calculate. For example, some environmental standards may not have quantifiable benefits, but are still imposed on the water corporations.
- The ERA considers a broader *"standards test"* is appropriate for the water corporations (rather than a safety and reliability test as applicable to Western Power under the Access Code) because of the water corporations' broader obligations on health and environmental standards.

  The "standards test" is a test of whether the new capital investment is undertaken to maintain or meet any of the standards imposed on the water corporations by government or government agencies. The test relates to the purpose of the new investment and the necessity of the investment to achieve that purpose. New capital investments that could be considered under the standards test could include, for example:
  - investment in assets required to meet higher drinking water standards imposed by the Department of Health; or
  - investment in new wastewater treatment assets (facilities) as a result of changes to environmental standards.

  Proposed capital expenditure would satisfy the standards test if the water corporations can provide evidence that they are required to address changes in standards imposed on them by governments and government agencies.

Managing material variations in operating expenditure

The ERA recommends that unexpected variations in operating expenditure are managed through annual cost pass-through applications that are submitted by the water corporations.

Cost pass-throughs allow businesses to pass on increases (or decreases) in operating costs associated with unexpected events to customers through higher (or lower) tariffs. In order to qualify as a cost pass-through event, the event should:

- be unexpected;
- be outside the control of the water corporations; and
- not be able to be managed or mitigated.

Events that the water corporations are insured for (or an efficient business would be insured for) should not be included in cost pass-throughs.

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[645] Ibid, p. 15.

The ERA administers cost pass-throughs events for gas networks, which includes only a *change in law* or a *tax change*.[646]

- A change in law is a legislative or administrative act or decision that has the effect of:
  - varying the manner in which the business provides a service;
  - imposing, removing or varying service standards; or
  - altering the scope of the service the business provides.
- A tax change is an event due to:
  - a change in the application or official interpretation of a relevant tax;
  - the removal of a relevant tax; or
  - the imposition of a relevant tax.

The ERA recommends that only efficient operating expenditure that results from a defined cost pass-through event be recovered through tariffs. The defined cost pass-through events should be restricted to an unexpected tax or law change. The cost pass-through mechanism should also be symmetrical. That is, if an unexpected tax or law change occurs that decreases operating costs, then these savings should be passed through to customers. It should be the water corporation's responsibility to notify the review body once a defined cost pass-through event has occurred.

As noted above, the ERA has recommended materiality thresholds for capital and operating expenditure variations. The materiality threshold for variations to operating expenditure should be lower than capital expenditure because it is restricted to changes in tax or law outside the control of the water corporations. Consideration was also given to ensure that the threshold was likely to be greater than the administrative cost of updating tariffs. The ERA considers the administrative cost is considerably lower for an assessment of operating expenditure variations than capital expenditure variations.

Unlike material capital expenditure variations, the cost pass-through assessments should be done during a review period. Such assessments could be done annually and as part of the water corporations' annual budgetary processes. Annual assessments would assist in keeping water tariffs more closely aligned with the true and efficient operating costs of the water corporations. Otherwise cost pass-through assessments would need to be conducted at the next review (inquiry) period, with water tariffs being set to ensure a revenue neutral outcome.

Agency roles and responsibilities

The ERA has recommended that material variations in capital expenditure be managed through an "options test" and "expenditure test" approach. The ERA considers that any adjustment to water tariffs to account for these variations occur at the next review (inquiry) period. The ERA has recommended that material variations in operating expenditure be managed through an annual cost pass-through mechanism.

The regulatory arrangements of the water industry in Western Australia do not provide for any review body to undertake water pricing assessments unless at the direction of the Treasurer. Given the current arrangements, such a review body could only undertake

[646] Goldfields Gas Pipeline, *Revised Access Arrangement. Revised by the Economic Regulation Authority*: *reprinted 21 July 2016 to incorporate corrigenda notice*, 30 June 2016, pp. 24-26.

assessments of material variations in the water corporations' expenditure if the Treasurer issues it with a terms of reference to do so. Such recommendations to the State Government would be non-binding. Such an arrangement may limit the effectiveness of any material variation assessments a review body undertakes because:

- The review body may not set water tariffs. Therefore, if the review body approves a capital or operating expenditure variation there is no guarantee this will be reflected in tariffs. Similarly, if the review body did not approve the expenditure variations, the State Government may still decide to include these expenditure variations in tariffs.
- There is little incentive for the water corporations to apply to the review body to assess expenditure variations because the review body's assessments are not binding.

Considering this, the State Government may wish to direct a review body, by terms of reference issued by the Treasurer, to undertake material variation assessments and make recommendations for the State Government to consider and implement.

Appendix 12 Efficient tariff structures

This appendix provides further background to the ERA's considerations in chapter 6.

Previous ERA recommendations on tariff structures

The ERA has previously considered tariff structures as part of its 2004, 2008 and 2012 inquires.[647] Summaries of recommendations made by the ERA are provided in Table 158.

