WACC parameters for GAWB Price Monitoring Investigation 2015-20 – Final Report

Queensland Competition Authority

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INCENTA
ECONOMIC CONSULTING

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1. Executive Summary

The Scope of Works provided to us by the Queensland Competition Authority (QCA or the Authority), required us to develop current estimates for a number parameters for the purpose of estimating the weighted average cost of capital (WACC) for the Gladstone Area Water Board (GAWB). These parameters were: asset and levered equity beta, capital structure and credit rating, 5 year risk free rate, 10 year debt risk premium (using the Authority's econometric and 'paired bonds' approaches, as well as the estimates of corporate bond yields that the Reserve Bank of Australia (RBA) has recently commenced producing), debt raising cost and interest rate swap allowance. The Authority asked that we apply its cost of debt methodology, assume its market risk premium (6.5 per cent) and gamma (0.47) estimates, apply the Conine formula (but assess the reasonableness of continuing to apply a debt beta of 0.11) to de-lever and re-lever betas, and compare and assess the parameters proposed by GAWB against the parameters estimated based on our findings.

In February, 2015, we provided a Draft Report that estimated the WACC for GAWB with reference to a 20 day averaging period ending 12 January, 2015. This Final Report is based on the earlier report, but estimates the cost of debt for a 20 day averaging period ending 13 April, 2015.

1.1 Cost of equity

Our first principles analysis has indicated that given its regulated nature, long term contracting, and stability of operations, we would expect a relatively low asset beta for GAWB. Regulation provides GAWB with a stable long term price regime that, when combined with long term contracting, results in a stable revenue stream. Whilst it is dependent on commercial customers and particularly world alumina markets, GAWB has grown steadily over the past 10 years, suffering no disruption or declines in revenue due to the global financial crisis.

Our specific findings relating to the cost of equity were:

- Debt beta – While empirical evidence on debt beta is mixed, recent empirical findings are in the range of 0.05 to 0.10, although estimates from earlier periods in the order of 0.20 or higher exist. In the case of GAWB, the effect of continuing to apply the current debt beta value of 0.11 as opposed to the value at the lower end of the recent estimates (i.e., 0.05) is in the region of 0.01 on the equity beta,[1] which is immaterial within the context of equity beta estimation. In view of this and the fact that higher debt beta estimates were derived in earlier periods, we recommend retaining the current **0.11 debt beta** assumption.

- Asset and equity beta – We derived a sample of North America and Western European water utilities that we consider to provide a reasonable comparator group for GAWB. Individual asset betas in this group varied considerably (from 0.194 to 0.65), with averages and medians were approximating 0.40, and in the range of 0.37 to 0.39 if a potential outlier is excluded, which we would recommend rounding off to **0.40**, consistent with the value the Authority has previously applied. Applying a benchmark gearing level of 50 per cent (as we also conclude) a geared equity beta of **0.64** is indicated.

[1] This assumes that the same debt beta is used for the de-levering and re-levering steps.

- Benchmark gearing - We conclude that **50 per cent** gearing is an appropriate assumption for GAWB after reviewing the net debt of our sample of water comparators. This is slightly higher than the 45 per cent gearing of regulated UK water comparators, and above the 35 per cent to 40 per cent gearing observed for US water businesses, but below the 60 per cent gearing observed in Australian regulated energy transmission and distribution businesses. A 50 per cent benchmark gearing level for GAWB is considered prudent in view of potential disruptions to cash flows owing to drought.

1.2 Cost of debt

The Authority's standard methodology when deriving the cost of debt is to assume that regulated firms issue long term debt (10 years), but use interest rate swaps to reset the base interest component to align with the term of the regulatory period. This hedging activity results in the term of the base interest component being reduced to reflect the term of the regulatory period, albeit with certain costs incurred to give effect to the hedging.

Our specific findings relevant to applying this method are:

- Benchmark credit rating - Our analysis indicates that it is appropriate to continue to apply a benchmark **credit rating of BBB** to GAWB. We reviewed the credit rating metrics of GAWB over the next 4 years, comparing them to the metrics of regulated energy transmission and distribution businesses. We found GAWB's metrics are likely to support a BBB rating.

- 10 year debt risk premium - Based on a benchmark credit rating of BBB, and applying the Authority's cost of debt methodology, a cost of debt in the range of **4.57 per cent** to **4.83 per cent** would be estimated for GAWB, based on a 20 business day averaging period to 13 April, 2015. However, we note that the Authority places primary weight on the econometric approach, refers to the Bloomberg extrapolation as a cross-check, and places relatively little weight on the RBA methodology owing to concerns about its robustness and stability. For the current averaging period the debt risk premiums obtained using these three approaches are as follows:

  – **2.59 per cent** applying an econometric methodology that employs data for 88 bonds rated BBB, BBB+ or A- to estimate the 10 year BBB+ yield, and then adding a premium of 26 basis points to allow for the difference between a BBB and BBB+ debt risk premium (which we estimated as the average difference between the estimated BBB+ fair value curve and the BBB bond yield observations);

  – **2.71 per cent** applying a methodology that extrapolates the Bloomberg 7 year BBB yield curve to 10 years using the 'paired bonds' methodology to estimate the 10 year BBB+ yield and adds the same BBB risk premium (relative to BBB+) of 26 basis points; and

  – **2.45 per cent** based on an extrapolation of the RBA data to an effective term of 10 years, adding the same BBB risk premium (relative to BBB+) of 26 basis points.

- Interest rate swap cost – As a sub-contractor to Incenta, Advisian has estimated the current (as at 29 April, 2015) interest rate swap costs associated with applying the Authority's cost of debt methodology, finding this cost to be 10 basis points per annum.

- Debt raising transaction cost – Applying PwC's (2013) generic WACC discount rate of 10 per cent results in a debt raising transaction cost estimate of 10.8 basis points per annum.

1.3 Comparison with GAWB/Synergies proposal

Overview of the WACC

The Authority requested us to compare and assess the WACC proposed by GAWB, based on the Synergies report, against the WACC estimated based on applying the Authority's methodologies and assumptions, as well as the parameters reviewed by Incenta. Table ES.1 below displays the WACC that was submitted by GAWB based on Synergies analysis, and the alternative WACCs that would be estimated by the QCA using its own parameter estimates (i.e. risk free rate, market risk premium, gamma, debt beta, benchmark term of debt) and methodologies (i.e. Conine formula and Lally methodology for the cost of debt), and the parameters estimated by Incenta.

Table ES1: GAWB – WACC estimated by GAWB and applying QCA methodology

WACC methodologies:	Synergies /GAWB	QCA Methodology		
Date of estimate:	31 July, 2014	13 April, 2015		
DRP methodology:		Econometric	Paired Bonds	RBA
Risk free rate (10 year)	3.53%	*2.39%*	*2.39%*	*2.39%*
Risk free rate (5 year)	*2.87%*	1.92%	1.92%	1.92%
Debt Risk Premium	2.34%	2.59%	2.71%	2.45%
Debt Raising Costs	0.11%	0.11%	0.11%	0.11%
Swap costs	n.a.	0.10%	0.10%	0.10%
Debt Margin	2.45%	2.80%	2.92%	2.66%
Market Risk Premium	6.50%	6.50%	6.50%	6.50%
Asset Beta	0.40	0.40	0.40	0.40
Debt to Value	50%	50%	50%	50%
Statutory Tax Rate	30%	30%	30%	30%
Gamma	0.47	0.47	0.47	0.47
Equity Beta	0.64	0.64	0.64	0.64
Debt Beta	0.11	0.11	0.11	0.11
Effective Tax Rate	15.9%	15.9%	15.9%	15.9%
Expected Return on Equity	7.72%	6.10%	6.10%	6.10%
Expected Return on Debt	5.98%	4.72%	4.83%	4.57%
Post-Tax Nominal WACC	**6.85%**	**5.41%**	**5.47%**	**5.34%**

Source: GAWB/Synergies, QCA and Incenta analysis. The government bond rates that are in italics are not used under the method employed by the relevant party and are provided for completeness.

While GAWB/Synergies' WACC estimate of 6.85 per cent is higher than the 5.34 per cent to 5.47 per cent WACC range that would be estimated applying the QCA's methodologies and our recommended inputs, our recommendations align very closely with the GAWB/Synergy estimates. Rather, the difference in the WACC estimates is mainly due to:

- A reduction in interest rates generally between the time that GAWB's estimate was prepared and the date applied in this report (the change in the 5 and 10 year bond rates is shown in the table above for completeness).

- Synergies/GAWB using a 10 year term for the risk free rate in the CAPM and for the base interest rate in the cost of debt, compared to the QCA-standard use of a 5 year term (this implies an approximate difference of 47 basis points for the cost of equity and 37 basis points for the cost of debt).

Observations regarding the GAWB/Synergies approach to the cost of equity

Consistent with the discussion above, GAWB/Synergies have applied the same asset, debt and equity beta and market risk premium as we have, and so the difference in the cost of equity reflects the reduction in interest rates since GAWB/Synergies prepared its estimates and the Authority's preference for using a 5 year risk free rate (as opposed to the 10 year risk free rate applied by GAWB/Synergies) in the CAPM formula.

However, there were some points of disagreement between our method and that of GAWB/Synergies with respect to the estimation of the asset beta that, while not material to the result, are summarised here for completeness.

- Synergies' exclusion of comparator firms from its comparator group on the basis of low r-square is not well-recognised in financial economics.

- Synergies included some very small comparator firms, which are much more likely to have spurious beta coefficients due to illiquidity in trading, which in our analysis we excluded.[2]

- We are not in agreement with Synergies' view that GAWB has a fundamentally different systematic risk profile to other water utilities due to its higher commercial content, given the role that contracts play in smoothing revenue volatility.

- It is our belief that Synergies has obtained slightly lower beta estimates for the firms in question than ourselves, partly due to timing of the estimate, but mainly because it applied book gearing rather than market gearing to de-lever equity betas.[3]

Observations regarding the GAWB/Synergies approach to the cost of debt

As noted above, the main cause of the difference in the cost of debt estimates between Synergies and ourselves was caused by Synergies deriving the cost of debt as the cost of 10 year fixed rate debt, whereas the standard QCA approach is to assume that interest rate swaps are used to reduce the base interest cost (by the 5 to 10 year CGS spread less the credit swap allowance).

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2 For example, Italy's Acque Potabli S.P.A. has a current market capitalisation of $41 million.

3 Synergies reports the 'Average D/E' for American States Water Company as 0.7857. Bloomberg's Net Debt/Book Equity for this company was 0.7891 for the 5 years to 2013, but for the same period the average Net Debt/Market Capitalisation was 0.4328. Had we applied the book value of equity, as Synergies appears to have done, our estimate of the asset beta for American States Water would have been 0.564 instead of 0.649.

Our observations on the GAWB/Synergies approach to the cost of debt are as follows:

- Synergies expressed disagreement with the QCA's in-house cost of debt methodology, submitting that it requires UBS data, which 'is only available to UBS clients,' and 'adds considerable complexity to the process and will not be readily replicable by regulated businesses.'

  – While we agree with Synergies that it would be desirable to rely upon more easily accessible information if possible, we note that many regulated businesses and advisers have access to the UBS database given that this database has previously been endorsed by the AER and Australian Competition Tribunal.

