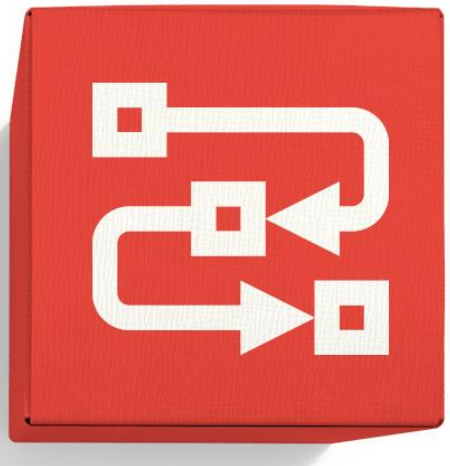
Advice on an appropriate asset beta, capital structure, credit rating, and debt risk premium for GAWB's 2020-2025 pricing period

Queensland Competition Authority

18 December 2019



FINAL REPORT

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1. EXECUTIVE SUMMARY

CEPA has been engaged by the Queensland Competition Authority (QCA) to provide advice on setting weighted average cost of capital (WACC) parameters for Gladstone Area Water Board's (GAWB) next price monitoring period 2020-2025. This includes advice on:

- An appropriate asset beta.
- An appropriate capital structure and credit rating.
- An estimate of the debt risk premium.

1.1. ASSET BETA

The asset beta is the unlevered equity beta, which is a measure of systematic risk. This measures how volatile the returns on an investment are relative to the volatility in returns on the stock market overall. To estimate the asset beta, we proceeded in three stages:

1. We selected, using a number of criteria and filters, a sample of firms that could act as relevant comparators to GAWB.
2. We undertook a relative risk assessment to understand how the systematic risk of these comparators might vary from that of GAWB.
3. We estimated the asset betas of these comparators.

Once we had selected a relevant comparator sample, we proceeded to analyse the systematic risk of the sample. This was to understand whether the sample's systematic risk was similar or not to GAWB. If not, then we would have sought to supplement our sample or possibly make an adjustment to the estimate of beta.

The table below summarises the results of our relative risk assessment. We concluded that our comparator sample has broadly similar systematic risk to GAWB, although the sample could be potentially riskier than GAWB in regard to growth opportunities (and this is reflected in our similar/higher rating in the table below). The difference in this risk is because some of the comparators have revenue streams from sources outside the water sector. However, we do not consider this to be significant enough to require an adjustment to the sample mean for any bias.

Table 1.1: Comparison between GAWB's systematic risk and the water utilities comparator sample systematic risk

Factor	GAWB	Water utilities sample	Sample's systematic risk relative to GAWB's
Regulatory framework	• Hybrid revenue cap (i.e., revenue cap with a deadband). Although, GAWB is only subject to price monitoring against the hybrid revenue cap.	• Mix of rate of return, revenue cap, and price cap regulation.	■
Demand risk	• Larger proportion of industrial customers than the comparator sample. However, this does not clearly result in increased systematic demand risk. • Hybrid revenue cap and generally long-term contracts (with significant fixed charge elements) in place that reduce demand volatility.	• Greater proportion of revenue from households, however, this does not necessarily mean a lower income elasticity of demand compared to GAWB's customer mix. • Typically, the companies in the sample operate under some form of regulation (price cap, rate of return, or revenue cap).	■
Growth opportunities	• Largely limited to new connections from population growth or new industrial connections.	• Largely limited to new connections from population growth or new industrial connections. • Some companies may have higher growth opportunities than GAWB.	■ / ▲
Operating leverage	• High operating leverage. • Regulatory framework provides protection	• Also high operating leverage. • Regulatory framework provides protection.	■

▼ = Lower ▲ = Higher ◀▶ = Different ■ = Similar

We estimated the asset betas for the companies in our comparator sample for two periods, five years to 30th August 2019 (Period A) and five years to 30th August 2014 (Period B), using two periodicities, weekly and four-weekly. We also considered a sub-sample of our comparators looking at developed countries only. The table below provides a summary of these results; the mean for each sample and estimate period ranged between 0.31 and 0.48. At QCA's request, we also estimated betas based on the 10-year period (i.e., Period A and B combined). The range produced was 0.44 to 0.45 for the entire sample and 0.40 to 0.45 for developed countries.

We note that the four-weekly Period A average was influenced by three companies' betas that were materially lower than their weekly estimates. We also consider that Period A is likely to be more relevant to setting the forward looking asset beta as it is based on the most recent information. Therefore, we are inclined to place more emphasis on the Period A weekly estimates. The Period A weekly estimates sample means range from 0.40 to 0.43.

Table 1.2: Summary of asset beta estimates

	Period A		Period B	
	Weekly	Four-weekly	Weekly	Four-weekly
Mean	0.43	0.38	0.47	0.47
Mean ('developed' countries)	0.40	0.31	0.48	0.47

Source: Bloomberg; CEPA analysis

We also examined recent regulatory precedent for Australian water utilities. Regulatory decisions often provide the equity beta and we obtained asset betas using the Conine formula to allow comparability between our estimates

and these regulatory decisions. Based on this analysis, regulatory precedent provided an asset beta range of 0.35 to 0.42.

On the basis of our analysis, **we consider that an asset beta range of 0.40 to 0.43 is an appropriate starting point for QCA's consideration for GAWB's 2020-2025 pricing period**. **However, we note that if a 10-year period is used the estimated asset beta range is slightly higher at 0.44 to 0.45**.

1.2. CAPITAL STRUCTURE AND CREDIT RATING

While GAWB's proposed 50% gearing level is below the Australian regulatory precedent levels, it is above the average gearing level observed in our comparator sample. However, a 50% gearing level is in line with two UK-listed water utilities with a BBB credit rating in our sample.

We have not identified evidence that GAWB's capital structure has changed since QCA's previous determination of 50%. Also, we have not uncovered evidence that a BBB credit rating assumption is no longer reasonable for GAWB. Evidence from regulatory precedent in Australia uniformly supports using a BBB credit rating for water utilities.

Therefore, **we consider that GAWB's proposal of 50% gearing and a credit rating of BBB is reasonable**.

1.3. DEBT RISK PREMIUM

We estimated the debt risk premium (DRP) following the QCA's preferred approach of using two data sources, RBA and Bloomberg. We estimated the DRP for a 20-business day averaging period to 30th August 2019. Our estimates are set out in the table below. **Our estimate of the average of the RBA and Bloomberg based estimates is 2.06%.**

Table 1.3: Debt risk premium estimate (to 30 August 2019)

	RBA	Bloomberg	Average
CEPA	2.24%	1.88%	2.06%

Source: RBA; Bloomberg; CEPA analysis

2. INTRODUCTION

At the direction of the Deputy Premier, the QCA has started a price monitoring investigation of GAWB's bulk water prices for the period 1 July 2020 to 30 June 2025. As part of the investigation, the QCA is required to consider an appropriate WACC for GAWB for this period.