Table 158 Final recommendations of previous ERA water inquiries

ERA Inquiry Recommendation(s)
2004 – Inquiry on Urban Water and Wastewater Pricing
Urban water – general approach • Reflecting scarcity: tariffs should be structured so that usage charges reflect the estimated LRMC of developing new water resources to meet demand. Other charges should be set at levels necessary to ensure that revenue requirements are met after taking into account revenues from usage charges. [Recommendation 9] • Short-term demand management: addressing short-term shortfalls in supply should continue to be undertaken using water restrictions rather than through pricing. [Recommendation 10] – This is because there are practical difficulties with seasonal pricing and uncertainty as to the size of its effects on demand (including due to the presence of water restrictions). • Environmental impacts: – The cost of environmental impacts is appropriately passed through to users through the imposition of regulatory requirements and standards on the water businesses, and the inclusion of the costs of meeting these requirements and standards in the cost forecasts for service provision. [Recommendation 11] – Whether the costs of water-resource management activities are recovered from users is ultimately a matter for the Government. [Recommendation 12] • Meeting social objectives: the impacts of changes in tariff structures on customers should be managed through their gradual phasing-in. Any further assistance that the Government might consider should be provided in a way that minimises efficiency losses. [Recommendation 13] – Uniform tariff policy: recommendations on tariffs are based on the premise that the uniform tariff policy would remain in place. – Concessions: as these do not affect the tariffs determined for water services, their maintenance and whether the Government provides CSO payments to compensate the water businesses is a matter of government policy. – Non-discretionary water use: charging lower tariffs for non-discretionary use is probably only partly effective in achieving its objective — the approach is inconsistent with LRMC-based usage charges and the policy would best be pursued as a CSO. – Wastewater services: GRV-based charging is an imperfect way of charging according to capacity to pay because some low-income households live in wealthy suburbs. Decoupling wastewater charges from property values makes pricing more cost reflective and removes the inequity for low-income households living in wealthy suburbs.

[647] See Economic Regulation Authority, *Inquiry on Urban Water and Wastewater Pricing*, 4 November 2005; Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009 and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013.

ERA Inquiry Recommendation(s)

Water Corporation

- For metropolitan residential customers, there should be an annual service charge ($/property) and a usage charge ($/kL). The usage charge should transition from five to two tiers over the review period.
- For metropolitan non-residential customers, there should be an annual service charge that increases across 12 tiers of increasing meter size; and a usage charge. The usage charge should transition from three to one tier over the review period. An inclining block tariff is less relevant for non-residential customers because their usage is less discretionary than residential customers'.

Aqwest

- For residential customers, there should be an annual service charge and a usage charge. The usage charge should transition from six to two tiers over the review period.
- For non-residential customers, there should be an annual service charge that increases across seven tiers of increasing meter size; and a single usage charge.

Busselton Water

- For residential customers, there should be an annual service charge and a usage charge The usage charge should transition from eight to two tiers over the review period.
- For non-residential customers, there should be an annual service charge that increases across eight tiers of increasing meter size; and a usage charge. Usage charges should transition from two tiers to a single tier.

Urban wastewater

Residential

- Tariffs for wastewater services for residential customers should be gradually decoupled from property values and determined as an inclining tariff, thus increasing transparency, while retaining, in part, the principle of charging according to capacity to pay. [Recommendation 14]
  - A four-block inclining tariff would provide for simpler and more transparent charging, but in part retain the principle of having charges based on capacity to pay (to the extent that capacity to pay is represented by property value). Initially, households should be placed in the different blocks based on the current GRV of their properties. The Water Corporation would then move each household over a four-year period to the average charge for the particular block that each household is allocated to. The GRV methodology would then not be required after the initial placement of households to their respective blocks.
  - The most cost reflective tariffs structure would be to determine usage charges on the basis of estimated interior household water use. A flat charge across all residential properties may also be more cost reflective than a GRV approach.
  - Customers generally do not have discretion as to whether to connect to wastewater services, so decisions are limited to affecting the volume of wastewater stream. Under a usage-charge approach based on estimates of indoor water consumption, households would be faced with only an indirect incentive to reduce wastewater discharge. More sophisticated mechanisms are unlikely to be practical.
  - A flat charge for wastewater services would avoid the administrative costs associated with GRV or usage-based charging.
  - Social impacts would arise in moving away from GRV-based pricing to a flat or usage-based charge. However GRV is an imperfect way of fairly allocating costs because 25 per cent of low-income households live in wealthy suburbs. It is unclear whether a usage-based charge would have less social impacts than a flat charge.

Non-Residential

- Tariffs for wastewater services for non-residential customers should incorporate a service and a usage charge. Usage charges should be set to reflect the LRMC of providing wastewater services. Service charges should be set at levels necessary to ensure that revenue requirements are met after taking into account revenues from usage charges. [Recommendation 15]

ERA Inquiry Recommendation(s)

- The annual service charge ($/fixture) should vary by number of fixtures; and there should be a single usage charge ($/kL).
- Usage charges for wastewater are appropriate when volumes discharged can be determined with reasonable accuracy; and their efficiency is enhanced because customers can alter discharges in response to tariff changes.