  – However, we also note that Bloomberg now provides a wider coverage of bonds than when PwC (2013) undertook its debt methodology study (the main gap previously being with respect to floating rate bonds), with it now possible to obtain yields for virtually all of the Bloomberg and UBS bonds used in the current sample. Consequently, one modification to the QCA's method that would be possible – and, in view of Synergies' comments, worth exploring – would be to rely exclusively on the Bloomberg database for bond pricing information.

- Synergies used the RBA corporate bond yield estimates exclusively to estimate its debt risk premium; however, we have reservations about the use (or at least sole use) of these estimates.

  – In the last two months, the RBA estimates have implied a downward sloping (i.e., reducing with term) debt risk premium from 7 to 10 years, and historically has done so 13 per cent of the time. As a consequence, we believe that the RBA methodology under-estimated the debt risk premium at 31 December 2014 (which was exacerbated by applying the AER extrapolation, see below), and that this is likely due to a small number of bonds being available near the 'target date' of 10 years.

  – We agree with Synergies that the RBA data needs to be extrapolated because the average term associated with each of the yield estimates depends on the bonds available and frequently differs from the target term (the yield estimate for a 10 year term currently has an actual average term of just over 8 years). We applied the AER's preferred linear extrapolation method, whereas Synergies appeared to apply a different method (we were unable to replicate its calculations), although we doubt that this difference would be material.

  – We agree with Synergies that, since the RBA produces estimates for only the last day of each month, it can be affected by random market volatility (the reason that a 20 day averaging period is commonly used), which reduces the utility of the RBA estimates.

- Synergies does not discuss the nature of the RBA BBB curve, which is being treated as equivalent to a BBB+ curve by the AER. By applying the RBA BBB curve to GAWB, which is a benchmark BBB credit rating (and which Synergies agrees is the case), and not making an upward adjustment in the required yield for the differential between BBB+ and BBB, we consider that Synergies has under-estimated the debt risk premium for a 10 year BBB bond that is the appropriate benchmark for GAWB.

2. Background, Terms of reference and outline of report

2.1 Background

The Queensland Treasurer has directed the Authority to conduct a price monitoring investigation into GAWB's prices for the period 1 July, 2015 to 30 June, 2020.[4] The Authority was directed to complete its draft report by 28 February, 2015, and its final report by 31 May, 2015. Under the direction the Authority is required to consider GAWB's pricing model, and 'in respect of the return on capital consider the WACC applied by GAWB against the benchmark WACC.'

The Authority has engaged Incenta to assist it in developing a benchmark weighted average cost of capital (WACC) for GAWB, and to assess the WACC and underlying parameters proposed by GAWB against this benchmark WACC. In February, 2015, we provided a Draft Report that estimated the WACC for GAWB with reference to a 20 day averaging period ending 12 January, 2015. The current Final Report is based on that earlier report, but estimates the cost of debt for a 20 day averaging period ending 13 April, 2015.

2.2 Terms of Reference

The key task of our engagement is to develop current estimates of the following parameters for GAWB:

- Asset beta
- Levered equity beta
- Capital structure and credit rating
- Risk free rate for both draft and final reports
- 10 year debt risk premium for the credit rating determined above, for both draft and final reports
- Interest rate swap allowance for the credit rating determined above, for both draft and final reports

In undertaking these tasks, the Authority has asked that we:

- Assume the following parameters for calculating the WACC: market risk premium, 6.5 per cent per annum; and gamma 0.47
- Check the reasonableness of continuing to use a debt beta of 0.11 in the Conine formula for calculating the levered equity beta
- Compare and assess the parameters proposed by GAWB against the parameters estimated based on our findings.

[4] Tim Nicholls (27 February, 2014), *Gladstone Area Water Board Price Monitoring Investigation 2015-20*, Letter to Dr Malcolm Roberts, Chairman, Queensland Competition Authority.

2.3 Outline of report

The remainder of this report is organised as follows:

- Chapter 3 we undertake a first principles analysis of the systematic risk characteristics of GAWB, and undertake empirical analysis to estimate the asset and equity beta.
- In Chapter 4 we assess the benchmark gearing level of GAWB, as well as the benchmark credit rating.
- Chapter 5 provides estimates of the cost of debt parameters required to apply the Authority's cost of debt methodology.
- In Chapter 6 we compare the WACC parameters we have assessed with those proposed by Synergies on behalf of GAWB.

3. GAWB – asset, equity and debt beta

3.1 Introduction

We have been requested to undertake an estimate of the asset beta and a levered equity beta reflecting the systematic risks of GAWB. The Authority's 2005 review found that an asset beta of 0.40 was appropriate to apply to GAWB. The subsequent review in 2010 found no reason to depart from this level. We have also been asked to assess the appropriateness of the Authority continuing to apply a debt beta of 0.11.

3.2 First Principles analysis

To estimate the asset beta of GAWB, we begin with a first principles analysis along the lines that was applied in the recent investigation of the asset beta of Aurizon Network (and in the previous reviews of GAWB that have been undertaken).[5] This requires consideration of a number of key characteristics of GAWB and the markets it operates in, including:

- Nature of regulation;
- The mix of customers and their characteristics;
- Pricing flexibility;
- Duration of contracts;
- Market power;
- Growth options;
- Operating leverage; and
- Stranding risk.

3.2.1 Nature of regulation

Empirical evidence suggests that regulation tends to reduce systematic risk by buffering cash flows (this is known as the 'Peltzman buffering hypothesis'). Regulated firms are also generally exposed to less market risk than non-regulated firms, because their product/service is valuable and they typically face little competition. It is these very characteristics that are instrumental in providing the rationale for applying regulation to a firm such as GAWB.

In addition, we are of the view that regulation suppresses the impact of such beta-determining characteristics as operating leverage, and growth options relative to their potential impact on non-regulated businesses. In order for operating leverage to have a strong effect on beta, it would also need to have high earnings volatility. In any event, as discussed further below, GAWB does not have

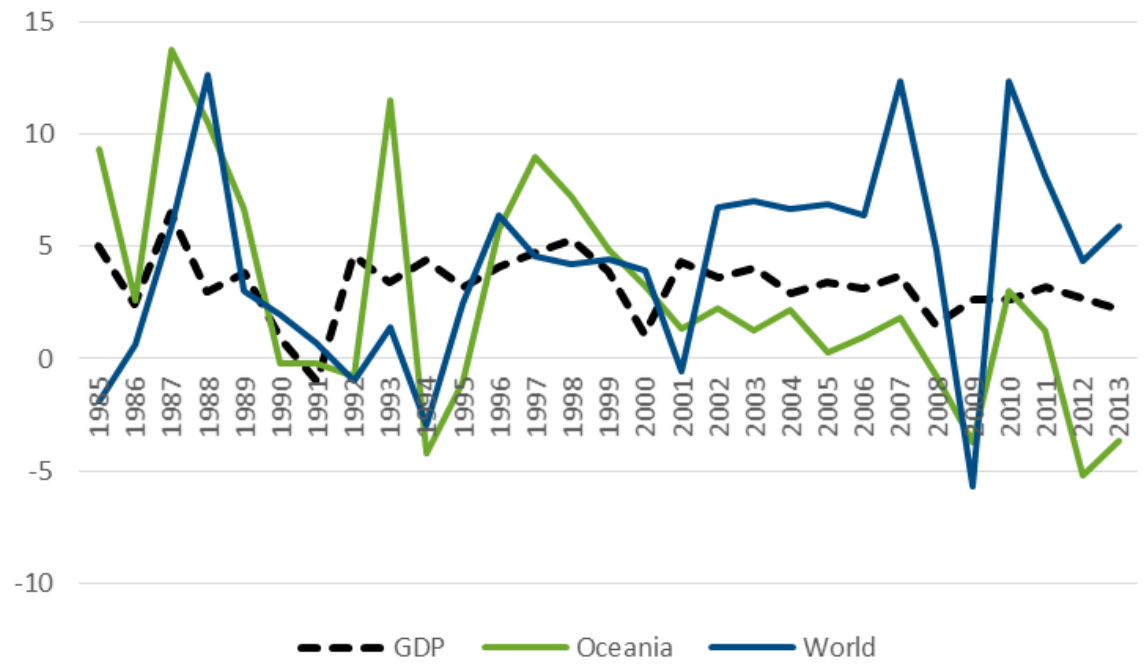
[5] Incenta (9 December, 2013), *Review of Regulatory Capital structure and Asset / Equity Beta for Aurizon Network*, Report to the Queensland Competition Authority.

high operating leverage, and any earnings volatility tends to be weather determined, and therefore is generally non-systematic.

3.2.2 The mix of customers and their characteristics

GAWB is relatively unique among regulated water utilities in Australia due to the fact that its customer base is heavily weighted to a small number of large commercial customers, with only 20 per cent of demand being accounted for by domestic and small commercial customers. The large customers that account for approximately 80 per cent of water demand are Queensland Alumina Limited (QAL), which is 80 per cent owned by Rio Tinto, CS Energy and Callide Power. Figure 3.1 below shows the growth in alumina production in Oceania and the world since 1985. The chart shows that world alumina production has exhibited a systematic relationship to Australia's GDP growth, and Oceania's production (the vast majority being Australia) was quite sensitive to GDP in the earlier part of the period. Since 2000 however, Oceania's production growth has been relatively less sensitive to GDP, and has contracted, owing to some challenging market conditions. While there were some job losses at QAL in 2012, production rebounded strongly in 2013,[6] and Rio Tinto is planning development projects that will ensure the long term viability of its two Gladstone alumina refineries.[7]

Figure 3.1: Growth in alumina production (yoy%) vs GDP



Source: Bloomberg

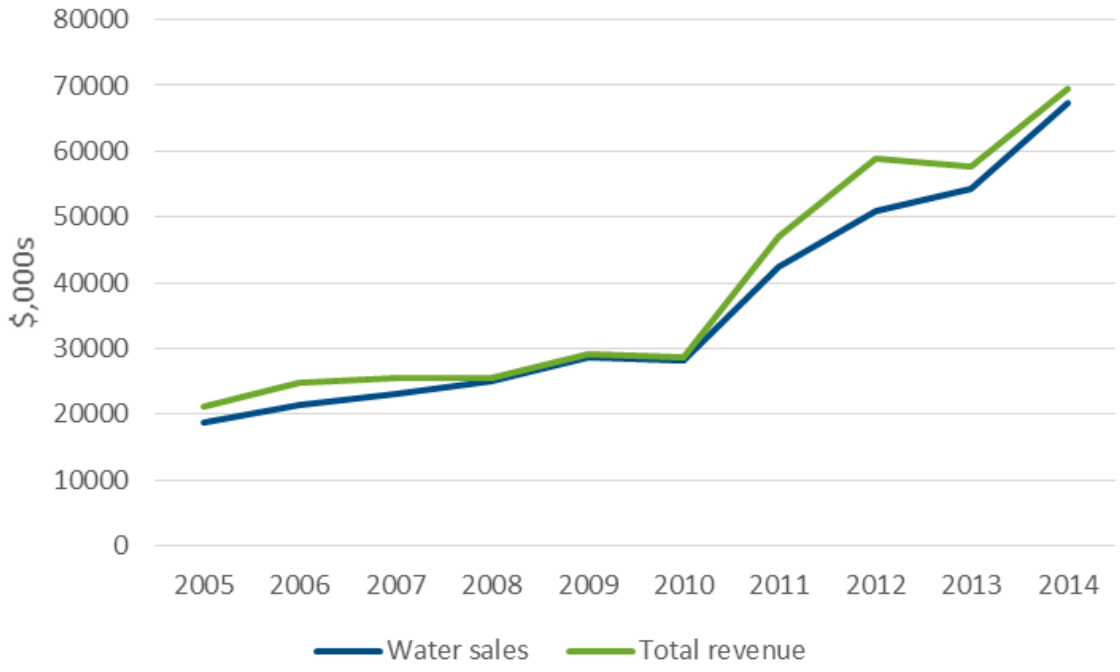
While it experiences some weather risk, such as during a drought in 2002-03 (when operating revenue declined 17 per cent), GAWB's revenue has generally increased over the last decade, as shown in

6 Alumina exports from Gladstone grew 25.1 per cent between 2011-12 and 2012-13 (Queensland Government (2013), *Trade Statistics for Queensland Ports: For the five years ending 30 June 2013*, p. 38).