CEPA has been engaged by the QCA to provide advice on setting parameters for GAWB's next price monitoring period 2020-2025. This includes advice on:

- An appropriate asset beta.
- An appropriate capital structure and credit rating.
- An estimate of the debt risk premium.

2.1. TERMS OF REFERENCE

The QCA's request for advice was clear and specific. The terms of reference covering this report are set out below:

(1) **recommend an appropriate range for the asset beta**. The consultant should:

  (a) undertake a **first principles analysis** that considers and assesses what economic factors are the most important determinants of GAWB's systematic risk (for example, such factors may include nature of regulation, customers, duration of contracts).

  (b) provide and justify an **appropriate comparator group (or groups)** based on the extent to which the comparators share similar systematic risk characteristics as GAWB (based on the economic determinants identified above). Consultants should explain their proposed methodology for selecting the comparator samples and explain why the firms in the proposed sample are the closest comparators to GAWB in terms of systematic risk exposure.

  (c) **assess the results from (a) and (b) against Synergies'** first principles analysis and comparator group

  (d) **estimate the underlying asset betas** of this group in two steps:

    (i) estimate the firms' equity betas based on observed returns—the consultant should specify the data source and frequency, the regression specification and any other relevant assumptions it proposes to use to estimate the equity betas.

    (ii) derive the underlying asset betas by de-levering the estimated equity betas—the consultant would be required to use the QCA's preferred de-levering approach of applying the Conine formula. Values for the debt beta, gamma and gearing for this purpose will be provided at the time of appointment (although the gearing value may depend on the outcome of task 2).

  (e) determine the **reasonableness** of an appropriate range for the asset beta having regard to the asset betas of **other regulated water entities**.

(2) **comment on the reasonableness of GAWB's proposed capital structure and credit rating**, having regard to the findings in (1).

(3) **calculate the ten-year debt risk premium** for a BBB-rated entity (or other credit rating depending on the outcome of task 2) for a placeholder 20-day averaging period, ending 30 August 2019. Consultants should calculate this using two data sources: RBA data (following the approach in the AER rate of return guidelines) and Bloomberg data (Bloomberg BVAL 10-year BBB rated series), and provide the underlying data.

2.2. STRUCTURE OF THE REPORT

The rest of this document is structured as follows:

- Section 3 sets out our approach to estimating an appropriate asset beta range for GAWB for the 2020-2025 pricing period.
- Section 4 set out our assessment of the reasonableness of GAWB's proposed capital structure and credit rating.
- Section 5 sets out our approach to, and estimates from, calculating the ten-year debt risk premium as specified by QCA.

3. ASSET BETA

Asset betas are not directly observable, instead equity betas are estimated from historical data on listed companies' and markets' returns.

The equity beta indicates how volatile the returns on an investment are, relative to the equity returns on the stock market as a whole.[2] The term is intended to cover systematic or non-diversifiable risk; that is, risk that investors cannot mitigate through diversifying into a broader portfolio of companies. A company's equity beta also reflects investors' view of the financial risk associated with its capital structure.

A company's risks that are not correlated with stock market movements can be mitigated by investors through diversification and should not therefore be captured in the asset beta. Non-systematic or business-specific risks are still important for investors, but they would not expect to be compensated for these through the asset beta.

The asset (or de-geared) beta translates empirical equity beta estimates into the equivalent beta for a company with zero gearing. This allows for comparisons of systematic risk across companies that have different capital structures. The asset beta can then be re-geared to an appropriate gearing level to provide an equity beta estimate to be used to estimate the company's cost of equity.

Appropriate comparator companies for estimating the asset beta for GAWB, which is not listed, are companies that are likely to have similar systematic risk.[3] Regulators will typically look at a range of comparable companies to estimate an appropriate asset beta. In order to select comparators with similar systematic risk, 'comparability' typically extends to companies in the same sector, listed on a liquid stock market, and subject to similar regulatory regimes. Even if GAWB were listed, regulators will typically look to establish a benchmark for the asset beta rather than relying solely on the regulated company's own data.

We consider that companies that have similar business models to GAWB are the most likely to have similar systematic risk. Therefore, our approach has been to:

- identify an appropriate set of comparators that operate predominantly in the water sector providing services such as treating raw water, distributing potable water, and collecting and treating wastewater – **'Comparator selection process'**; and
- assess the extent to which their characteristics might result in different systematic risk relative to GAWB – **'Relative risk assessment'**.

If in the latter step we determine that our initial sample does not have similar systematic risk to GAWB, then we will seek to establish a broader/ alternative sample and/ or propose an adjustment for any bias in the sample. An initial comparator sample is required in order to undertake the first principles relative risk assessment (i.e. we need a reference point to assess GAWB's systematic risk against).

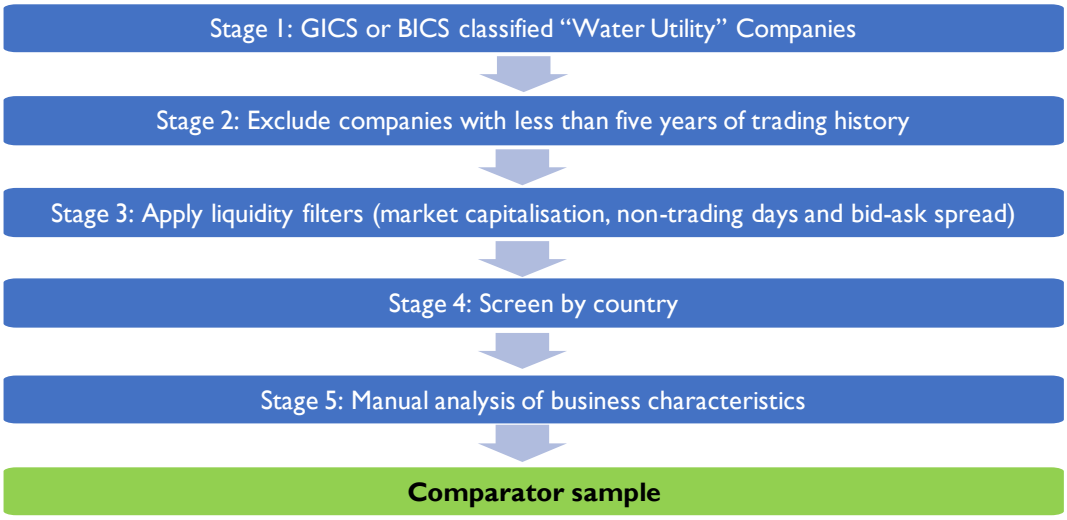
3.1. COMPARATOR SELECTION PROCESS

Our starting point has been to identify the broadest possible set of water utility comparators, then exclude firms that are less likely to be appropriate, either because of concerns with the underlying data or their characteristics. The process we have followed is summarised in Figure 3.1, with further explanation in the text below.