2005 – Inquiry into Country Water and Wastewater Pricing

Residential water

- The categories of Group A and Group B towns should be retained, based on differences in climate and household water needs. Towns should continue to be allocated to Group A and Group B in the same way as they are currently.
- The uniform pricing policy threshold should be lowered to 300 kL per household per year in Group A and 500 kL per household per year in Group B.
- Within Group A and Group B, towns should be grouped into five classes according to their direct costs of water service provision with a relatively even spread of water usage per class.
- An inclining tariff structure should be applied for each class, with usage charges:
  - for the first tier set at the Perth rates;
  - for the second tier set in relation to avoidable costs (i.e. direct operating costs plus an allowance for the estimated future capital expenditure);
  - for the third tier set in relation to direct costs (i.e. total costs less indirect overheads); and
  - for the fourth tier set in relation to total costs.
- Prices above the uniform pricing threshold should be no less than the prices that apply in Perth for equivalent amounts of water (with the implication that Group B towns will have two sub-tiers within the second tier and two sub-tiers within the third tier).
- The threshold between the second and third tiers should be set at 550 kL per household per year in Group A and at 750 kL per household per year in Group B. The threshold between the third and fourth tiers should be set at 950 kL in Group A and 1150 kL in Group B.
- For Class 5 towns, residential water prices above the uniform pricing threshold should be set at $2.50/kL in the second tier and at $5.00/kL above the second tier.
- The Government, via CSO payments, should pay the cost of the uniform pricing policy, the cost of indirect overheads for residential water usage in the second and third tiers, the indirect return on assets for residential water usage in the third tier, and the cost of the caps for residential water customers in Class 5.

Non-residential water

- Country towns into Groups A and B should be grouped in the same manner for commercial water pricing as for residential water pricing.
- In general, CSO payments should not be provided to country commercial customers, or if they are, such payments should be made transparent.
- For commercial water, either:
  - a two-block inclining tariff structure should be continued for each class, with usage charges for the first block set in relation to total direct costs (i.e. total costs less indirect overheads) and usage charges for the second block set in relation to total costs; and the threshold should be kept at 300 kL per customer per year; or
  - a single usage charge should be applied to commercial customers to recover total costs.
- Under either approach, the commercial water usage charge for Class 5 customers should be capped at $5/kL.
- Country commercial water fixed service charges should be uniform across the State.
- The flat usage charge for water for farmland customers should maintain the current water price relativity with residential customers. The fixed charge for water for farmland customers should be set at the same amount as the residential fixed charge.

ERA Inquiry Recommendation(s)

Residential wastewater

- Prices should be decoupled from property values and a flat charge (subject to a maximum) applied for each town, set in relation to either:
  - the total cost of providing the service in each town (Option A); or
  - the total cost less indirect overheads (Option B).
- The maximum flat charge for residential wastewater services should be set at the current maximum.

Non-residential wastewater

- Uniform commercial wastewater pricing should be replaced by a more cost-reflective structure once the current non-residential wastewater pricing reforms are largely completed.

2008 – Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water

Urban water – general approach

The ERA considered:

- the LRMC estimates provided by the Water Corporation;
- the LRMC of water in Bunbury and Busselton and tariff structures in those locations; and
- whether, given there are multiple options for setting usage charges without compromising economic efficiency, usage charges should be adjusted to achieve social objectives.

At the time the Government was phasing in LRMC pricing for the Water Corporation's metropolitan customers, and considering doing so for Aqwest and Busselton Water's customers.

Water Corporation

- The metropolitan residential usage charge should transition from five to three tiers over the review period.
- The metropolitan non-residential service charge should increase across twelve tiers of increasing meter size; and the usage charge should transition from three tiers to a single tier over the review period. The usage charge should be set at the second tier usage charge for residential customers. The service charge for small-use customers should be set to equal the service charge for residential customers.

Aqwest and Busselton Water

- The usage charge for residential customers, which initially increased across six tiers (for Aqwest) and eight tiers (for Busselton Water) should transition to five tiers over the review period.
- The usage charge for non-residential customers should transition from two tiers to a single tier over the review period. Usage charges should be set at the third tier usage charge for residential customers. The service charge for small-use non-residential water customers should be set at the service charge for residential customers.

Country water

The ERA's recommendations were made in the context of the Water Corporation implementing the set of reforms to country water usage charges recommended by the ERA in the previous inquiry.[648]

- The uniform pricing policy should be changed to a tariff cap policy to avoid customers in low cost country towns paying more than the cost of providing the water service. The cost of water in Perth has increased significantly — if the uniform pricing policy were to continue, residential customers in low cost areas would pay charges higher than costs.
- The threshold above which fully cost-reflective usage charges apply to country residential customers should be lowered. The threshold is set above what may be considered reasonable to meet essential water needs.

[648] These reforms were due to be phased in by 2016, though the ERA understands that some country schemes are still being phased into cost classes for non-residential customers.

ERA Inquiry Recommendation(s)

Wastewater

- Residential wastewater charges should transition over a three year period from being based on GRV to being based on an annual average service charge. A flat charge across all residential properties would be more cost reflective than tariffs based on GRV; given the technical and administrative considerations associated with usage-based charges, a flat charge should be adopted. If billing frequency increased to quarterly, this could facilitate a move to usage-based charges.
- No changes should be made to non-residential wastewater tariff structures.

Drainage

- Developers should be charged the costs of any drainage infrastructure that is required to service developments, with the developer charge based on the average costs to the Water Corporation of expanding the drainage network over the last 10 years.
- Residential and non-residential customers within the main drainage system provided by the Water Corporation in Perth should be charged the residual costs of drainage that remain after the costs attributed to developers have been deducted.
- Customers within the Water Corporation's main drainage system in Perth should be charged for drainage on the basis of land area. There is no economic rationale for using GRV — it is not cost reflective and results in a significant level of cross-subsidy from non-residential to residential customers.
- The proposed drainage charges should be introduced in 2010-11 and then held constant in real terms.
- In future, any expenditure on drainage quality should be recovered through a levy on all of the Water Corporation's water customers in the scheme.
- The Water Corporation's costs in providing drainage services in the six rural drainage districts should be passed on to local councils in a cost reflective manner. It is inequitable for the drainage costs in the six drainage districts serviced by the Water Corporation to be funded by general tax payers.