7 Rio Tinto, *2012 Annual report*, p. 23.

Figure 3.2 below. It is notable that water sales growth has been relatively smooth, with an upturn after 2010. It is also important to note that GAWB's revenues continued to rise through the global financial crisis of 2008-09.

Figure 3.2: GAWB water sales and total revenue, 2005-2014



Source: GAWB annual reports

3.2.3 Pricing flexibility

While GAWB locks in its prices for a 5 year period, it has a reasonable degree of flexibility to adjust the prices of different customer groups to reflect demand conditions. In addition, as described above, there is a regulatory mechanism for smoothing the impact of demand shocks, which can be smoothed over future regulatory periods.

3.2.4 Duration of contracts

A large percentage of GAWB's commercial water is supplied through take or pay contracts. These contracts incorporate a reservation volume, which GAWB is at liberty to adjust depending on usage over the preceding two years. The default term for contracts is 20 years, with a minimum term of 5 years. Customers wanting to increase or decrease their reservation volume require GAWB approval.

3.2.5 Market power

GAWB has significant market power, as alternative water sources would be expensive and would take a considerable amount of time to implement. GAWB's market power, in the context where its prices

are regulatory monitoring in line with cost, suggests a greater stability of demand (at the regulated price), and lower stranded asset risk, which both suggest lower beta risk.[8]

3.2.6 Growth options

GAWB does benefit from step changes to the demand requirements of its major commercial customers. However, the regulatory regime provides GAWB a high degree of confidence that it will receive a commercial return on new investment. GAWB interacts with its customers and other stakeholders (including the QCA) prior to commitment.[9]

3.2.7 Operating leverage

As discussed above, operating leverage should have a relatively minor impact on the asset beta of regulated businesses as it requires earnings volatility, which is dampened by regulation. In any event, notwithstanding our views on the limited scope of operating leverage to impact the systematic risk of a regulated business, Table 3.1 below shows that relative to the group of water utilities with market capitalisation above USD200 million, GAWB has a relatively low level of operating leverage based on two measures – cash operating costs as a percentage of assets, and the inverse of the EBIT/Revenue margin.

Table 3.1: GAWB - measures of relative operating leverage

	Cash Opex/ Assets		Inverse EBIT/Rev Margin
Pennon Group PLC	22.1%	California Water Service Group	7.65
American States Water Company	20.8%	Pennon Group PLC	4.93
Severn Trent PLC	14.6%	SJW Corp	4.77
Middlesex Water Company	13.6%	American States Water Company	4.19
California Water Service Group	12.6%	Connecticut Water Service Inc	4.11
American Water Works Co.	11.0%	Middlesex Water Company	3.97
Artesian Resources Corporation	10.6%	Severn Trent PLC	3.66
Connecticut Water Service Inc	10.1%	Artesian Resources Corporation	3.37
SJW Corp	10.0%	American Water Works Co.	3.17
United Utilities Group PLC	7.2%	United Utilities Group PLC	2.63
Acqua America Inc	7.1%	Acqua America Inc	2.44
York Water Company	5.9%	GAWB	2.37
GAWB	2.3%	York Water Company	2.03

Source: Bloomberg and Incenta analysis

8 An unregulated firm with market power could be expected to raise prices close to the point where substitutes become viable and demand is price elastic. This would be likely to increase the sensitivity of cash flow to economic cycles.

9 However, there was a case during the last drought where GAWB undertook more preparatory capex work than was considered prudent by the QCA, which subsequently did not allow the expenditure of $14 million to be included in the RAB.

3.3 Summary of our first principles analysis

The key characteristics of GAWB that have informed our views on its asset beta are:

The regulatory framework aligns revenue with cost at periodic intervals and minimises revenue risk in the long run

GAWB has a regulated asset base (RAB) and is provided with a rate of return on these assets that is updated at periodic reviews in line with current market evidence, thereby limiting its exposure to cost risk and interest rate risk. The framework has provisions to smooth the impact of shocks to the forecast revenues within a regulatory period over the next four regulatory periods.

Underlying economics that imply confidence of recovery of regulated revenues

The strong underlying economics of GAWB means there is a high degree of confidence that the revenues forecasted and included in the regulatory process will be received, and that investors in a benchmark firm with GAWB's characteristics would not factor in market-based stranded asset risk. We consider that stranded asset risk is also reduced by:

- Secure long term demand for GAWB's services – The alumina and electricity generation businesses that comprise most of GAWB's commercial demand are secure, and there are new developments such as LNG that are providing additional growth opportunities.

- A high percentage of the water supply services are under long term take-or-pay contracts – Although GAWB has fewer customers, and a less diverse mix of customers than the average regulated water business, a high percentage of its commercial capacity is based on long term take-or-pay contracts.

Overall, our first principles analysis suggests that GAWB's systematic risk is likely to be similar to other regulated water businesses, with a key similarity being regulation and review at periodic intervals in line with cost. While GAWB's customer base is different, being much more highly concentrated in a small number of commercial customers, there is little evidence to suggest that this reliance results in greater systematic risk. For instance, GAWB's cash flows were highly resilient at the time of the global financial crisis (2008-09).

3.4 Debt beta

The Authority has requested that we review the reasonableness of assuming a debt beta of 0.11 in the Conine formula for calculating the levered equity beta, which it has applied in both the 2005 and 2010 reviews of GAWB's pricing. In doing so we have reviewed the Authority's initial reasoning, academic studies and other research on the topic.

The Authority's current approach

During the 2005 review a value of 0.11 was estimated by the Authority based on the mid-point of two values:

- Zero; and

- A value of 0.22 based on the then current debt risk premium divided by the then current market risk premium assumption (6 per cent).

The mid-point of these two values was taken, as it was recognised that the debt risk premium contains a default risk component. It was recognised that this was only a crude estimate of the debt beta.

Estimates of debt beta

Financial economists agree that the debt beta should be non-zero: some component of the return on debt will be subject to systematic risk. Disagreement arises over how big the debt beta is, and whether it is material enough to make a difference to estimates of the re-geared equity beta. The Australian Energy Regulator's consultants, Professor Michael McKenzie and Associate Professor Graham Partington concluded:[10]

> *While [assuming the debt beta to be zero] is a common assumption among academics and practitioners, it is nonetheless incorrect.*[11] *It is true that the volatility of the equity market is far greater than the debt market, but this does not mean the covariance is zero as this would imply the expected return on debt equals the risk free rate assuming default. Thus while it is likely that the debt beta is low, it is unlikely that it is zero.*

It should be noted that if the benchmark gearing level of the target (GAWB in this case) is the same as that of the sample of firms used to estimate the asset beta, consistently using the same debt beta to de-lever and re-lever will not affect the beta estimate relative to using a zero debt beta. However, if the benchmark gearing of the target is higher than that of the sample that the asset beta estimate was derived from there will be a small under-estimation of the re-levered equity beta. With a debt beta of 0.11, the extent of this under-estimation is likely to be in the order of 0.02 to 0.03 if the gearing of the comparator sample is in the order of 40 per cent, while the benchmark gearing of the target is 50 per cent.

Estimation of debt betas has been undertaken in one of two ways:

- Regression analysis – Under the regression analysis approach the monthly change in a debt instrument relative to the risk free rate (i.e. the monthly excess rate of return) is regressed against the monthly return on the market (i.e. the excess return on the market index). The problem with actual debt instruments is that they suffer from poor liquidity, making monthly return estimates unreliable. Hence, some researchers have relied on credit default swaps (CDS) for individual firms, which often have strong liquidity and can be used to construct a notional index (and notional rate of return). Other researchers have relied on indexes for credit rating bands, where the monthly excess rate of return can be regressed against the excess return on the market.

- Decomposition analysis – The decomposition approach derives the debt beta from the standard CAPM relationship:

$$K_d = R_f + \beta_d . MRP$$

[10] Michael McKenzie and Graham Partington (3 April, 2012), *Estimation of the equity beta (conceptual and econometric issues) for a gas regulatory process in 2012*, Report to the AER, p.10.

[11] McLaney et al (2004, p.128) report that 25 per cent of market practitioners assume a non-zero debt beta when estimating the cost of capital.

Where,

K_d is the cost of debt

R_f is the risk free rate

B_d is debt beta

MRP is the Market Risk Premium

Which is manipulated to:

$$\beta_d = \frac{Corp.debt\ spread - liquidity\ premium - prob.of\ default\ x\ (1 - recovery\ rate)}{MRP}$$

Where,

Corp. debt spread is K_d - R_f

Hence, by obtaining estimates of the corporate debt spread, liquidity premium, probability of default and recovery rate (the proportion of debt that is recovered given default), it is possible to obtain an estimate of the debt beta.

Academic estimates of debt beta

Academic estimates of debt beta are shown in Table 3.2 below, with a summary of the methodology applied. The early study by Weinstein (1987) showed a very small positive number (0.006 to 0.007), which is practically zero. However, for some time academics (Cornell and Green, Fama and French, and Brealey and Myers) derived significant estimates for debt beta in the range of 0.17 to 0.25. More recently, Schaefer and Stebulaev used a more recent sample, and achieved an estimate of only 0.04. This finding, together with other research that is summarised below, indicates that previous high debt beta levels (0.17 to 0.25) may no longer be representative of the current market.