[2] More specifically, it is an empirical measure of the covariance of the company's stock return relative to the market divided by the variance in the market's returns.

[3] This means that factors that affect the market's returns (e.g. economic factors) will influence the returns of comparator companies in a similar way to the company for which the asset beta is being estimated.

Figure 3.1: Comparator sample filtering stages



We selected and filtered the companies as follows:

- **Stage 1:** To obtain an initial long list of companies, using Bloomberg, we selected companies that had a Bloomberg Industry Classification System (BICS) or a Global Industry Classification Standard (GICS) code of "Water Network" or "Water Utilities" respectively.
- **Stage 2:** We intend to estimate asset betas for two five-year periods (discussed in more detail in Section 3.3), the five-year period to 30/08/2019 ('Period A') and to 30/08/2014 ('Period B'), therefore we exclude companies that did not have five years trading history for Period A or Period B. This is required for the regression analysis.
- **Stage 3:** We apply three liquidity filters for the relevant period:
    - Zero trading days do not exceed 20% of all available trading days across the five-year period. In this case this filter does not eliminate any companies.
    - The average bid-ask spread for the five-year period, as calculated by Bloomberg, does not exceed 1%.
    - We exclude companies that had below US$100 million market capitalisation on 30/08/2019 for Period A and 30/08/2014 for Period B.
- **Stage 4:** We include all countries with equity markets classified by FTSE Russell as "Developed" or "Advanced Emerging". We then also remove Greek companies and all but one Hong Kong listed company.
- **Stage 5:** We manually examine the list of companies to eliminate companies that do not look like water utilities. This mainly occurs if the GICS/ BICS classification does not accurately represent the company.

3.1.1. Stage 1 – Long list

Prior to implementing any filters, we want to start with as comprehensive a list of potential companies that conduct similar operations to GAWB as possible. To construct the long list, we used the Global Industry Classification Standard (GICS) and the Bloomberg Industry Classification System (BICS), and selected companies that were classified as "Water Utility" (GICS) or" Water Network" (BICS).[4]

The classification of firms into a GICS category (a firm can only have a single classification) is based on:

[4] Using GICS to select an initial long list is in line with the QCA's previous GAWB decisions and Synergies' proposal.

- The business activities that generate the majority of the company's revenues. S&P and MSCI, GICS creators and administrators, note that "*a company engaged in two or more substantially different business activities, none of which contributes 60% or more of revenues, is classified in the sub-industry that provides the majority of both the company's revenues and earnings*."[5]
- S&P and MSCI also consider earnings and market perception.[6]

The BICS system allocates firms into a single BICS category. Bloomberg states that *"BICS…classifies companies by tracking their primary business as measured first by source of revenue and second by operating income, assets and market perception."* [7]

Despite the similar descriptions, the two classification systems produce different results. Bloomberg lists 112 companies under GICS and 172 under BICS. In total there are 220 unique firms. We consider that using both lists reduces the risk of relevant listed water utilities being excluded from our sample.

In addition, we also:

- Used Thompson Reuters Eikon to undertake a search using the GICS code "Water Utilities". Despite Eikon producing more results all additional companies were either no longer trading or were not water utilities.
- Checked against the list of water utilities compiled by IPART in 2019, which used the Thompson Reuters Business Classification (TRBC) "Industry – Gas Water & Multi-utilities, Sub-Industry – Water".[8] Our examination of this list found no additional companies to add to our long list.

3.1.2. Stage 2 – Trading history

To ensure that we can employ our preferred regression specification we need five years of data. Any companies that did not have a full five years of trading data were excluded. In Period A this filter removes 90 companies.

3.1.3. Stage 3 – Liquidity

A necessary condition for estimating companies' betas is that markets for their securities are sufficiently liquid. Illiquidity can impose additional trading costs on investors, which breaches the assumption of zero transaction costs in the Capital Asset Pricing Model (CAPM). We recognise that there are several potential measures of liquidity.

We have looked at three liquidity filters, one by itself and two in combination:[9]

A) **Market capitalisation.** Market capitalisation is used as an initial liquidity filter, as smaller and/or less well-established companies may experience thin trading volumes. This may impact upon the estimated equity betas. However, there is no clear specific theory/ criterion for selecting a capitalisation value below which companies are more likely to experience low liquidity. Incenta (2017) used a filter of US$200 million while Synergies (2019) adopted a filter of US$100 million. In work for the New Zealand Commerce Commission (CEPA, 2019a) we adopted a filter of US$100 million, which is also what we adopt here.

B) **Trading filter**:

i) Removing firms where there are zero trading volumes on more than 20% of available trading days.

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[5] S&P Global and MSCI (2018), page 5.

[6] https://www.msci.com/gics, accessed 8 November 2018.

[7] Bloomberg (2015).

[8] IPART (2019b).

[9] If the market cap filter is not used the total number of companies ultimately included in both periods' samples is the same. For Period A, the total number of companies that pass this stage with the market capitalisation filter included is 54; without the market capitalisation filter it is 55. This additional company would be eliminated at stage 5.

ii) We remove firms where the average bid-ask spread over the period is greater than 1%. The bid-ask spread is a measure of transaction cost and liquidity.

The trading filter specification is in line with what we have used previously for the New Zealand Commerce Commission (CEPA, 2019b). We note that using both filters is likely not required, however we have maintained the use of filter A given the use of a market capitalisation filter (albeit with different USD levels) in QCA's previous decisions. We note that turning off the market capitalisation filter does not lead to a difference in our final sample.

The filter in this stage removed 76 companies from our sample. We note that there are several different approaches and values that could be chosen for liquidity filters. We consider that our choices are reasonable and consistent with regulatory precedent.[10]

3.1.4. Stage 4 – Country of operation

Equity and asset betas measure companies' systematic risk. We want to select companies from markets that have well developed stock markets and have similar liquidity to that seen in Australia. There are several potential classification systems for countries' equity markets, and we are electing to use the FTSE (Financial Times Stock Exchange) Russell classification.[11] This is the same classification system that Synergies (2019) used. Countries that are classified as "Developed" and "Advanced Emerging" are more likely to have sufficiently deep and liquid equity markets which are more comparable to Australia.

However, we are inclined to remove two countries from this list:

- Greece – Greece has experienced a severe economic crisis in the last decade. This has the potential to distort market data.[12]
- Hong Kong – Five water companies listed in Hong Kong are still present after all previous filters. However, Bloomberg provides evidence that four of the companies' operations are substantially in mainland China and not Hong Kong. Bloomberg provides an indicator ('Country of Risk') which allows the filtering of companies listed in Hong Kong but whose operations are in China.[13] Only one firm (China Water Affairs Group) has the country of risk listed as Hong Kong. As China is rated as 'Secondary Emerging' by FTSE Russell we are inclined to remove the other four companies.[14]

This filter removed 34 companies from our sample.