Other Water Corporation tariff structures

- Where practical, charges for minor tariffs associated with water, wastewater and drainage services should reflect the efficient costs of service.
- Non-standard charges associated with metropolitan standpipes, industrial waste discharge to sewers, and specific services relating to industrial waste are already set in a way that reflects costs and are therefore appropriate.
- Additional charges (or discounts) on delayed (or early) payments reflect the costs to the Water Corporation of delayed payment. However, the penalty rate on overdue accounts should be reduced from 13.99 per cent to no higher than 1 per cent above the nominal cost of debt in the weighted average cost of capital calculation, to reflect the cost of debt.
- Subsidies to public and charitable institutions for water and wastewater services should be either funded by a CSO or discontinued, rather than paid for by other customers.
- Residential caravan bays should be charged the standard residential service charges for water and wastewater services.
- Water usage charges for farmland, local government standpipes and stock watering should be set cost reflectively, and include a quota for residential use set at residential tariffs, with non-residential tariffs for usage above the quota.
- Small mining customers should be charged for water use at country non-residential tariffs.
- Wastewater charges for non-residential vacant land should be based on a service charge, and the additional GRV-based component removed.

ERA Inquiry Recommendation(s)
2012 – Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board
Urban Water **Water Corporation** • The existing tariff structure for metropolitan residential customers should be maintained (three usage tiers and a service charge) with the first tier set at the lower estimate of LRMC; the second tier at the central estimate; and the third tier at the upper estimate. • The existing tariff structure for metropolitan non-residential customers should be maintained (single usage charge and service charges — seven in total — dependent on the size of the meter being used). The usage charge should be set to transition to equal the second tier usage charge for residential customers. The annual service charge for small-use commercial water customers should be set to equal the annual service charge for residential customers. **Busselton Water and Aqwest water** • The existing tariff structure for residential customers should be maintained (six usage tiers — converging to five for Aqwest — and a service charge). Usage charges should be capped at the Water Corporation's highest usage charge because this reflects an upper limit of the value of water used by Aqwest and Busselton Water. • The existing tariff structure for non-residential customers should be maintained (a single usage charge and service charges — seven in total — that are dependent on the size of the meter being used). Usage charges should be set at the second tier usage charge for residential customers. The annual service charge for small-use commercial water customers should be set to equal the annual service charge for residential customers.
Wastewater • GRV-based pricing for residential customers should be replaced by a single service charge which is equal to the average annual cost of service per household. • The existing tariff structure for non-residential customers should be maintained (a service charge, which is based on the number of wastewater fixtures, and a single usage charge).
Country water and wastewater • Water and wastewater tariffs for country residential and non-residential customers should continue to be levied using the existing structure; charges should continue to be transitioned to cost-reflective levels. This transition is expected to be completed by 2016.
Drainage • GRV-based pricing for residential customers should be replaced by a single service charge that is levied on drainage customers and is based on the average annual cost of service per household. • GRV-based pricing for non-residential customers should be replaced by a series of three service charges that are levied according to land size.
Recycled Water • The ERA assessed the Water Corporation's draft Recycled Water Pricing Policy (RWPP) against the pricing principles recommended by the ERA as part of its Inquiry into Pricing of Recycled Water in Western Australia (Recycled Water Inquiry) and the guiding principles adopted by the National Water Commission. • Investigation should be undertaken into two aspects of the draft RWPP: – the possibility of the Water Corporation attaining monopoly rents by withdrawing recycled water allocations from low value customers and reallocating this water to high value customers at a later date; and – the extent of Water Corporation's price discrimination between public and private users. • The Water Corporation should be required to: – expand the use of neutral tendering mechanisms for future wastewater allocations;

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– permit customers to on-sell their water allocation where appropriate; – remove principles from its draft RWWP that result in pre-determined outcomes for price discrimination between different customer groups and instead apply commercial negotiations; and – finalise and publish its RWWP.

Source: *Economic Regulation Authority*

Current water tariff structures

This section of the appendix sets out:

- current water tariff structures; and
- analysis of the implications of the rising marginal cost case.

The current tariff structures for water are outlined in Table 159.

Table 159 Current water use tariff structures – the Water Corporation, Aqwest and Busselton Water

Customer group	Fixed charge ($/annum)	Variable charge ($/kL)
Residential		
Metropolitan	Single service charge, uniform for Water Corporation customers 50% discount for those eligible for concessions	Increases across 3 tiers: • 0-150kL • 151-500kL • >500kL 50% discount on first 150kL for those eligible for concessions
Country		Each country scheme is placed in 1 of 5 cost classes – each cost class has different $/kL charge Within cost class, $/kL increases across 4 tiers. Definition of the tiers varies by location: • 0-150kL (south), 0-350kL (north) • 151-300kL (south), 351-500kL (north) • 301-550kL (south), 501-750kL (north) • >550kL (south), >750kL (north) $/kL in first and second tiers must be no more than $/kL for equivalent metropolitan customers 50% discount on first 400kL p.a. (south), 600kL p.a. (north) for those eligible for concessions