Table 3.2: Academic estimates of debt beta

Study	Year	Debt beta estimate	Approach
Weinstein	1987	0.006 - 0.007	Regressions of investment grade / non-investment grade bonds from 1962-1974
Cornell & Green	1991	0.25	For 'high grade bonds' using monthly data for period 01/1977 to 12/1989, regressing a portfolio of bonds rated BBB or above against the S&P 500 index
Fama and French	2003	0.220	Excess returns on US corporate bonds regressed against excess returns on the US market index
Brealey & Myers	2003	0.17	Regressed Salomon Brothers' high grade long term corporate bond index (maturity > 20 years) against the S&P 500. Beta of bond portfolio in 10 years ending Dec 2000 was 0.17.
Schaefer & Stebulaev	2008	0.040	Debt beta estimated from a regression of excess returns on equity and excess returns on a 10 year Treasury bond on the corresponding excess return on the firm's corporate bonds

Sources: M.I. Weinstein (1987) A Curmudgeon's View of Junk Bonds, Journal of Portfolio Management, *Spring, pp. 76-80; Brealey & Myers (2003)*, Principles of Corporate Finance, *7th edition; Cornell & Green (1991) The investment performance of low grade bond funds; E Fama and K French, (1993), Common risk factors in the returns on stocks and bonds*, Journal of Financial Economics, *Vol. 33 (1), pp. 3-56; Stephen M. Schaefer and Ilya A. Strebulaev (2008), 'Structural models of credit risk are useful: Evidence from hedge ratios on corporate bonds*, Journal of Financial Economics, *pp1-19*.

Estimates of debt beta made in the course of regulatory processes

Other (non-academic) estimates of beta, all of which have been made in the context of regulatory processes in the UK and New Zealand, are shown in Table 3.4. The study by Europe Economics was undertaken in the context of a regulatory review for BAA. It identified a debt beta range of 0.17 to 0.23 and this finding, together with the Schaefer and Stebulaev finding of a debt beta of 0.04 and a finding of zero by Professor Stewart Myers based on the bonds of BAA, informed a decision that was made by the UK CAA to adopt a 'conservative' debt beta of 0.10 for BAA.

Based on an analysis of Australian investment grade corporate bond indices, a recent PwC (New Zealand) study found a debt beta in the range of 0.061 for AAA bonds, to 0.106 for BBB rated bonds,[12] and some more recent studies in the UK have found debt beta estimates in the range of 0.05 to 0.10.

[12] PwC New Zealand (5 April, 2012), *Transpower New Zealand Limited – Leverage and the Cost of Capital*, p. 24.

Table 3.4: Estimates of debt beta made in the course of regulatory processes

Study	Year	Debt beta estimate for BBB bonds	Approach
Europe Economics	2006	0.17 to 0.23	Estimates for BAA based on the Market Debt Premium over the Market Risk Premium (0.21 to 0.23) and regressing BAA bond returns on the FTSE All share index (0.17).
Stewart Myers	2008	0	Rolling 5 year debt beta estimates for a portfolio of BAA bonds against the FTSE All share total return index
NERA	2009	0	Index of electricity and water company bonds regressed against the FTSE All share indexed from 1963, repeated for an index of UK utilities bonds
PwC (New Zealand)	2012	0.08	Range of 0.12 to 0.143 obtained by decomposition analysis, and 0.07 to 0.09 range from regression analysis
PwC (United Kingdom)	2013	0.08 to 0.10	Regressed 5 year monthly returns on 10-15 year BBB and AAA rated benchmark indices on the FTSE ALL share index, finding 0.08 (spot) to 0.10 (5 year average) range for BBB rated bonds and 0.3 to 0.05 range respectively for AAA bonds.
Oxera (United Kingdom)	2014	0.05	Regressed different European corporate bond indices against European equity market indices for past 5 years. Found debt betas of 0.01 to 0.02 (A rating), 0.05 for BBB

Sources: Europe Economics (December, 2006), CAA's initial price control proposals for Heathrow, Gatwick and Stanstead airports, Supporting Paper XIII, pp.27-28; Stewart Myers (2008) CAA Price Control Proposals, Heathrow and Gatwick Airports; NERA (January, 2009), Cost of capital for PR09, A final Report for Water UK; PwC (New Zealand) (5 April, 2012), Transpower New Zealand Limited, Leverage and the Cost of capital; PwC (UK) (April, 2013), Estimating the cost of capital in Q6 for Heathrow, Gatwick and Stanstead, A report prepared for the Civil Aviation Authority, pp.94-95; Oxera (June, 2014), Review of the beta and gearing for UCLL and UBA services: Evidence and recommendations, Prepared for New Zealand Commerce Commission.

Thus, the more recent estimates suggest a range for the debt beta of between 0.05 and 0.10, although the earlier estimates provided some evidence that the true value may be higher (with a number of estimates in the order of 0.20 obtained).

Despite the theoretical expectation that the debt beta is non-zero, and empirical evidence that it is generally non-zero, there are relatively few precedents for its application by regulators. Apart from the QCA, Australian regulators have not adopted a debt beta. After discussing the issues, New Zealand has not adopted a debt beta,

In relation to GAWB, the effect is likely to be in the range of 0.02 to 0.03 equity beta points relative to a debt beta of zero. Even if the true level of debt beta were, say, 0.05, applying a debt beta of 0.11 to GAWB would be likely to change the equity beta by approximately 0.01. Given the large estimation errors in estimating both equity and debt betas, such a potential error is immaterial.

We recommend that the Authority remain with its current assumption of 0.11. While this is effectively at the upper end of recent estimates, it is not inconsistent with the earlier estimates. Moreover, the effect of changing the value to the midpoint of more recent estimates (i.e., 0.075) would not have a material effect on the estimated beta.

3.5 Asset and equity beta – empirical analysis

3.5.1 Selection of sample

Since Australia has no listed water utility business, we have searched for appropriate comparators internationally using the Bloomberg service. We referenced the Global Industrial Classification (GICS), and selected the 'Water Utilities' sub-sector of 'Utilities', which provided an initial sample of 114 businesses. In our previous report on the beta of Aurizon Network, we selected a sample of 7 water businesses because they were predominantly in the regulated water sector, operated in English speaking countries or Western Europe, and had a market capitalisation in excess of USD400 million. This was done in order to ensure that market conditions and regulatory arrangements were not too dissimilar from those in Australia. A market capitalisation of above USD400 million was adopted in order to reduce the likelihood of illiquidity.

Two potential sample members that were excluded were:

- United Utilities Group PLC, on grounds that it has a multitude of operations spanning water, energy and asset management; and
- Athens Water Supply, on grounds that it is not based in Western Europe, but in Greece, where a severe economic crisis has potentially distorted market data (we note that while Synergies included this business in its sample, it was excluded as it was considered an outlier).

We have also considered a wider sample of firms with market capitalisations in excess of $200 million; however, firms below that level were not considered since they are much more likely to provide non-robust beta estimates owing to such factors as illiquidity.

3.5.2 Equity beta estimates

Table 3.5 below shows the equity beta estimates that we obtained from Bloomberg for the 60 month period ending 31 December, 2014. The sample firms are arranged in order of USD market capitalisation as at 31 December, 2014. Unlike Synergies, we did not reject observations on the grounds that there was a low R-squared value (say below 0.10). In fact, the lowest R-squared values were observed for the very largest firms (above USD 5 billion in market capitalisation) and the very smallest (below $100 million in market capitalisation). The difference between the largest firms and the smallest, is that among the former there was a high degree of statistical significance (T-ratios above 2), while this was not the case for the latter group of small firms. The entire sample of firms with market capitalisation above $200 million had T-ratios greater than or equal to 2.[13] Hence, we have more confidence in the beta estimates for large firms.

[13] A T-ratio of more than approximately 2 indicates that there is a lower than 5 per cent probability that a positive beta estimate was due to chance.

Table 3.5: Estimates of equity beta (60 months to December, 2014) – sample used by Synergies

	Country	Current Market Cap USD mill	Equity Beta to 31 Dec 2014	R-square	T statistic
American Water Works Co.	US	9,672	0.237	0.064	1.992
United Utilities Group PLC	UK	9,584	0.366	0.083	2.284
Severn Trent PLC	UK	7,334	0.381	0.081	2.259
Pennon Group PLC	UK	5,555	0.41	0.11	2.676
Acqua America Inc	US	4,741	0.504	0.203	3.846
American States Water Company	US	1,465	0.754	0.212	3.945
California Water Service Group	US	1,177	0.621	0.256	4.466
Athens Water Supply	Greece	805	0.942	0.552	8.447
SJW Corp	US	650	0.836	0.307	5.074
Connecticut Water Service Inc	US	401	0.646	0.201	3.824
Middlesex Water Company	US	368	0.661	0.309	5.093
York Water Company	US	290	0.509	0.152	3.226
Artesian Resources Corporation	US	200	0.441	0.145	3.141
Consolidated Water Co Ltd	US	160	1.251	0.236	4.228
Thessaloniki Water & Sewage	Greece	116	0.69	0.406	6.294
Pure Cycle Corporation	US	95	0.71	0.03	1.336
Dee Valley Group PLC	UK	84	0.006	0	0.038
Acque Potabili SPA	Italy	41	0.612	0.147	3.164
Eaux De Royans SA	France	20	0.246	0.028	1.303
Two Rivers Water & Farming Co	US	17	0.259	0.003	0.418
Societe Dex Eaux De Douai	France	4	0.075	0.001	0.234

Source: Bloomberg and Incenta analysis

The Authority's approach, which is based on the Conine formula:

$$\beta_e = \beta_a + (\beta_a - \beta_d)(1 - T)\left(\frac{D}{E}\right)$$

In order to convert the equity beta estimates to asset betas we used the following expression:

$$\beta_a = \frac{\beta_e + \beta_d(1 - T)\left(\frac{D}{E}\right)}{\left(1 + (1 - T)\left(\frac{D}{E}\right)\right)}$$

Where,

β_e, is equity beta

β_a is asset beta

β_d is debt beta, which the Authority sets at 0.11

D is the value of net (book) debt

E is the value of market equity

T is the imputation adjusted tax rate (i.e. $T = t(1 - \gamma)$)

t is the corporate tax rate (30 per cent) and

γ is gamma, the value of distributed franking credits, which the Authority sets at 0.47

We have applied the value of net book debt because the use of a gross debt figure would distort the asset beta estimate. As Professor Aswath Damodaran notes:[14]

> *What you are doing when you use net debt is break the firm into two parts – a cash business, which is funded 100% with riskless debt, and an operating business, funded partly with risky debt.*

We note from chapter 4, however, that the average difference between gross and net debt is not very large, and would not result in a very different beta estimate in that case. It is, however, important to apply market gearing ratios, i.e. book debt (proxying the value of market debt) relative to market equity (i.e. market capitalisation). The net gearing levels that we have applied are the average net gearing over the 60 month estimation period.

In Table 3.6 we show the asset beta estimates for three sub-samples of firms, all of which have an average asset beta of approximately 0.40. The first sub-sample of 7 firms is the one that was applied in our earlier report on Aurizon Network, and for which the asset beta has risen from 0.34 to 0.421 in the last two years. On closer inspection we found that more than half of this increase has been due to American States Water Company's asset beta increasing from 0.35 at June 2013, to 0.65 by the end of 2014. The share price of American States Water Company has increased significantly during 2014, and appears to be driven by very rapid and successful growth in its infrastructure construction business (16 per cent compound annual growth for the past three years). Bloomberg reports that currently the infrastructure construction business accounts for 24 per cent of American States Water Company's revenue. Without the change in the observed beta of this one firm, the average asset betas of the three samples would range between 0.36 and 0.39.