3.1.5. Stage 5 – Manual analysis

We examined the list of companies remaining after stages 1 to 4 to eliminate any companies that were clearly not water utilities.[15] This mainly relied upon the description of the company provided by Bloomberg. In this case, we removed two companies – Cadiz Inc (Cadiz appears to be an agricultural resource management company) and Pico Holdings Inc (Pico appears to be a diversified holding company).

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[10] IPART included a liquidity filter in its 2019 WACC water sample selection. See IPART (2019b).

[11] The MSCI world index is another alternative that can also be used. The MSCI generally provides comparable results to the FTSE Russell. However, unlike the FTSE Russell, the MSCI does not split emerging markets in to 'Advanced Emerging' and 'Secondary Emerging'. If only 'Developed' countries were included, Thailand and Brazil would be excluded from our sample.

[12] We note that only one Greek company Athens Water Supply & Sewage, passes our other filters, and for this company Bloomberg reports significantly positive net debt levels, i.e., negative gearing. On this basis, we would exclude the company anyway.

[13] Bloomberg provides an explanation that the "Country of Risk" field will, if applicable, provide a filter for "Red Chip/'H' Share companies following a list maintained by the Hong Kong stock exchange.

[14] This also means that the Hong Kong index may not be appropriate for assessing the listed companies' systematic risk.

[15] While technically the classifications should have already sorted this, we have noticed, on the basis of the descriptions available in Bloomberg, errors in the classifications.

3.1.6. Sample size

The table below summaries the sample size, for Period A, after each stage of our selection process. After the five stages, we are left with a sample of 18 companies in Period A (and a sample of 16 in Period B).

Table 3.1: Sample size after each stage

Stage	Period	
	Period A	Period B
Stage 1: GICS or BICS classified companies	220	220
Stage 2: Trading information	130	138
Stage 3: Liquidity filters	54	41
Stage 4: Country (well-developed stock market) filter	20	18
Stage 5: Business characteristics review	18	16

3.1.7. Statistical filters

Synergies (2019) proposed two filters based on statistical criteria – companies were removed from its sample if the regression had an R^2 of less than 0.1 or the coefficient of the equity beta had a t-statistic of less than 2. We have chosen not to apply a statistical filter as Synergies has done. While we understand Synergies' rationale for its proposed filters, our reasons for not including the filters are set out below.

Coefficient of determination (R^2)

Synergies states that "*a low R2 suggests that the movements of the market index explain only a small proportion of the variation of the stock under investigation.*"[16] Synergies goes on to state that "*[t]his contravenes the theory underpinning the CAPM, which stipulates that the return on a stock depends on its correlation with the market*."[17]

We disagree that a low R^2 contravenes CAPM theory. A low R^2 simply means that, at the given equity beta estimate in the model, the model only explains a small amount of the variation in the company's returns compared to the markets' returns. A low R^2 means that much of the variation in the company's stock returns are driven by non-systematic (company-specific) factors. We expect to see low R^2 in equity beta models as company's valuations are affected by many factors.

We do not consider that choosing a specific cut-off point for removing companies from the sample is appropriate. As IPART stated in 2009, "*using this filter [R-squared of 0.1], companies whose share prices are not well explained by systematic variation, which also tend to be those with low equity betas, are excluded. This biases upwards the estimate of the asset beta.*"[18]

T-statistic

Synergies suggests that you should remove estimates with a t-statistic of less than 2. Synergies argue that this is particularly important in measuring the statistical significance of the beta estimate.

T-statistics can be used to determine the statistical significance of the beta estimate. However, we consider that this is not an appropriate approach. T-statistics measure how statistically likely it is that the equity beta is different from 0. The higher the t-statistic the more likely the equity beta is to be greater than zero. The introduction of a t-statistic filter would make it more likely that companies with low equity betas are removed from the sample. This may bias the overall estimate upwards.

[16] Synergies (2019), page 27.

[17] Synergies (2019), page 27.

[18] IPART (2009), page 28.

A more appropriate filter would be the standard error.[19] The standard error provides an indication of the accuracy of the estimate; the smaller the standard error the more precise the estimate. Nonetheless, we do not propose to include a standard error filter for two reasons:

- Firstly, a decision on the required precision of the regression coefficients would need to be made and we do not consider that there is a good justification for choosing a specific value.
- Secondly, no matter the size of the standard error the estimate is still the best possible estimate based on the available information. The standard error only provides an indication of how precise the estimate is.

However, for reference, we have provided standard errors in Appendix C.

3.2. RELATIVE RISK ASSESSMENT

In order to determine an appropriate comparator sample, we have undertaken a relative risk assessment (alternatively referred to as a 'first principles' assessment) of GAWB. The relative risk assessment evaluates the comparator sample's systematic risk against GAWB's systematic risk. Non-systematic risk is not considered as it is not captured in the beta.

As set out in Section 3.1, our final sample for Period A consists of 18 companies that we consider have similar business models to GAWB, and are therefore likely to have similar systematic risk.

We note that judgement needs to be applied when determining if a comparator sample offers a reasonable approximation of the systematic risk faced by GAWB. In practice, many risk factors may have both systematic and non-systematic elements. The distinction between systematic and non-systematic risk and companies' exposure to systematic risk can and does vary across regulators and practitioners. Our relative risk assessment is structured around the following key factors:

- The regulatory framework.
- Demand risk – this also covers the nature of the product, customer mix, pricing structure, market power, and contract length.
- Growth opportunities.
- Operating leverage.

If the initial sample is not representative, then we will consider whether alternative/ additional comparators can be included in the sample, or an adjustment is required, to ensure it is representative.

3.2.1. Regulatory framework

QCA undertakes "price monitoring" of GAWB, this means QCA reports on GAWB's planned prices with regard to the total prudent and efficient cost of service. However, QCA does not mandate the prices that GAWB charges.

Where GAWB elects to follow QCA's findings the rules provide GAWB with some protection from revenue fluctuations. GAWB is price-monitored ('regulated') based on a hybrid revenue cap, that is a revenue cap with a ± 10% deadband. This means that if revenue varies by less than 10% GAWB bears this risk. However, if revenue varies by more than 10% then prices will be adjusted to recover the variance using a 'true-up' mechanism at the start of the following price monitoring period.

In its submission, GAWB's consultant, Synergies, noted that GAWB's current regulatory framework provides it with some protection from revenue fluctuations. We agree with Synergies' view that the current regulatory framework provides GAWB with some protection from revenue fluctuations. Under the price monitoring framework, GAWB

[19] IPART (2009), page 28, makes a similar point and also advocate for the use of standard errors.

only bears the risk of revenue fluctuations within the deadband, as any additional discrepancy from the revenue cap would be recovered through price adjustments in the following regulatory period.