Customer group	Fixed charge ($/annum)	Variable charge ($/kL)
Aqwest	Single charge, capped at Water Corporation service charge 50% discount for those eligible for concessions	Increases across 4 tiers: • 0-150kL • 151-350kL • 351-500kL • > 500kL Highest usage charge capped at the highest usage charge for Water Corporation metropolitan customers 50% discount on first 350kL for those eligible for concessions
Busselton Water	Single charge, capped at Water Corporation service charge 50% discount for those eligible for concessions	Increases across 6 tiers: • 0-150kL • 151-350kL • 351-500kL • 501-700kL • 701-1000 • >1000kL Highest usage charge capped at the highest usage charge for Water Corporation metropolitan customers 50% discount on first 350kL for those eligible for concessions
Non-residential[a]		
Metropolitan	Based on meter size (7 size tiers), uniform for Water Corporation customers	Single charge
Country	Based on meter size (10 size tiers), uniform for Water Corporation customers	Each country scheme is being phased-in to 1 of 15 cost classes – each cost class has a different $/kL charge Within each cost class, there is a single $/kL charge Maximum charge is capped
Aqwest	Based on meter size (7 size tiers)	Single charge
Busselton Water	Based on meter size (7 size tiers)	Single charge

Note: Charges for small use non-residential customers (20mm meter size) are set equal to residential charges.

Source: Water Corporation, *Submission to the Economic Regulation Authority,* March 2017, pp. 79 - 81.

The rising marginal cost case?

Intuitively, LRMC should be increasing as more expensive sources of supply, such as desalination, become the main marginal source option. In the 2012 inquiry, the ERA found that there had been an increase in LRMC relative to the 2009 inquiry, due to the need for

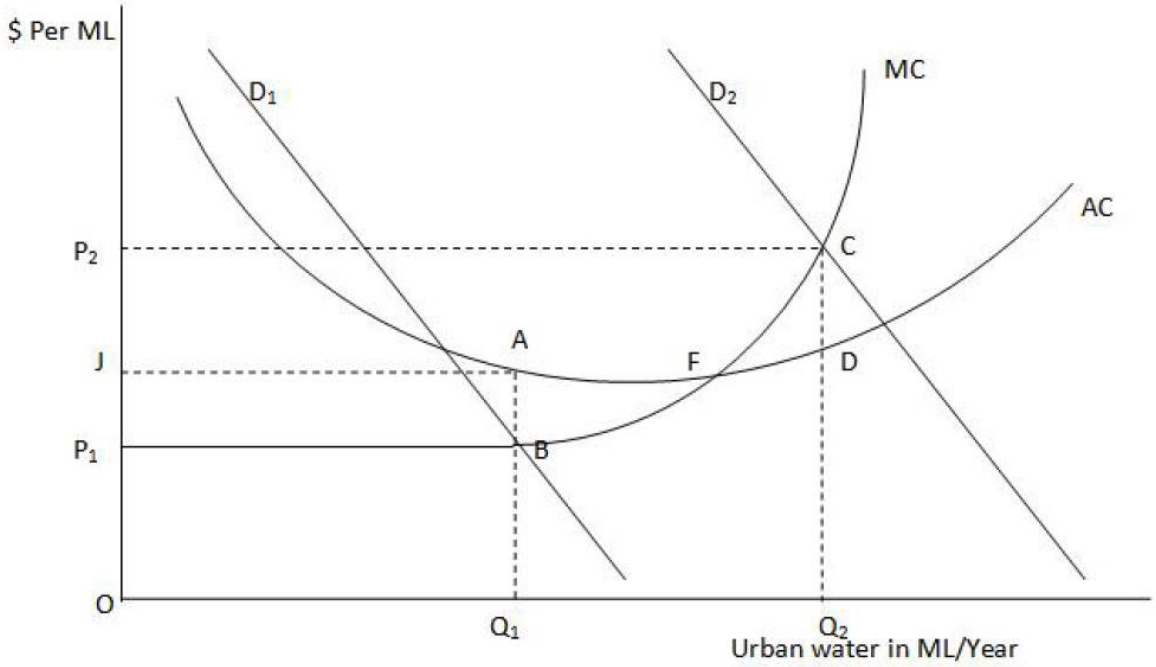
the Water Corporation to invest in desalination capacity.[649] The ERA's current analysis suggests that LRMC is likely to increase over time.

Where LRMC increases above the average cost of water supply, a single usage charge can generate sufficient revenues for the water utility to recover its efficient costs.[650] Figure 111 shows this diagrammatically. Up to point B, the marginal cost curve (marked as MC) is constant; beyond quantity B, marginal cost increases. Rising marginal cost could reflect:[651]

- increases in the opportunity value of the water in other uses;
- rising external costs (particularly due to increased wastewater costs);
- a scarcity rent for limited infrastructure capacity;
- more expensive infrastructure in more inaccessible regions; and/or
- more expensive sources of fresh water such as desalination being used to augment the water supply.

Due to 'lumpy' infrastructure capital costs, initially the average cost curve (marked as AC), is declining and well above the marginal cost curve. With further increases in water demanded and supplied, average cost starts to increase with rising marginal cost. Beyond output at F, marginal cost exceeds average cost.