While the individual asset betas of the firms in the sub-samples (i.e. firms with greater than USD200 million in market capitalisation) have a reasonably wide range (asset beta estimates ranging from 0.19 to 0.65), the central estimates from those samples (mean and median) are very similar. Our preferred subsample is the last – all firms with greater than USD200 million in market capitalisation excluding the firms from Greece – and our preference would also be to exclude SJW Corp (for the reasons given above). This implies an asset beta of 0.39 (mean) or 0.41 (median), which in any case we would recommend rounding to 0.40. However, the two smaller subsamples would have been consistent with the same conclusion.

We therefore recommend that the Authority adopt an asset beta of 0.40.

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[14] Aswath Damodaran (2002), *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, Wiley Finance, New York (University Edition), p.398.

Table 3.6: Estimates of asset beta (60 months to December, 2014), debt beta = 0.11

	Asset Beta to 31 Dec 2014	Incenta (2013) sample	Incenta (2013) sample plus UU	All >USD200m less Athens
American Water Works Co.	0.194	0.194	0.194	0.194
United Utilities Group PLC	0.238		0.238	0.238
Severn Trent PLC	0.259	0.259	0.259	0.259
Pennon Group PLC	0.288	0.288	0.288	0.288
Acqua America Inc	0.409	0.409	0.409	0.409
American States Water Company	0.649	0.649	0.649	0.649
California Water Service Group	0.495	0.495	0.495	0.495
Athens Water Supply	0.942			
SJW Corp	0.653	0.653	0.653	0.653
Connecticut Water Service Inc	0.479			0.479
Middlesex Water Company	0.526			0.526
York Water Company	0.441			0.441
Artesian Resources Corporation	0.345			0.345
Consolidated Water Co Ltd	1.251			
Thessaloniki Water & Sewage	0.690			
Pure Cycle Corporation	0.710			
Dee Valley Group PLC	0.047			
Acque Potabili SPA	0.375			
Eaux De Royans SA	0.246			
Two Rivers Water & Farming Co	0.197			
Societe Dex Eaux De Douai	0.075			
Average asset beta	**0.472**	**0.421**	**0.398**	**0.415**
Median asset beta	**0.409**	**0.409**	**0.348**	**0.425**
Average asset beta (excluding SJW)	**0.443**	**0.382**	**0.362**	**0.393**
Median asset beta (excluding SJW)	**0.392**	**0.348**	**0.288**	**0.409**

Source: Bloomberg and Incenta analysis

3.6 Conclusions

Our first principles analysis has indicated that given its regulated nature, long term contracting, and stability of operations, we would expect a relatively low asset beta for GAWB. Whilst it is dependent on commercial customers and particularly world alumina markets, these have provided steady growth to GAWB, which did not feel any reduction in revenue as a result of the global financial crisis.

Based on our conclusion that an asset beta of 0.40 is appropriate, our finding (in Chapter 4 below) that a benchmark gearing level of 50 per cent continues to be appropriate, and that the Authority's assumption of a debt beta of 0.11 is reasonable (within a wide range of possible debt betas), applying the Conine formula the estimated benchmark equity beta is 0.64.

4. Benchmark gearing and credit rating

4.1 Introduction

In this chapter we assess the benchmark gearing level that is appropriate to apply to GAWB. Having done so, we consider, given the assumed benchmark level of gearing, what the appropriate benchmark credit rating should be for GAWB.

4.2 Factors influencing capital structure

The 'benchmark capital structure' relates to proportions of debt and equity that are employed in financing a firm that has benchmark characteristics. It is the combination of debt and equity financing that maximises the enterprise value of the firm (i.e. the sum of the market values of debt and equity). Hence, it is the natural gearing level for firms with benchmark characteristics.

Modigliani and Miller (M&M) hypothesised that in a stylised world where debt and equity are taxed equally, there are no bankruptcy costs, and no informational asymmetries, capital structure has no influence on the value of the firm. M&M's paper has focussed attention on factors that are important in determining optimum capital structures. Within a 'classical' taxation framework debt is taxed at a lower rate than is equity, implying that enterprise value will increase with more gearing (i.e. a higher proportion of debt). The theoretical maximum increment in enterprise value (not including the costs listed below) is:

$$\Delta V = t_c \Delta D$$

Where, Δ refers to 'change', V is enterprise value, t_c is the company tax rate, and D is the quantum of debt. If the Australian dividend imputation system resulted in all imputation credits being fully utilised and valued there would be no tax-related benefit from debt finance. While empirical evidence suggests that this is not the case, the level of utilisation and valuation of imputation credits has been controversial. The additional costs associated with more debt in the capital structure are:

- *Bankruptcy costs* – More debt increases the chance of bankruptcy, as well as the probability that bankruptcy costs will be incurred. This implies that any advantage from a debt tax shelter would be offset as the proportion of debt increases.

- *Financial flexibility* - Managers are likely to prefer lower debt levels than the theoretical optimum that would maximise enterprise value in a steady state in order to maintain financial flexibility to retain debt raising capacity so that the firm can finance unforseen investment opportunities.

- *Free cash flow* – Firms that are less than optimally geared will have greater free cash flows available to finance new projects, and if the market assessment is that firms will apply the desired level of scrutiny to new investments, shareholder value will decline.

- *Market signalling* – More debt could be seen as a positive signal that shareholder value will be maximised, as it reflects management's confidence that the interest payments can be met, while maintaining dividends.

The benchmark optimal capital structure of an industry will depend on factors including the level of business risk, taxation and incentive effects, and the expected losses given default. Firms that experience more volatile operating cash flows would generally be expected to carry less debt.

4.3 Benchmark gearing

In previous price reviews the Authority has applied a benchmark gearing level of 50 per cent. In Table 4.1 we show the gearing levels observed for the sample firms identified in Chapter 3. For net debt to enterprise value we find a gearing level of 35 per cent to 38 per cent. However, when this is split by country (US and UK firms) we find that while the gearing level was approximately 35 per cent for US firms, it was approximately 45 per cent for UK firms. Australian regulated energy distribution businesses are geared at approximately 60 per cent, however, they have a smaller component of commercial customers and are less susceptible to weather risk. We consider that 50 per cent benchmark gearing is a prudent level of gearing for GAWB. It is approximately the same as the UK regulated water businesses, and less than Australian regulated energy transmission and distribution businesses.

Table 4.1: Benchmark gearing – net debt to enterprise value (5 year average to December 2014)

	Country	Market Cap	Net Debt	Gearing D/(D + E)	Incenta (2013) sample	Incenta (2013) sample plus UU	All >USD200m less Athens	All US	All UK
American Water Works Co.	US	6756.7	5693.1	45.7%	45.7%	45.7%	45.7%	45.7%	
United Utilities Group PLC	UK	4920.1	5729.0	53.8%		53.8%	53.8%		53.8%
Severn Trent PLC	UK	4072.5	4285.7	51.3%	51.3%	51.3%	51.3%		51.3%
Acqua America Inc	US	3722.8	1362.0	26.8%	26.8%	26.8%	26.8%	45.7%	
Pennon Group PLC	UK	2487.2	866.3	25.8%	25.8%	25.8%	25.8%		25.8%
American States Water Company	US	959.0	312.8	24.6%	24.6%	24.6%	24.6%	45.7%	
California Water Service Group	US	917.5	483.6	34.5%	34.5%	34.5%	34.5%	53.8%	
Athens Water Supply	Greece	575.1	0.0	0.0%					
SJW Corp	US	535.5	342.8	39.0%			39.0%	39.0%	
Connecticut Water Service Inc	US	317.9	152.3	32.4%			32.4%	32.4%	
Middlesex Water Company	US	317.4	154.4	32.7%			32.7%	32.7%	
York Water Company	US	246.4	80.6	24.7%			24.7%	24.7%	
Artesian Resources Corporation	US	180.2	122.6	40.5%			40.5%	40.5%	
Consolidated Water Co Ltd	US	146.6	0.0	0.0%				0.0%	
Thessaloniki Water & Sewage	Greece	153.0	0.0	0.0%					
Pure Cycle Corporation	US	99.2	0.0	0.0%				0.0%	
Dee Valley Group PLC	UK	60.3	45.1	42.8%					51.4%
Acque Potabili SPA	Italy	40.2	35.9	47.2%					
Eaux De Royans SA	France	18.6	0.0	0.0%					
Two Rivers Water & Farming Co	US	17.3	12.3	41.5%				41.5%	
Societe Dex Eaux De Douai	France	0.1	0.1	50.0%					
Average gearing				**29.2%**	**34.8%**	**37.5%**	**36.0%**	**33.5%**	**45.6%**
Median gearing				**32.7%**	**30.7%**	**34.5%**	**33.6%**	**39.8%**	**51.3%**

Source: Bloomberg and Incenta analysis

4.4 Benchmark credit rating

In previous reviews of GAWB's pricing the Authority has assumed a BBB benchmark credit rating. Credit ratings are based on a number of credit metrics and other indicators of credit risk. Credit rating agencies emphasise that credit metrics account for less than half of the total score of risk factors. According to Moody's, a stable and predictable regulatory environment accounts for 15 per cent of the score.[15] However, we do not have access to how these factors are scored for comparable firms, and therefore must rely mainly on credit metrics. The two most important credit rating metrics that are applied by credit rating agencies are:

Funds from Operations (FFO) /interest coverage,

$$= \frac{FFO \ + \ Interest\ paid}{Interest\ paid}$$

And,

Funds from Operations (FFO) /total net debt,

$$= \frac{FFO}{Short\ term\ debt + Long\ term\ debt - cash\ and\ cash\ equivalents}$$

Where,

FFO Earnings Before Interest, Tax and Depreciation (EBITDA) less interest less taxes paid

The approximate metrics of GAWB that are forecast for the next four years are shown in Table 4.2 below.

Table 4.2: GAWB – Credit metrics forecast (2015/16 to 2018/19)

	2015/16	2016/17	2017/18	2018/19	Average
GAWB proposal					
- actual forecast debt, 6.6% cost of debt :					
FFO/Interest cover	2.47	2.58	2.74	2.95	2.68
FFO/Debt	9.6%	10.5%	11.8%	13.7%	11.4%
GAWB proposal					
- benchmark debt, 5.98% cost of debt :					
FFO/Interest cover	2.26	2.28	2.33	2.38	2.31
FFO/Debt	7.5%	7.7%	8.0%	8.3%	7.9%
GAWB revised WACC (5.4%):					
- benchmark debt, benchmark 4.5% cost of debt :					
FFO/Interest cover	2.66	2.70	2.77	2.83	2.74
FFO/Debt	7.5%	7.7%	8.0%	8.2%	7.8%

Source: GAWB proposal and Incenta analysis

[15] Moody's (August, 2009), *Rating Methodology – Regulated Electric and Gas Networks.*

Comparators for GAWB could include regulated Australian energy network service providers (NSPs). In a recent analysis of these ratings by Kanangra Ratings Advisory Services (Kanangra) the range of observed ratings in 2012 were mapped to their credit metrics as shown in Table 4.3 below. Since these metrics relate to 60 per cent geared businesses, we expect that they somewhat overstate the metrics required to satisfy these credit ratings with 50 per cent gearing. The GAWB proposal relies on Moody's and for a BBB credit rating posits an FFO/Interest cover in the range of 1.7x to 2.5x, and for FFO/Debt, a range of 6 per cent to 10 per cent.