Companies in the comparator sample are subject to a variety of regulatory frameworks which provide them with some degree of protection from revenue fluctuations:

- US water companies, while operating under different state jurisdictions, are generally subject to rate of return regulation, which provides a strong buffer by setting the company's revenue allowance on the basis of the rate of return and on the value of the assets forming the rate base.
- UK water companies are subject to a revenue cap regime.
- Brazilian water companies are typically regulated under a price cap but can also have concession agreements.
- Comparators from Thailand and Hong Kong are in long-term concession agreements with the government and have tariffs indexed to inflation. French companies also enter concession or lease arrangements with local government.

Overall, we consider that firms in the comparator sample are subject to regulatory or contractual arrangements which protect them from the risk of revenue fluctuations in a way that is broadly comparable with GAWB's price monitoring framework.

We consider the implication of the hybrid revenue cap in relation to demand risk in the next section.

Table 3.2: Relative systematic risk exposure – Regulatory framework

GAWB	Water utilities sample	Sample's systematic risk relative to GAWB's
• Hybrid revenue cap (i.e., revenue cap with a deadband). Although, GAWB is only subject to price monitoring against the hybrid revenue cap.	• Mix of rate of return, revenue cap, and price cap regulation.	■

▼ = Lower ▲ = Higher ◀▶ = Different ■ = Similar

3.2.2. Demand risk

Companies offering services and products with higher income elasticity of demand could be expected to have higher asset betas, as demand for their services and products will be more sensitive to fluctuations in economic conditions. The extent of a firm's exposure to systematic demand risk may also be affected by the regulatory framework they operate within (if any) and/or contracts with their customers.

Generally, for residents, water is considered to have a low income elasticity of demand given its essential ('necessary') nature.[20] However, GAWB and its consultant Synergies have indicated that GAWB's customer base may result in GAWB having higher systematic risk than other water companies. In particular, Synergies noted that "*GAWB has a primarily industrial customer base, with 80% of water accounted for by these users.*"[21] QCA has advised us that its analysis of GAWB's 2020-25 proposal supports the proposition that a substantial proportion of GAWB's revenue is from industrial and commercial customers. The QCA's analysis on GAWB's 2020-25 proposal indicates that around 67% of its proposed revenue is from industrial customers. GAWB's industrial customers are split largely into alumina refineries and energy companies.

[20] See for example Hoffmann et al (2005).

[21] Synergies (2019), page 32.

Publicly available data from US companies' annual reports (seven of the companies in our sample)[22] indicates that roughly 70% of these companies' customers are typically residential. Therefore, GAWB's customer mix does appear to be different from those companies in our sample for which data was available.

The questions we need to consider are:

- Are GAWB's revenues correlated with its industrial customers' output volumes?
- If so, are the customers' output volumes systematic in nature? And;
- Is the demand volatility of GAWB's customer mix different from the sample of water companies, and does this impact on revenue volatility?

We note that determining the answer to the above questions based on publicly available data is difficult. Nonetheless, we consider that there is sufficient information to determine whether GAWB's systematic risk is materially different from the comparator sample.

QCA has advised that, based on analysis of GAWB's 2020-25 proposal, approximately 95% of GAWB's proposed revenue is from fixed charges. Therefore, even if GAWB's industrial customers increased/ reduced production GAWB's revenues would be largely unaffected. This broadly means that the GAWB's key exposure is if an industrial customer ceased operations. However, for completeness we have considered whether there is a potential link between revenue volatility in GAWB's largest industrial companies and their water demands.

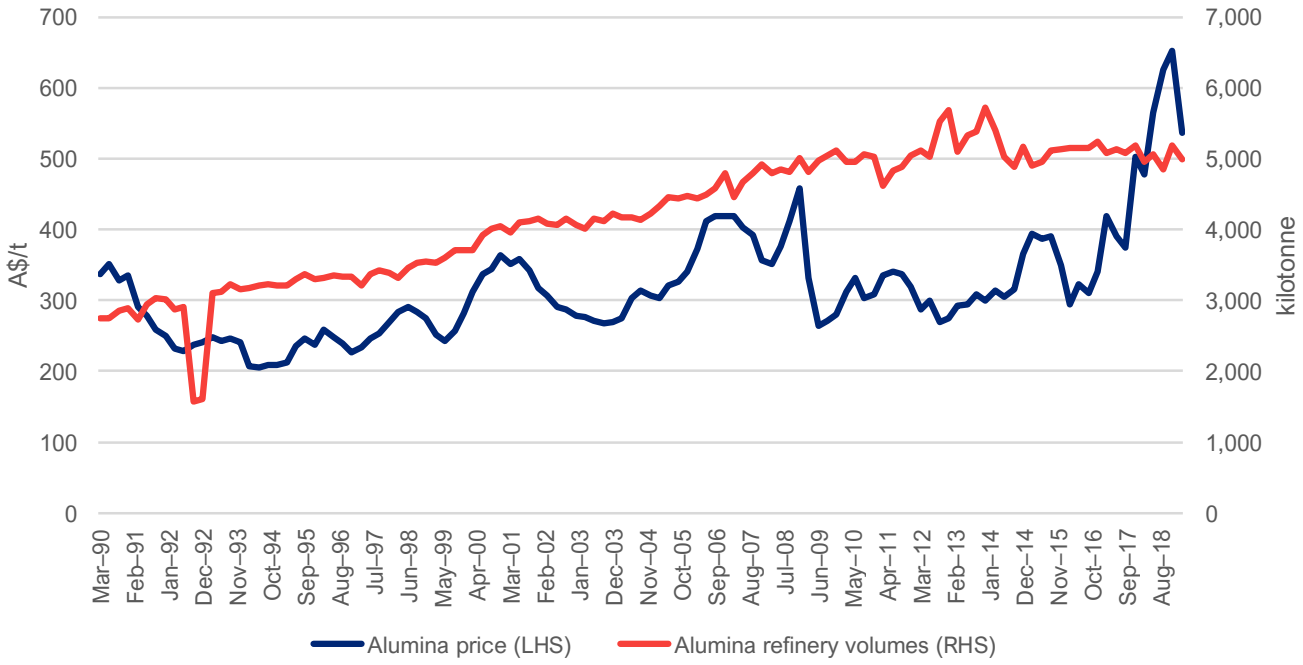
Alumina refinery customers

[redacted] Therefore, we need to consider whether these two refineries' demand volatility is systematic and, if so, whether it is different from the sample companies' systematic demand risk.