Figure 111 Costs of, and demand for, urban water



Source: J. Freebairn, 'Some emerging issues in urban water supply and pricing', *Economic Papers*, Vol 27 No. 2, June 2008, p. 188.

649 Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board: Revised Final Report*, 28 March 2013, p. 69.

650 J. Freebairn, 'Some emerging issues in urban water supply and pricing', *Economic Papers*, vol. 27, No. 2, June, 2008, pp. 187-188.

651 Ibid.

At lower levels of demand (marked as D1), average cost is greater than marginal cost. Marginal cost pricing would set a usage charge at price P1. This would be efficient, but it would generate a revenue shortfall (equal to the area P1JAB). The fixed component of a two-part tariff would be set to recover the shortfall. At higher levels of demand (marked as D2), marginal cost is rising and greater than average cost. Marginal cost pricing would set a usage charge at P2. This price more than covers average costs, and so meets the criteria of revenue adequacy.[652]

There is therefore merit in continuing to monitor trends in LRMC, with a view to changing the existing water price structure if marginal cost rises above average cost.

Current wastewater tariffs

The current structures of wastewater charges are outlined in Table 160.

Table 160 Current wastewater tariff structures – the Water Corporation

Customer group	Fixed charge ($/annum)	Variable charge ($/kL)
Residential		
Metropolitan	Based on GRV multiplied by the appropriate rate in the dollar — there are two rate in the dollar tiers Minimum charge but no cap on maximum charges Vacant land charge has one rate in the dollar 50% discount for those eligible for concessions	N/A
Country	Based on GRV multiplied by the appropriate rate in the dollar — each country scheme has a different rate in the dollar Maximum charge is capped The cost base used as the target for setting tariffs is derived from total scheme costs less non-residential revenue 50% discount for those eligible for concessions	
Non-residential		
Metropolitan	Uniform State-wide, based on fixture (toilet) — 16-17 charges: • 1st fixture = $886. • 2nd fixture = $379.55 • 3rd fixture = $506.88 • 4th fixture and over = $551.20 each	Single $/kL charge No charge for first 200kL/annum Customer specific discharge factor applied to calculate volumetric charge

[652] Ibid, pp. 188-189.

	Vacant land pays GRV-based rate in the dollar charge	
Country	Same as metropolitan	Same as metropolitan

Source: Water Corporation, *Submission to the Economic Regulation Authority,* March 2017, pp. 79 - 81.

Drainage tariffs

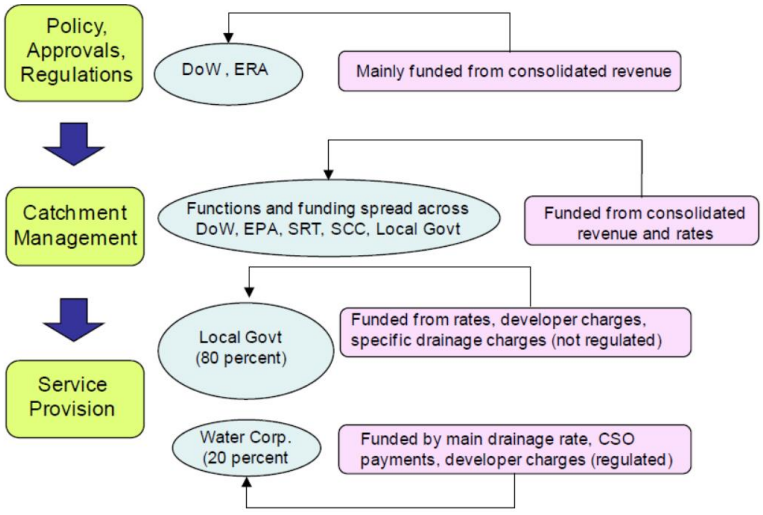
This section of the appendix provides further detail on:

- the governance arrangements for drainage services;
- the current drainage tariff structure; and
- options for drainage tariff structures considered in previous ERA inquiries.

Governance arrangements for drainage

Figure 112 sets out the current governance arrangements for drainage services in Western Australia. Broadly, main drainage services are provided by the Water Corporation in around 40 per cent of metropolitan areas and some country areas, while local drainage services are supplied by local councils.[653] Local councils also provide main drainage services in some country regions.[654]

Figure 112 Current governance of drainage in Western Australia



Source: ACIL Tasman, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 4.

The Water Corporation supplies drainage services in Declared Drainage Areas. Around 40 per cent of, or 325,000, premises in Perth are serviced by the Water Corporation's drainage infrastructure and hence pay drainage charges to the Water Corporation.[655] The Water Corporation can recommend to the Minister that an area be designated a Declared

[653] ACIL Tasman, Advice on Water Corporation's Drainage Charges, 16 February 2009, p. 5-6.

[654] Ibid.

[655] See Economic Regulation Authority, *Inquiry into Tariffs of the Water Corporation, Aqwest and Busselton Water*, 14 August 2009, p. 82 and Economic Regulation Authority, *Inquiry into the Efficient Costs and Tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, 23 March 2013, p. 13.