Table 4.3: Summarised financial metric limits from Standard & Poor's for a regulated energy business risk

Credit rating	FFO Interest Cover	FFO/Debt
A-	3.0 - 3.5x	15% -16%
BBB+	2.5 - 3.0x	12% -15%
BBB	1.9 - 2.5x	8% - 11%
BBB-	1.7 - 1.9x	5% - 8%

Source: Kanangra (June, 2013), p. 19, based on various Standard & Poor's credit rating reports for energy NSPs.

Based on the criteria set out above, and forecast FFO Interest cover and FFO/Debt values shown in Table 4.3, we conclude that GAWB would most likely be rated BBB:

- GAWB proposal - The GAWB proposal contains credit metrics that are based on its own budget forecast, which uses actual debt and embedded interest cost assumptions. This results in credit metrics that on average (FFO Interest cover of 2.68 and FFO/Debt of 11.4 per cent) are on the border of a BBB+ credit rating.

- GAWB proposal with benchmark debt and cost of debt of 6.6 per cent – Adjusting the GAWB proposal using benchmark debt (50 per cent of RAB) and the benchmark GAWB/Synergies cost of debt assumption (5.98 per cent) results in credit metrics that are weaker. These revised metrics (FFO Interest cover of 2.31 and FFO/Debt of 7.9 per cent) are comfortably within the BBB credit rating band, particularly on the Moody's metrics referred to by GAWB.

- GAWB with benchmark debt, and cost of debt of 4.5 per cent and revised WACC of 5.4 per cent – This is the full regulatory scenario, with benchmark gearing, cost of debt and WACC that are lower than the GAWB proposal WACC (i.e. the WACC of approximately 5.4 per cent that we have calculated using the QCA's methodology and current inputs), and therefore results in lower cash flows. The FFO Interest cover metric (i.e. FFO Interest cover of 2.74) is within the BBB+ credit rating band for both the Moody's and Standard & Poor's metrics. However, with these assumptions GAWB lies within the BBB credit rating band for both Moody's and Standard & Poor's on the FFO/Debt metric (i.e. 7.8 per cent). In a relatively low interest rate environment a credit rating agency will place much more emphasis on the FFO/Debt metric than the FFO Interest cover metric. On this basis we conclude that there is no compelling reason to depart from the benchmark BBB credit rating that has been applied in previous reviews of GAWB.

4.5 Conclusions

We consider there is no compelling evidence to move away from the previously adopted benchmark gearing level of 50 per cent, nor from the previously adopted benchmark BBB credit rating.

5. Cost of debt estimates

5.1 Introduction

The Authority has previously adopted a methodology for determining the efficient term of the risk-free rate and the debt premium based on the advice of Dr Martin Lally,[16] which can be described as follows:[17]

- A firm will issue debt with a term that is consistent with prudent financial management, and incur transaction costs in doing so.
- If the regulatory WACC is reset at the spot rate at the time of a price review, a rational regulated entity would incur swap transaction costs to use interest rate swaps to convert the base interest rate element of its cost of debt from the raw term, to a term matching the length of the regulatory period, as this would ordinarily reduce its cost of debt.
- If the market for credit default swaps is sufficiently deep, a rational regulated entity would incur transaction costs to use derivative instruments to convert the margin component of its cost of debt from the raw term to the term matching the length of the regulatory period.
- A regulatory allowance for the cost of debt would therefore need to include compensation for the transaction costs incurred.

According to Lally, if the credit default swaps are not available in sufficient quantities, the efficient cost of debt under this method is a debt risk premium consistent with the prudent term of debt issuance, plus a base interest rate that is consistent with the term of the regulatory period, plus an allowance for two sets of transaction costs (debt issuance costs and the cost of entering into interest rate swaps). As the Authority has requested us to provide the inputs necessary to apply Lally's methodology we note that this requires estimates for:

- The prudent term of debt issuance – which the Authority has specified as 10 years;
- As credit default swaps are not available to convert GAWB's debt risk premium into one that matches the term of the regulatory period, we require an estimate of the debt risk premium for debt with term at issuance of 10 years;
- The transaction cost associated with issuing corporate bonds, and
- The transaction cost associated with entering into interest rate swap contracts.

16 Recent decisions in this set include: QCA (May, 2012), *Final Report: Sun Water Irrigation Price Review – 2012-17*; and QCA (April, 2013), *Seqwater Irrigation Price Review*.

17 Lally, M. (27 April, 2010), *The appropriate term for the risk free rate and the debt margin.*

5.2 Estimating the benchmark debt margin

The Authority engaged PricewaterhouseCoopers (PwC) to develop a cost of debt estimation methodology to estimate the debt risk premium and associated transaction costs.[18] Subsequently, the Authority recommended adoption of the PwC methodology, and we have been requested by the Authority to follow that approach, and to also obtain a debt risk premium estimate based on the methodology applied by the Reserve Bank of Australia (RBA).

5.3 Econometric estimated fair value curve

Following the Authority's methodology, we have derived an estimate of the debt risk premium based on an econometric approach. The debt risk premium was calculated based on a 10 year Commonwealth bond yield of 2.39 per cent (239 basis points) for the 20 business day averaging period up to and including 13 April, 2015.

We assembled a sample of fixed and floating rate Australian corporate bonds with remaining terms to maturity in excess of 1 year that were rated by Standard & Poor's, Fitch or Moody's in the BBB, BBB+ and A- credit rating categories.[19] If possible we calculated the average of the yield estimates reported by the Bloomberg and UBS services. There were 90 bonds in the sample, but we excluded two of these on the grounds that they were Special Purpose Vehicle (SPV) bonds issued in the course of Private Public Partnerships (PPPs) and were more akin to financial mechanisms than to the bonds of operating companies (following the PwC methodology we excluded finance company bonds). This left a final sample of 88 bonds.

We applied a linear functional form in the regression, as recommended by PwC, which had undertaken tests of the functional form that provided the best fit with Australian corporate bond data. The spread of bonds was only marginally weighted toward A-:

- 34 bonds were BBB rated (39 per cent of the total)
- 17 bonds were BBB+ rated (19 per cent of the total)
- 37 bonds were A- rated (42 per cent of the total)

Our findings are displayed in Table 5.1 below.[20] The sample of 88 bonds implied a 10 year BBB+ debt risk premium of 233 basis points, however, we required an estimate of the 10 year BBB risk premium. To undertake this additional step we applied the same approach that was used by PwC to estimate a 10 year debt risk premium for the South East Queensland distribution-retail water and wastewater entities.[21] PwC calculated the average difference between the BBB bonds in its sample and the econometric fair value curve estimated from the sample of BBB, BBB+ and A- rated bonds, and added this to the BBB+ curve to estimate the BBB curve. PwC estimated this differential to be 38 basis points in the 20 days to 22 January, 2013. We found the BBB premium (over BBB+) to be 26

18 PwC (June, 2013), *A cost of debt methodology for businesses regulated by the Queensland Competition Authority.*

19 Eight bonds out of the full sample of 90 were rated only by Fitch or Moody's. These were mainly BBB rated and included an Envestra bond and bonds of two Special Purpose Vehicles.

20 In the previous report we

21 PwC (4 February, 2013), *Queensland Competition Authority: Cost of Debt for SEQ distribution-retail water and wastewater entities.*

basis points, which when added to the 10 year BBB debt risk premium of 233 basis points, results in a debt risk premium of 259 basis points for a 10 year BBB rated bond.

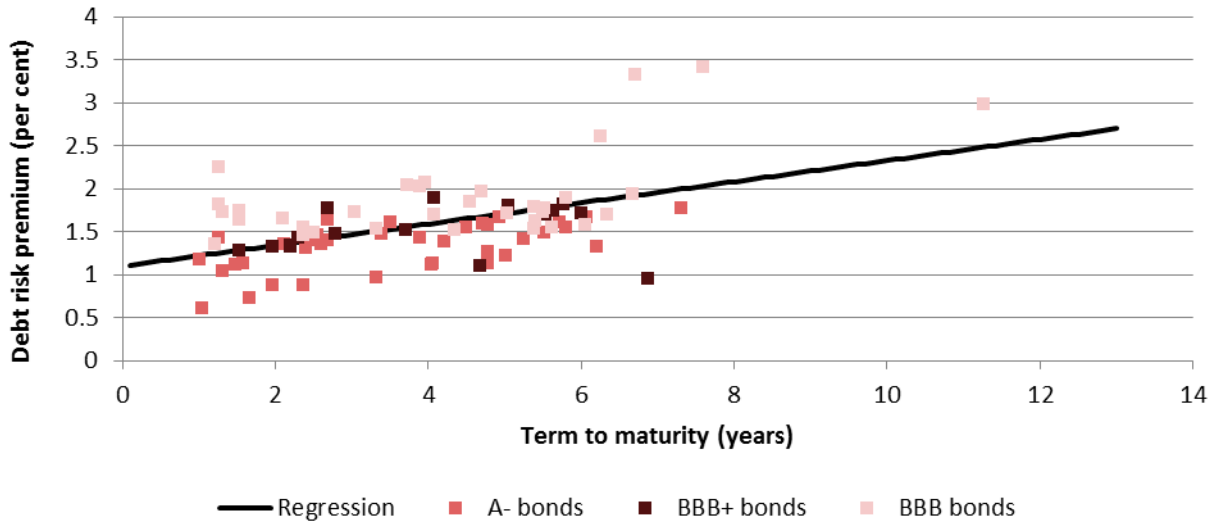
Table 5.1: Regression results, debt risk premium (basis points) - 20 days to 13 April, 2015

Sample	Obs	Intercept	T-stat	Term Coeff	T-stat	Adj R^2	10 year DRP BBB+	BBB premium	10 year DRP BBB
Full sample excluding SPVs	88	1.097	11.539	0.123	5.697	0.266	233	26	259

Source: Bloomberg, UBS and Incenta analysis

Figure 5.1 shows the regression line obtained using the final sample of 88 bonds. This scatter shows that the estimated regression line (using bonds from the BBB, BBB+ and A- credit rating bands) provides a relatively good fit for the BBB+ rated bonds.

Figure 5.1: Regression of debt risk premium using primary sample of 83 bonds - 20 days to 13 April, 2015



Source: Bloomberg, UBS and Incenta analysis

5.4 Bloomberg fair value curve with a 'paired' bonds' extrapolation

Bloomberg has recently been developing a new methodology to estimate fair value yields for Australian corporate bonds, which will provide 10 year yield estimates for the BBB+ and BBB credit rating bands. The new Bloomberg estimates became available from 14 April, 2015. However, the new approach did not provide data for a 20 day averaging period in time for this report, and we have therefore applied the previous Bloomberg methodology, and have applied the extrapolation methodology recommended by the PwC (2013) report, which is to extrapolate the 7 year Bloomberg debt risk premium to 10 years using the 'paired bonds' methodology. This approach was recommended on grounds that the change in the debt risk premium for "pairs" of bonds issued by the same company will hold constant a host of factors that determine the debt risk premium for individual bonds, and vary only one factor, which is term. The methodology had been applied in several

decisions in 2013 by the AER, and was also relied upon by the Authority in its South East Queensland irrigation price review.[22]

The paired bonds methodology does not require as many observations as the econometric methodology since the only factor that is changing is term, and the 'statistical noise' that is present in regression analysis is eliminated. However, in the 20 day period to 13 April, 2015, there was only one pair of bonds with the appropriate terms to maturity and rated BBB, BBB+ or A-, namely DBCT, which is rated BBB by Standard and Poor's, with the two bonds having terms to maturity of 6.3 and 11.3 years.