We do not have information available on the refined alumina volumes produced at these two refineries; however, the Department of Industry, Innovation and Science (DIIS) has national statistics. We have set out the quarterly alumina price and national alumina refinery volumes in the figure below. The alumina price exhibits an upward trend, but significant volatility around this trend. In contrast, while alumina refinery volumes also exhibit an upward trend (at least until 2014), the volume has been much less volatile around this trend compared to the price.

[22] The companies for which we could identify their customer mix, and the year of the annual report that included the information, are: American Water Works, 2017; American States Water, 2017; California Water Service, 2015; Middlesex Water, 2017; SJW Group, 2018; Aqua America, 2018; and York Water, 2018. All these companies provided at least the following categories: residential, commercial and industrial.

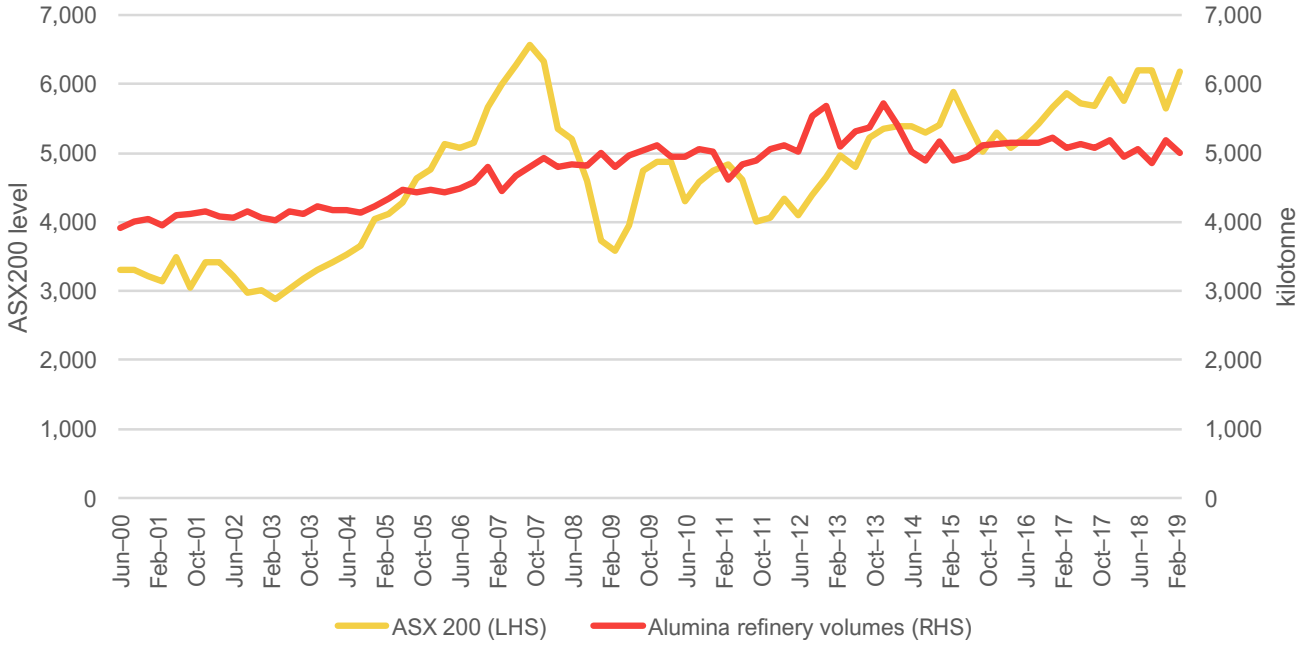
Figure 3.2: Historical alumina price, and alumina smelter and refinery volumes



Source: DIIS (2019)

DIIS are forecasting that alumina prices (average export unit value) will reduce this year and level off at around A$360 per tonne in 2021. This price is more in line with levels seen between 2014 and 2017. However, between 2014 and 2017 alumina refinery volumes were relatively consistent. Therefore, this evidence does not support a conclusion that volatility in alumina prices would, firstly, result in volatility in the refineries output volumes, and secondly, in volatility in GAWB's revenue. In addition, the refineries' output volumes do not appear to be significantly correlated with the ASX 200 index. In other words, movements in the market index do not appear to translate into movements in alumina production volumes.

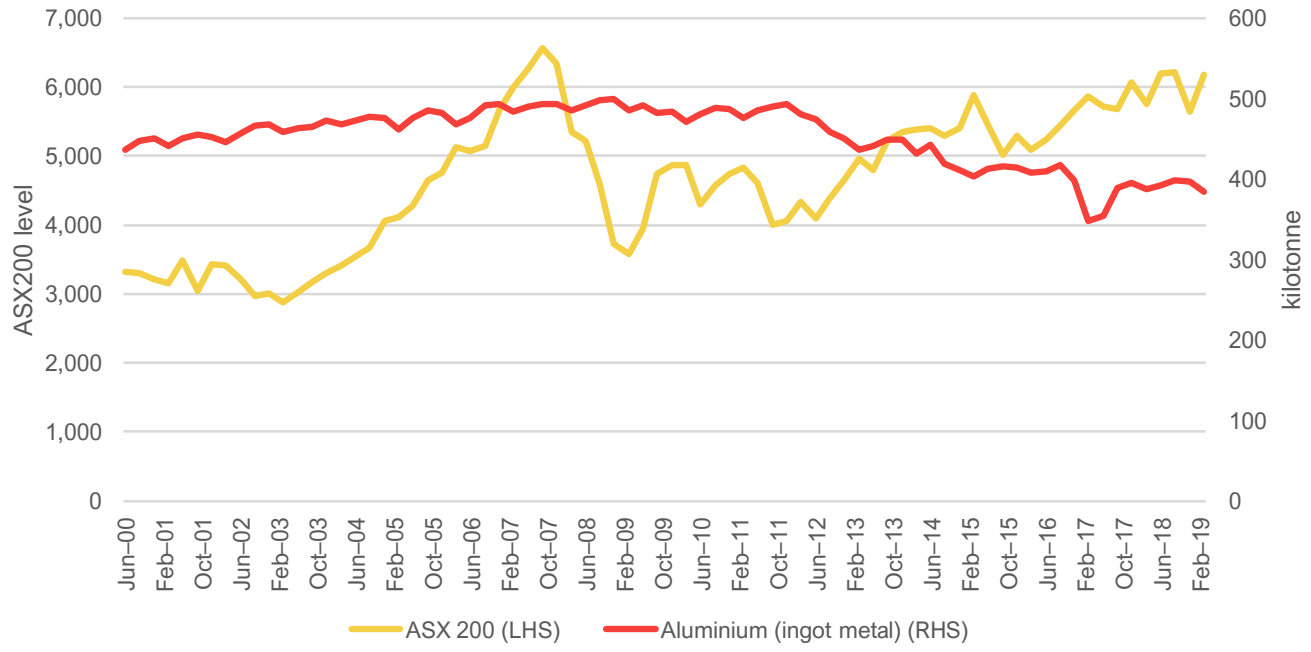
Figure 3.3: ASX200 index (level at the end of the quarter) compared to the alumina refinery volumes



Source: Bloomberg; DIIS (2019)

We understand that aluminium production also occurs at plants served by GAWB, [redacted] We have reviewed the DIIS information on aluminium prices and production volume. Similar to the alumina data, while the price was relatively volatile the production volumes did not obviously vary in line with the price movements (even when considering a lagged impact). Since late 2011 aluminium production has been decreasing; however, this was at a time when the ASX was increasing, indicating that aluminium production has not been pro-cyclical.