Drainage Area if the area contributes to the need for, or benefits from, a main drainage service. In the past, the Water Corporation typically became involved in providing main drainage services where drainage flows crossed individual local government boundaries, or where the local government requested assistance.[656] The Water Corporation also provides rural main drain services to a number of rural districts, namely: Albany, Harvey, Waroona, Roelands, Mundijong, and Busselton. As shown in Table 161, these services are entirely operating subsidy funded.[657]

Whereas main drains are the responsibility of the Water Corporation, the local drainage network is the responsibility of local government. The local drainage network, comprising road drainage and piped drains, provides the link between properties and the Water Corporation main drains, and is substantially longer than the main drain network.[658] Local government recovers the costs involved in the provision of drainage services through general rates. General rates are levied either on the basis of GRV or unimproved value. The unimproved value of the property is used for rating purposes where the land is predominately for rural purposes, and GRV where the land is predominately for non-rural purposes.[659]

Current drainage tariff structure

Table 161 sets out the current tariff structure for the Water Corporation's drainage service.

[656] ACIL Tasman, Advice on Water Corporation's Drainage Charges, 16 February 2009, p. 5-6.

[657] The reason these services are funded by a CSO payment relates to a decision by the Court Coalition government in 1993-94. ACIL Tasman, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 5-6.

[658] ACIL Tasman, Advice on Water Corporation's Drainage Charges, 16 February 2009, p. 5-6.

[659] Ibid.

Table 161 Current drainage tariff structures – the Water Corporation

Charge type		Structure of charge	
		Annual fixed charge	Usage ($/kL) charge
Residential	Metropolitan	Based on GRV multiplied by a rate in the dollar. Minimum charge but no cap on maximum charges Vacant land charge has one rate in the dollar 50% discount for those eligible for concessions	N/A
	Country	N/A — 100% funded by Operating Subsidy	N/A
Non-residential	Metropolitan	Based on GRV multiplied by a rate in the dollar. Minimum charge but no cap on maximum charges Vacant land pays GRV-based rate in the dollar charge	N/A
	Country	N/A — 100% funded by Operating Subsidy	N/A

Source: Water Corporation, *Submission to the Economic Regulation Authority*, March 2017, pp. 79 - 81.

Alternative tariff structures for drainage

Table 162 Alternative tariff structures for drainage considered by Acil Tasman, 2009

Basis charge	Efficiency	Equity, including incidence effects	Implementation
Current GRV based charge	None	Broad reflection of ability to pay. Ability to pay is less appropriate for non-residential customers. High GRV non-residential customers pay more than warranted by beneficiary pays or impactor pays considerations. The same is true for residential customers, albeit to a lesser extent. Equity would be improved by removing the differential GRV rate for non-residential customers and imposing a maximum non-residential charge.	GRV is expensive to maintain and not well understood by customers. Not using GRV provides no net saving to society as GRVs are still needed for local government. There would be some administration savings to Water Corporation.
GRV banded charge	None	Could be used to abate the bills of high GRV customers. However, the process of banding introduces significant incidence effects. Charges would lose the link to ability to pay, and would not reflect the costs imposed by customers.	Bands for GRV are unlikely to improve transparency for customers, and may introduce complaints over the cut-offs. The data required to implement it as a charging base is available.
Flat charge, current residential/non-residential split of costs	None	For residential customers, a reasonable approximation to costs imposed. Due to heterogeneity a flat charge is less appropriate for non-residential customers. No clear rationale for retaining the existing split of costs between residential and non-residential, other than minimizing residential incidence effects. Bills to average non-residential customers likely to increase.	Easy to implement. Relatively transparent.
Flat charge, land area based split of costs	None	For residential customers, a reasonable approximation to costs imposed.	Easy to implement (subject to data availability). The change in basis of cost allocation would require explanation to customers.

Basis charge	Efficiency	Equity, including incidence effects	Implementation
		Due to heterogeneity a flat charge is less appropriate for non-residential customers. Would increase the bills to residential customers, particularly for average customers. However the impact on average customers could be mitigated if the costs of providing the public benefits of drainage are funded by a separate 'public benefit' levy on all metropolitan customers.	
Land area based banded charge, current split of costs	None	Improved reflection of costs imposed by customers, particularly for non-residential customers. Would increase the bills of large land area non-residential customers significantly. Average non-residential bill likely to increase somewhat. Bills to high GRV residential and non-residential customers would be reduced. No clear rationale for retaining the existing split of costs between residential and non-residential, other than minimising residential incidence effects.	Likely to be more transparent to customers.
Land area based banded charge, land area based split of costs	None	Improved reflection of costs imposed by customers, particularly for non-residential customers. Would increase the bills of large land area non-residential customers significantly. Bills to residential customers would increase. However the charge to high residential GRV properties falls and the increase to average residential GRV properties is halved if the costs of providing the public benefits of drainage are funded by a separate 'public benefit' levy on all metropolitan customers.	Likely to be more transparent to customers. The change in basis of cost allocation would require explanation to customers.

Source: ACIL Tasman, *Advice on Water Corporation's Drainage Charges*, 16 February 2009, p. 49.

Appendix 13 Treatment of capital contributions

'Capital contributions' are those assets which have been paid for, up front, by developers, or ultimately, by end-use customers. Capital contributions primarily involve 'developer contributions' or 'developer charges'.

Developer contributions take the form of transfers of reticulation assets (often referred to as 'works handed over' or 'gifted assets') or cash payments ('developer charges').

Developer charges often recover part of the network infrastructure costs incurred to allow new developments to connect to the main water network (often referred to as 'headworks charges'), as well as charges for bringing forward new developments ahead of schedule (often referred to as 'out-of-sequence charges').

Developers will pass the majority of these costs or charges on to their customers.