We therefore widened the search for other bond pairs by looking for higher rated bonds, and found two candidate pairs:

- ARTC, which is rated Aa2 by Moody's (but not rated by Standard & Poor's), and the two bonds have terms to maturity of 4.7 and 9.8 years; and
- Australia Post, which is rated AA- by Standard & Poor's, and the two bonds have terms to maturity of 5.7 and 8.7 years.

The results are summarised in Table 5.2 below. The implied basis points per annum rise observed for these bonds (3.0 basis points to 7.2 basis points) is in the order of magnitude observed for many other bond pairs analyses conducted during the past two years. As expected, the 3.0 basis point to 4.1 basis point annual rise observed for the higher rated ARTC and Australia Post bond pairs is lower than for the lower rated DBCT bond pair, and is supportive of the 7.2 basis points observed for DBCT.

For the 20 day averaging period to 13 April, 2015, applying the DBCT bond pair, and the 26 basis point BBB premium obtained relative to the BBB+ debt risk premiums estimated using regression analysis, the Bloomberg 10 year BBB debt risk premium was **271 basis points**. However, we note that a sensitivity undertaken using the average of all three bond pairs resulted in a 10 year BBB debt risk premium of 264 basis points.[23]

Table 5.2: Debt risk premium estimates applying the 'paired bonds' methodology - 20 days to 13 April, 2015 (basis points)

		Term to maturity (years)		Debt Risk Premium		Implied basis	Implied
Bond issuer	Credit rating	First bond	Second bond	First bond	Second bond	points per annum	bppa
DBCT	BBB	6.3	11.3	263	298	7.2	7.2
ARTC	Aa2 (Moody's)	4.7	9.8	126	147	4.1	
Australia Post	AA-	5.7	8.7	107	116	3.0	
Average							7.2
3 times average							21
Bloomberg 7 year DRP							223
Extrapolated 10 year BBB+ DRP							244
Plus BBB premium							26
Extrapolated 10 year BBB DRP							**271**

Source: Bloomberg, UBS and Incenta analysis

22 QCA (April, 2013).

23 Using all three bond pairs might be expected to under-estimate the debt risk premium given that this gives equal weighting to two AA- credit rated pairs and the single BBB pair.

5.5 Reserve Bank of Australia methodology

Since December 2013, the Reserve Bank of Australia (RBA) has published a series of Australian corporate credit spreads for the BBB and A credit rating bands (which are available on a monthly basis since January 2005). The methodology was described in the December Quarter issue of the RBA's *Bulletin* magazine.[24] The RBA applies a Gaussian kernel weighting methodology, which gives more weight to the yields of bonds that are closest to the target term. However, one problem with this method is that it produces estimates of the cost of debt for a 10-year tenor that are downwardly biased. As noted by the RBA:[25]

> *Overall, the Gaussian kernel method produces weighted average tenors that are very close to each of the target tenors (Graph 11). . . . The exception is the 10-year tenor where the effective tenor is closer to 9 years. This reflects the dearth of issuance of bonds with tenors of 10 years or more. Notwithstanding the slightly shorter effective tenor for the 10-year point, the estimates of the 10-year spread from the Gaussian kernel are distinct from the estimates of the 9-year spread as the two are estimated by applying different weights to the bonds in the sample.*

The Australian Energy Regulator (AER) has adopted the RBA methodology, and having recognised this under-estimation problem, engaged Associate Professor Martin Lally to advise on the appropriate extrapolation methodology.[26] Lally noted that both the 10 year and 7 year BBB yields are under-estimated relative to a 10 year term benchmark, and the effective term at 10 years is generally in the order of close to 9 years. It was recommended that a linear extrapolation of the debt risk premium component of the cost of debt be undertaken based on the effective tenors of both the 'seven' and 'ten' year values.

We applied Lally's extrapolation equation to the RBA data at 31 March, 2015, which was the closest date available to 13 April, 2015, and lay in the middle of the 20 day averaging period. Applying this equation as shown in Appendix A, resulted in an extrapolated 10 year RBA BBB yield of 4.52 per cent, which is lower than the 4.57 per cent yield shown in the RBA's Table 3F due to the fact that the 7 to 10 year debt risk premium was negative in March, 2015.[27] The extrapolated annualised RBA yield estimate at 31 March, 2015, is 4.57 per cent, which implies a 10 year BBB yield estimate of 4.83 per cent, and a 10 year debt risk premium estimate of **245 basis points**. A downward sloping RBA estimated debt risk premium has occurred in approximately 19 per cent of the months since 2005. We consider that this result is anomalous, as there is no reason to expect the debt risk premium to be negative over that term. For example, it runs counter to the observation of positive debt risk premiums in each of the three paired bonds that we have examined, and suggests that the RBA methodology can be inaccurate at longer terms to maturity.

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24 Ivailo Arsov, Matthew Brooks and Mitch Kosev (December Quarter, 2013), 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, pp. 15-26.

25 Ivailo Arsov, Matthew Brooks and Mitch Kosev (December Quarter, 2013), p.23.

26 Lally, Martin (20 November, 2014), *Implementation issues for the cost of debt*, Capital Financial Consultants Ltd.

27 These are yields before annualisation.

5.6 Debt issuing transaction cost allowance

Prior to adopting its most recent policy, the Authority applied a fixed debt issuing transaction cost allowance of 12.5 basis points. More recently the Authority has adopted an approach that is based on a benchmarking analysis of debt issuing transaction costs undertaken by PwC.[28] There are two major components to this cost:

- Arrangement/placement fees are paid to investment banks to compensate for their management services during the debt-raising process. PwC found these fees to be 8.5 basis points per annum based on data for Australian corporate bond issues in the US (where the required data are available from prospectuses) assuming annualisation using a 10 per cent generic cost of capital; and

- Other costs associated with the debt-raising process, including items such as lawyers' fees and credit rating agency fees, which PwC obtained through interviews with legal firms, banks and credit rating agencies.

The methodology estimates the benchmark debt issuance cost based on the number of standard sized (benchmarked) bond issues that would be required to re-finance the current debt component of the Regulated Asset Base (RAB). PwC found the standard size of bond issue to be $250 million, which implies that only one standard sized debt issue would be required to re-finance $243 million in debt (i.e. 50 per cent of GAWB's RAB of approximately $486 million). Based on the benchmark values reported by PwC, GAWB's benchmark debt issuance transaction cost is 10.8 basis points per annum. This is the same value that was proposed by Synergies, whose approach in this respect is therefore consistent with that of the QCA.

5.7 Interest rate swap transaction cost allowance

Advisian (formerly Evans & Peck) was engaged as a sub-contractor by Incenta in order to estimate the swap transaction costs necessary in order to swap the base interest rate component of a BBB rated fixed rate 10 year bond yield into a 5 year fixed rate yield. Advisian (as Evans & Peck) has previously undertaken similar assignments as a sub-contractor to Incenta in relation to Aurizon Network, and directly for the Authority in relation to the South East Queensland water and waste water businesses.[29] In the case of Aurizon Network, Evans & Peck obtained a market quotation of 11.3 basis points to undertake the required swap transactions

5.7.1 Assumptions

The following assumptions were made by Advisian for a hypothetical entity:

- On the debt side the benchmark entity funds itself with an average of 10 year fixed rate bonds.

- The regulatory period is 5 years.

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28 PwC (2013),

29 See Incenta (November, 2013), Aurizon Network: Review of benchmark credit rating and cost of debt; and Evans & Peck (4 February, 2013), *Queensland Competition Authority: SEQ Retail Water Price Review.*

- The RAB is approximately $500 million, representing the geared financing, and remains constant over the periods under assessment.
- The benchmark credit rating is consistent at BBB over time.
- The Debt to Debt plus Equity ratio is 50 per cent and remains fixed over time.
- Swaps were priced as if contracted at 10am on Wednesday, 29 April, 2015.

5.7.2 Mechanism

For each hypothetical swap, the hypothetical execution and risk spreads were obtained from a bank active in this market. The swap was assumed to be to BBSW (mid-market swap rate). The swap from 10 year fixed to 10 year floating was obtained – as well as the spread breakdown for the hypothetical entity. Next, the spread from floating to 5 year fixed was derived, as well as the spread breakdown.

The 'execution spread' estimates buffer a bank would charge in order to cover itself for fluctuations in the market while the back-to-back transactions are placed. These circumstances might require the bank to incur unforeseen costs. Essentially, it is a 'risk spread' estimate of the charge that a bank applies to cover itself for the risk of the counterparties defaulting during the term of the transaction.

5.7.3 Basis for derivation

The fixed rates underlying the swap spreads were based on the prevailing mid inter-bank market Australian dollar swap rates that are published in ICAP (an inter-bank broker) on Reuters page ICAPAUSSWAPS01, and relevant basis swap markets as published on Reuters page ICAPAUBASIS (i.e. the same publisher) as at 10.00am, Wednesday, 29 April, 2015, Australian Eastern Daylight Savings Time. As noted above, the rates we have applied are mid-market (BBSW),[30] and the credit spreads are based upon an internal bank process of credit risk assessment, which reflects perceived risk in the bond swaps market at that time. Execution spreads were based on the bank's assessment of market risk at the time, and the bank's internal pricing model (which takes account of its operating costs and required returns).

5.7.4 Results

Table 5.3 below shows the results:

- Pricing has been undertaken for a BBB credit risk;

[30] Another 5 basis points is required to convert the cost to the bid rate (BBSY bid), which would be needed if the margins quoted on the debt were margins to BBSY bid, which is common. It is not required if the margins are based to BBSW. Previously the QCA advised that the rate relative to BBSW (mid-market) should be applied.

- Pricing for the two stage swaps have been derived by adding the spreads for the first swap to those of the second. For example, the cost of swapping the 10 year fixed, BBB rated debt to 5 year fixed, BBB rated debt = (0.040 + 0.025) + (0.020 + 0.025) = 0.10.

Table 5.3: Benchmark swap cost (basis points per annum)

	5 year	10 year
Credit rating	BBB	BBB
Execution spread	1.5	2.0
Risk spread	2.5	4.0
Benchmark swap cost	**10.0**	

Source: Market quotes obtained by Advisian for 29 April, 2015

5.8 Conclusion on the cost of debt applying the QCA's methodology

Table 5.4 summarises the components of the benchmark cost of debt for GAWB estimated by Incenta, and sums these to derive the total cost of debt. Three estimates are presented, comprising the three methods of estimating the 10 year BBB debt risk premium (i.e., an econometric approach, the extrapolated Bloomberg BBB fair value curve, and RBA methodology).

Table 5.4: Total cost of debt estimates for GAWB (20 business days to 13 April, 2015), per cent (QCA methodology)

	Econometric	Paired Bonds	RBA
Risk free rate (5 year CGS)	1.917	1.917	1.917
10 year Debt Risk Premium	2.593	2.709	2.448
Debt raising transaction costs	0.108	0.108	0.108
Interest rate swap costs	0.100	0.100	0.100
Total cost of debt	**4.72**	**4.83**	**4.57**

Source: Estimates based on Bloomberg, RBA, Advisian and Incenta analysis.