Figure 3.4: ASX200 index (level at the end of the quarter) compared to the aluminum production



Source: Bloomberg; DIIS (2019)

Synergies argues that Gladstone-based producers are more sensitive to adverse events than Australian producers more generally.[23] Synergies points to redundancies in 2016 by Queensland Alumina Limited which Synergies argues were in response to deteriorating market conditions. We do not believe that this one event provides evidence to support Synergies' position that the betas of mining and industrial services companies should be taken into account when considering comparators for GAWB's beta. To support its argument, we would expect evidence that the redundancies were related to systematic factors (not simply price changes), that the event led to a change in production volumes that affected the industrial company's water demand, and that the change in water demand affected GAWB's revenues. We have not seen this evidence.

Other industrial customers

GAWB's other large industrial customers are a mix of electricity and gas companies. [redacted]

Synergies argues that while the electricity generators' revenues tend to be less sensitive to commodity market conditions, they must still participate in the competitive national energy market. Synergies points to evidence from IPART that determined an asset beta of 0.58 for an electricity generation proxy industry and concludes that a water utility with significant exposure to this sector would face higher systematic risk.[24]

[23] Synergies (2019), page 33.

[24] It is worth noting that this asset beta is not comparable to Synergies' estimate for GAWB as IPART uses a different de-levering approach.

As with the refineries, we consider that electricity generation companies' revenue will largely be volatile due to price movements and not 'volume' changes. As long as their generation remains relatively constant their water demand will also remain relatively constant. Synergies has not provided evidence that water demand by these electricity generators is volatile or that this volatility is caused by systematic reasons. This means that even if electricity generators face higher systematic risk it need not be the case that their water supplier is affected.

As noted above, around 95% of GAWB's proposed 2020-25 revenue is from fixed charges, so variations in these customers' water demand from systematic risks are unlikely to have a material impact on GAWB's revenues.

GAWB's revenue volatility compared to Seqwater

Synergies provided a figure (Figure 8) comparing GAWB's and Seqwater's revenue between 2012 and 2018 to illustrate that GAWB had more volatile revenue than Seqwater.

We appreciate that this figure may show, for this period, that GAWB had more volatile cash flow than Seqwater, but it does not prove by itself that GAWB has different systematic risk from Seqwater (or even that the revenue volatility is systematic).

Offsetting factors

Even if variability in demand for GAWB's water is more systematic than for the companies in the comparator sample, there are several offsetting factors (i.e. factors that reduce the extent to which systematic variability in demand and/or prices is translated into systematic variability in GAWB's revenue), in addition to its largely fixed charge pricing structure.

Revenue cap and long-term contracts

GAWB's price monitoring is based on a hybrid revenue cap. This means that while GAWB would be exposed to 10% revenue gain/ loss during a given revenue determination period, its prices would be reset in the following period to account for change in its customer base going forward. As the risk of over-/under-recovery should be symmetric, any under-recovery in one period may be covered by an over-recovery in a subsequent period.

We also note that GAWB encourages the use of long-term contracts with large fixed price elements. This should further reduce any systematic volatility in its revenues. In their submissions on GAWB's proposal, both Wiggins Island Coal Export Terminal and Callide Power Management highlighted that they were on long-term contracts (with initial terms of at least 20 years).[25] GAWB does also use short-term contracts. However, we understand these typically include a significant premium.

There is a question of whether GAWB's remaining customers could absorb an increase in prices if one (or more) of its industrial customers ceased operations. This is raised by Synergies when it states that "*it is not certain that in the event of one or two large customers ceasing operations and disconnecting their water supply, GAWB would be able to fully recover its costs from all remaining customers.*"[26] We consider that this becomes a question of whether this is a systematic risk or a (partial) stranding risk. As Synergies noted earlier in its report:

> *"a concentrated customer base heightens the prospect of stranding risk, which is asymmetric and therefore not compensated through the CAPM"*[27]

If a customer(s) ceased operations and the revenue stream could not be replaced, or recovered from other customers, then this would represent an asymmetric risk that should not be compensated through the asset beta.

[25] Wiggins Island Coal Export Terminal (2019), page 2 and Callide Power (2019), page 4.

[26] Synergies (2019), page 36.

[27] Synergies (2019), page 32.

Market power

Synergies argues that the existence of market power will have a mitigating effect on systematic risk. This is because a firm that possesses market power can exercise this power to its advantage.[28]

Synergies notes that GAWB has market power as it is the only bulk water supplier in the Gladstone region. On the other hand, Synergies highlights that GAWB's industrial customers are large and well-informed and may be able to exert countervailing power in negotiations with GAWB. We agree that GAWB's customers may be able to exert some countervailing power in negotiations, but as GAWB remains the only water supplier this is likely to be limited (which underscores why GAWB is subject to regulation). We understand that any entity that takes water from GAWB is bound by its standard terms and conditions.

Synergies concludes that any existence of market power does not mitigate GAWB's systematic risk exposure any more than it does for listed water utilities or Seqwater. Overall, we agree with Synergies' conclusion that GAWB has comparable market power to that of our comparator sample.

While Synergies has not set this out in relation to market power, we note that earlier in its report it argues that:

> *"GAWB's commercial arrangements are different from what we typically observe in other regulated sectors, such as rail and ports. Therefore, they do not provide the same degree of revenue smoothing or protection to the infrastructure provider.*
>
> *Consequently, while GAWB may benefit from some commercial protections not extended to other industrial services companies, these arrangements typically apply only for the duration of the regulatory period. Beyond that point, GAWB is susceptible to customers adjusting their reservations, including through managerial decisions which are likely to bear close correlation with broader economic conditions."*[29]

However, even if GAWB's commercial arrangements typically only apply for each regulatory period, and it is not clear to us that this is the case, its market power means that it can recover its required revenue over future regulatory periods.

Pricing structure

Coupled with the long-term contracts, GAWB appear to have price structures in place that attempt to match its cost structures (which are primarily fixed). This is reflected in approximately 95% of its proposed revenue coming from fixed charges.