Capital contributions are excluded from the RAB

It has been standard practice – since 2009 – for the ERA to exclude capital contributions in the regulatory asset base (**RAB**) used for estimating the efficient cost of service.

Prior to 2009, the ERA utilised the 'Queensland method' to account for contributed assets. The Queensland method:

- includes gifted assets and capital expenditure funded by cash contributions in the RAB, as equivalent capital expenditure, in the year the assets are contributed;
- provides for a subsequent annual return on and of those assets over their effective life, just like any other asset;
- recognises the value of the contributed assets as 'imputed' revenue in the year the assets are received;
    - this revenue deduction then exactly offsets the stream of future returns on those assets resulting from their capitalisation in the regulatory asset base, satisfying the 'NPV=0' principle.

The net present value of the Queensland method is zero, as the future stream of returns charged to tariffs exactly offsets the imputed revenue of the first year. Hence, over time, the broad set of customers do not pay for the contributed assets.

In 2009 the ERA discontinued the use of the Queensland method, in favour of excluding contributed assets from the approved capital expenditure added to the RAB. However, despite the changed treatment, the overall outcome is unchanged – the broad set of customers do not pay for the contributed assets.

The ERA elected for a changed approach on the basis that the advantages of the change outweighed the disadvantages.[660] For example, one particular benefit is reduced tariff volatility, particularly for smaller schemes. Tariff volatility might arise under the Queensland method if there was a particularly big capital contribution. The revenue would be imputed, depressing the revenue requirement that remained to be applied to tariffs. Efficient tariffs

[660] Economic Regulation Authority, *Inquiry into the Tariffs of the Water Corporation, Aqwest and Busselton Water: Final Report*, 16 September 2009, p. 118.

would then drop sharply. In the following year, to the extent that there were no further capital contributions, efficient tariffs would increase sharply back to the former level.

However, under either method, the broad customer base is not charged for the contributed assets. To do so would result in the cost of the assets being recovered twice, first from the developer/user, and second from the broad customer base.

The tax implications of capital contributions are a matter for the water corporation and the developer.

The ERA's revised method excludes contributed assets from the RAB. Despite this, there are still tax implications for the water corporations associated with the contributed assets. The tax rules interpret the contributions – whether works handed over or significant infrastructure contributions – as revenue in the year of contribution.[661] If the firm is in a tax paying position in any year, capital contributions will increase the tax payable.

Tax treatment

Contributed assets will be included by the service provider in their tax asset base, developed for calculating their tax position under the National Tax Equivalent Regime.

The result is a net tax costs for the service provider, on receipt of any capital contribution, due to the timing differences between the initial tax paid on the 'revenue' of the capital contribution, and the subsequent depreciation tax shield benefit provided over the life of the assets as the asset is depreciated in the tax asset base.

This leads to an overall tax cost in net present value terms. The calculation of the resulting total tax cost accounts for: [662]

- the initial revenue equivalent to the value of the capital contribution;
- any statutory tax depreciation benefit, which offsets the initial tax costs, giving a stream of tax cash flow benefits in later years (this is just like the Queensland method);
- any tax 'circularity' arising from the additional tax impact of any revenue received to recover the service provider's tax costs related to the contribution – for example as an additional tax 'margin' levied by the service provider on the contributor; and
- dividend imputation franking credits passed through to its shareholder associated with resulting tax payments at the corporate level.

'Circularity' arises because a developer's payment of tax costs will also be treated as revenue, which increases the value of taxable income. This in turn requires the payment of additional tax, and so on. Ultimately, at the limit, and with the netting off of the benefits arising from dividend imputation franking credits and statutory tax depreciation benefits

[661] See Australian Accounting Standards Board 2009, *Interpretation 18* 'Transfer of Assets from Customers' available at www.aasb.gov.au.

[662] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012, p. 243.

(subsequent, over time), the total tax impact is calculated to be around 25 per cent of the value of the capital contribution.[663]

The ERA has consistently rejected any call to allow the service provider to recover these tax costs, implied by capital contributions, from tariffs, rather than from the contributor, on the basis that:[664]

- capital contributions are considered to have been paid for by the user, and so are not included in the RAB;
- taxation costs relating to capital contributions should be borne by customers who make use of those assets, not by other users on the system – to include capital contributions in the taxable asset base would be inconsistent with this approach.

Given that the ERA does not account for the tax implications of contributed assets in setting efficient tariffs, it is incumbent then for the water corporations to negotiate payment, with developers, for any tax liabilities they may incur. The ERA's view is that the water corporations and the contributors are best placed to establish the commercial terms of any such contribution.

Incentives

If the broader customer base were to subsidise the developers' costs, it may establish incentives for the capital contributions to be *less than* efficient. This incentive would arise as part of the costs of any new assets would not be borne by those who benefit from them.

However, where the developers are responsible for the full (tax inclusive) costs of capital contributions, they will have greater incentive to ensure those assets cost no more than they should.

In addition, as users ultimately pay for the assets in this scenario, and given that developers' costs are generally passed on, then the competitive nature of the land development market will work to ensure the costs of the contributed assets are (productively, allocatively and dynamically) efficient.

It follows that the service provider, water customers and the broader community will benefit from the efficiency incentives that the current approach establishes.

[663] Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 5 September 2012, p. 246.

[664] Economic Regulation Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, 2012, p. 209.