Applying PwC's methodology, and using the econometric debt risk premium estimation, we obtain a 4.72 per cent total cost of debt estimate for the averaging period covering the 20 business days to 13 April, 2015. This estimate is 11 basis points lower than the 4.83 basis points estimate obtained by applying the extrapolated Bloomberg (paired bonds) methodology, and 15 basis points higher than the RBA methodology. As noted above, we do not have much confidence in the RBA methodology at present owing to the negative change in the debt risk premium observed from 7 to 10 years. In our view this is anomalous given the upward sloping debt risk premium (for approximately the same term from 7 to 10 years) observed for several paired bonds that we examined.

6. Comparison with GAWB's submission on WACC

6.1 Introduction

The Authority has requested that we compare and assess the WACC proposed by GAWB, based on the analysis undertaken by Synergies (on behalf of GAWB), against the WACC estimated based on applying the Authority's methodologies and assumptions, as well as the parameters reviewed by Incenta. In this chapter we first set out the overall picture with respect to alternative WACC estimates, highlighting the major differences, and then separately examine the cost of equity and cost of debt parameters that we have been specifically tasked to review.

6.2 Review of key WACC parameters in GAWB's submission

Table 6.1 below displays the WACC that was submitted by GAWB based on Synergies' analysis, and the alternative WACCs that would be estimated by the QCA using its own parameter estimates (i.e. risk free rate, market risk premium, gamma, debt beta, benchmark term of debt, debt raising transaction costs) and methodologies (i.e. Conine formula and Lally methodology for the cost of debt), and those parameter estimates that have been derived by Incenta (i.e. benchmark gearing, benchmark credit rating, 10 year debt risk premium using three methodologies, and swap costs).

Table 6.1: GAWB – WACC estimated by GAWB and applying QCA methodology

WACC methodologies:	Synergies /GAWB	QCA Methodology		
Date of estimate:	31 July, 2014	13 April, 2015		
DRP methodology:		Econometric	Paired Bonds	RBA
Risk free rate (10 year)	3.53%	*2.39%*	*2.39%*	*2.39%*
Risk free rate (5 year)	*2.87%*	1.92%	1.92%	1.92%
Debt Risk Premium	2.34%	2.59%	2.71%	2.45%
Debt Raising Costs	0.11%	0.11%	0.11%	0.11%
Swap costs	n.a.	0.10%	0.10%	0.10%
Debt Margin	2.45%	2.80%	2.92%	2.66%
Market Risk Premium	6.50%	6.50%	6.50%	6.50%
Asset Beta	0.40	0.40	0.40	0.40
Debt to Value	50%	50%	50%	50%
Statutory Tax Rate	30%	30%	30%	30%
Gamma	0.47	0.47	0.47	0.47
Equity Beta	0.64	0.64	0.64	0.64
Debt Beta	0.11	0.11	0.11	0.11
Effective Tax Rate	15.9%	15.9%	15.9%	15.9%
Expected Return on Equity	7.72%	6.10%	6.10%	6.10%
Expected Return on Debt	5.98%	4.72%	4.83%	4.57%
Post-Tax Nominal WACC	**6.85%**	**5.41%**	**5.47%**	**5.34%**

Source: GAWB/Synergies, QCA and Incenta analysis. The government bond rates that are in italics are not used under the method employed by the relevant party and are provided for completeness.

The WACC estimate submitted by GAWB was 6.85 per cent, which is higher than the 5.34 per cent to 5.47 per cent WACC range that would be estimated applying the QCA's methodology to the three alternative approaches to cost of debt estimation. The different WACC estimates shown in Table 6.1 are mainly due to:

- A reduction in interest rates generally between the time that GAWB's estimate was prepared, and the date applied in this report (the change in the 5 and 10 year Commonwealth Government bond rates is shown in the table above for completeness).

- Synergies/GAWB using a 10 year term for the risk free rate in the CAPM and for the base interest rate in the cost of debt, compared to the QCA-standard use of a 5 year term (this implies an approximate difference of 47 basis points for the cost of equity and 37 basis points for the cost of debt).

6.1 The GAWB/Synergies approach to cost of equity analysis

With respect to the cost of equity we note that the only difference between the GAWB/Synergies approach, and the Authority's approach (if it applies Incenta's equity beta recommendation) is the latter's application of a 5 year risk free rate in the CAPM formula.

With respect to the parameters that Incenta has assessed, we are in agreement with Synergies that an equity beta of 0.64 is appropriate given the application of the Conine formula and assuming a debt beta of 0.11. However, we disagree with Synergies on a number of other issues associated with the estimation of beta:

- The exclusion of comparator firms from the beta analysis on the basis of low r-square is not a well-recognised feature in financial economics. Many of the comparator firms that had low r-squared values had highly statistically significant beta coefficients.

- Synergies was open to including very small comparator firms into its sample, which are much more likely to have spurious beta coefficients due to illiquidity in trading.[31]

- We are not in agreement with Synergies' view that GAWB has a fundamentally different systematic risk profile to other water utilities due to its higher commercial content. As noted above, GAWB is buffered by its regulatory framework, and by the added security of long term contracting. GAWB navigated the global financial crisis with no impact on its revenues. Historically, the major threat to the security of GAWB's cash flows has been the weather, which is largely unsystematic in its incidence.

- Synergies has obtained slightly lower beta estimates than ours, partly due to timing of the estimate, but mainly because it appears to have applied book gearing rather than market gearing to de-lever to an asset beta. For example, Synergies reports the 'Average D/E' for American States Water Company as 0.7857. From Bloomberg we found that the average Net Debt/Book Equity for this company was 0.7891 for the 5 years to 2013, but for the same period the average Net Debt/Market Capitalisation was 0.4328. The average Net Debt/Market Capitalisation one year later, which was used in our calculations, was 0.3695. Had we applied the book value of equity, as

[31] For example, Italy's Acque Potabli S.P.A. has a current market capitalisation of $41 million.

we believe Synergies did, our estimate of the asset beta for American States Water would have been 0.564 instead of 0.649.

6.2 The GAWB/Synergies approach to cost of debt analysis

Synergies did not agree with the QCA's in-house cost of debt methodology submitting that it requires UBS data, which 'is only available to UBS clients,' and 'adds considerable complexity to the process and will not be readily replicable by regulated businesses.'

- We agree with Synergies that it would be desirable to rely on more easily accessible information if it were possible, however we note that many regulated businesses and advisers have access to the UBS database, and that this database has previously been endorsed by both the AER and Australian Competition Tribunal.

- We also note that Bloomberg now provides a wider coverage of bonds than when PwC (2013) undertook its debt methodology study (previously the main gap related to far fewer floating rate bonds in the Bloomberg database). Hence, it is now possible to obtain yields for virtually all of the Bloomberg and UBS bonds used in the current sample. One modification to the QCA's method that would be possible – and, in view of Synergies' comments, worth exploring – would be to rely exclusively on the Bloomberg database for bond pricing information.

Synergies used only the RBA corporate bond yield estimates to estimate its debt risk premium, but we have reservations about the use (or at least sole use) of these estimates:

- From November 2014 to March 2015 the RBA estimates have implied a downward sloping (i.e., reducing with term) debt risk premium from 7 to 10 years, which has historically been the case 21 per cent of the time. Consequently, we believe that the RBA methodology under-estimated the debt risk premium at 31 March 2015 (which was exacerbated by applying the AER extrapolation (see below), and that this is likely to be due to the small number of bonds that are available near the 'target date' of 10 years.

- We agree with Synergies that the RBA data needs to be extrapolated because the average term associated with each of the yield estimates depends on the bonds available and frequently differs from the target term (the yield estimate for a 10 year term currently has an actual average term of 8.8 years). We have applied the AER's preferred linear extrapolation method, whereas Synergies appeared to apply a different method (we were unable to replicate its calculations), although we doubt that this difference would be material.

- We agree with Synergies that, since the RBA produces estimates for only the last day of each month, it can be affected by random market volatility (which is the reason that a 20 day averaging period is commonly used), and consider that this reduces the utility of the RBA estimates.

Finally, we note that there is no discussion by Synergies about the actual nature of the RBA BBB curve. The RBA BBB curve is being treated as equivalent to a BBB+ curve by the AER, and Synergies has adopted it as being appropriate for GAWB, which we agree with Synergies should be considered to have a benchmark BBB credit rating. Synergies makes no upward adjustment in the required yield for this, while we have adopted an 26 basis point premium for the differential between BBB+ and BBB (estimated by reference to the debt risk premiums of BBB bonds relative to the

estimated BBB+ fair value debt risk premium regression line). We therefore consider that Synergies has under-estimated the debt risk premium for a 10 year BBB bond.

A. Derivation of RBA extrapolated BBB fair value yield

For the 31 March, 2015, the RBA's Table F3 notes that the effective terms of the 'seven' and 'ten' year terms were 6.62 years and 8.79 years respectively. We have applied the extrapolation equation recommended by Lally:[32]

$$R\hat{B}A(10) = RBA(10) + \left[\frac{DRP(10e) - DRP(7e)}{10e - 7e}\right](10 - 10e)$$

It takes the yield reported by the RBA to be at 10 years and adds to this extrapolated component of the debt risk premium from the effective term (10e), which is less than 10 years, up to an actual term of 10 years. It includes the components:

$RBA(10e) = RBA(10) - Swap(10) + Swap(10e)$

$RBA(7e) = RBA(7) - Swap(7) + Swap(7e)$

$DRP(10e) = RBA(10e) - CGS(10e)$

$DRP(7e) = RBA(7e) - CGS(7e)$

Where (showing values at 31 March, 2015),

$R\hat{B}A(10)$	is the extrapolated 10 year Bloomberg BBB yield (4.52 per cent)
$RBA(10)$	is the RBA's reported yield on 10 year debt (4.57 per cent)
$RBA(10e)$	is the RBA yield (4.481 per cent) at the effective term corresponding to 10 years (8.79 years)
$RBA(7e)$	is the RBA yield (4.313 per cent) at the effective term corresponding to 7 years (6.62 years)
$Swap(10)$	is the Swap yield (2.712 per cent) at a term of 10 years
$Swap(10e)$	is the Swap yield (2.623 per cent) at the effective term corresponding to 10 years (8.79 years)
$Swap(7)$	is the Swap yield (2.491 per cent) at a term of 7 years (6.62 years)
$Swap(7e)$	is the Swap yield (2.454 per cent) at the effective term corresponding to 7 years (6.62 years)

Applying the values results in a 10 year BBB yield of 4.52 per cent calculated as follows:

[32] Lally (November, 2014), pp. 39-40. This could be extrapolated relative to the swap curve, or the CGS curve. This calculation was done relative to the Australian dollar swap curve.

$$\hat{RBA} = 4.521 = 4.570 + \left[\frac{2.315 - 2.403}{8.79 - 6.62}\right](10 - 8.79)$$

Annualising, provides a 10 year BBB+ yield estimate of 4.57 per cent, and adding 26 basis points for the BBB premium results in a 10 year BBB yield estimate of 4.83 per cent.