Summary

Our assessment of the systematic demand risk faced by GAWB and the comparator set is summarised in the table below. Overall, we do not consider that there is convincing evidence that GAWB faces greater demand risk than the comparator sample. Even if some industrial customers had a greater income elasticity of demand than the comparator sample, GAWB is largely protected from demand fluctuations because of its pricing structure (high proportion of fixed costs), form of regulation, and long-term contracts.

[28] Synergies (2019), page 36.

[29] Synergies (2019), page 30.

Table 3.3: Relative systematic risk exposure – Income elasticity of demand

GAWB	Water utilities sample	Sample's systematic risk relative to GAWB's
• Larger proportion of industrial customers than the comparator sample. However, this does not clearly result in increased systematic demand risk. • Hybrid revenue cap and generally long-term contracts (with significant fixed charge elements) in place that reduce demand volatility.	• Greater proportion of revenue from households, however this does not necessarily mean a lower income elasticity of demand compared to GAWB's customer mix. • Typically, the companies in the sample operate under some form of regulation (price cap, rate of return, or revenue cap).	■

▼ = Lower ▲ = Higher ◀▶ = Different ■ = Similar

3.2.3. Growth opportunities

Growth opportunities (or options) relate to the real options for companies to increase their revenue streams from providing alternative or additional products. In other words, if there is a positive economic shock, the value of companies with material growth options should increase more strongly than those without as investors will place more value on these growth options. Such companies can therefore be expected to have a higher asset beta. It is important to note that growth options are related to growth that is over and above what might be normally expected from the company given its existing range of services/ service areas. For example, the introduction of new products or a significant expansion of the network to service new customers producing a significant new volume of demand.

Synergies considers that water utilities may pursue investment opportunities to accommodate increased demand or to improve drought resilience and indicates that GAWB may consider some investments in risk mitigation in the coming years. Synergies refers in particular to the Gladstone-Fitzroy pipeline project and argues that the project's cashflows are likely to correlate with the economic conditions of the businesses that utilise the pipeline for supply continuity.

Our analysis of growth opportunities focuses on the company's ability to increase its delivered volumes (and therefore revenue) over and above stable growth, and the value investors place on this. While investors value capital investment if it increases returns, we consider that capital investment should be a consequence of growth options rather than a driver.

The existence of an option to proceed with the Gladstone-Fitzroy pipeline might provide some evidence that a growth opportunity for GAWB exists. The QCA has advised us that the triggers for this project are if demand exceeds a certain level or if the Awoonga dam level falls below a certain threshold. These triggers suggest that the Gladstone-Fitzroy pipeline is not in fact a substantial growth opportunity. The project exists as either a risk mitigation measure to ensure currently delivered services can continue or it exists to meet future demand.[30] In the former case this is not strictly a growth opportunity, while in the latter our comparator sample has sufficiently similar characteristics to GAWB, as we argue in the next paragraph. Synergies' statement that the "*cashflows derived from water supplied through these [Gladstone-Fitzroy pipeline] projects, if implemented, are likely to correlate with the economic conditions of the businesses that utilise the pipeline for supply continuity*" does not appear to be supported by the regime. We understand that if triggered, the capital expenditure would enter GAWB's asset base and be recovered from its customers on the same basis as the rest of its asset base.

For water utilities, which are geographically constrained to their service area and likely limited in their service offerings, such opportunities, for example new connections, are provided primarily by population growth. This has a cyclical element, as economic conditions may increase net inwards migration to the utility's service region. We do not have sufficient information to conclude that the Gladstone area is going to experience significantly different

[30] Synergies (2019), page 37.

population growth compared to the areas served by the companies in the comparator sample. We note that Brazilian companies may have greater growth opportunities given the lower penetration of water networks in the country. However, even if population growth or access to water services were materially different, the regulatory regimes under which GAWB and the comparators operate would mitigate the value of growth opportunities.

We also note that some of the comparators earn significant revenue from other services, for example waste management. These services are likely to have higher elasticity of demand than water. We consider it reasonable to assume that GAWB's systematic growth opportunities would not be higher than these companies.

Table 3.4: Relative systematic risk exposure – Growth options

GAWB	Water utilities sample	Sample's systematic risk relative to GAWB's
• Largely limited to new connections from population growth or new industrial connections.	• Similar to GAWB i.e., largely limited to new connections from population growth or new industrial connections. • Some companies in the comparator sample may have greater growth opportunities due to the other sectors they operate in.	■ / ▲

▼ = Lower ▲ = Higher ◀▶ = Different ■ = Similar

3.2.4. Operating leverage

Operating leverage represents the ratio of fixed costs to variable costs. The higher the proportion of fixed costs, the higher the operating leverage. Typically, if a company operating in a competitive market has a higher proportion of variable costs to fixed costs, then it will be able to change its variable costs as economic conditions change to a greater extent than a company with higher operating leverage. As a result, volatility in profits (and thus the asset beta) would be relatively lower.

Consistent reporting of costs as fixed or variable is generally not available. As a result, assessments of operating leverage typically rely on proxy measures, including those based on accounting costs and revenues (e.g., EBIT growth/revenue growth) and on cash flows (for example, capital expenditure/RAB, operating cashflow/revenue, free cash flow/revenue). All such proxy measures suffer from limitations.

Synergies notes that it is unclear whether GAWB's operating leverage would differ materially from that of comparable water utilities. Synergies points to the establishment of water connections with the LNG facility at Curtis Island as an example of a project that has high fixed costs which might be atypical for a water utility that has a stronger residential focus. Synergies argues, however, that overall any impacts from differences in the customer base will only "*marginally manifest*" themselves through differences in operating leverage.[31]

We agree with Synergies' view that an *a priori* assessment of operating leverage does not seem to suggest a material and systematic difference between GAWB and the comparators. All the comparators are likely to have large fixed asset bases and limited scope to increase/ reduce operating expenditure in the event of a systematic shock.

In addition, we note that in the case of GAWB (and those comparators who are subject to rate of return or revenue cap regulation) the impact of operating leverage on the asset beta is dampened by the relationship between revenue and the RAB. Under these regulatory frameworks, the company's allowed revenue increases with the RAB regardless of fluctuations in demand, limiting the impact of fixed costs on earnings volatility.

[31] Synergies (2019), page 37.

Table 3.5: Relative systematic risk exposure – Operating leverage

GAWB	Water utilities sample	Sample's systematic risk relative to GAWB's
• High operating leverage. • Regulatory framework provides protection.	• Also, high operating leverages. • Regulatory framework provides protection.	■

▼ = Lower ▲ = Higher ◀▶ = Different ■ = Similar

3.2.5. Summary

Our relative risk analysis indicates that GAWB's systematic risk is similar to that of the comparator set. This is because:

- our findings do not support the proposition that GAWB's industrial customers' water demand varies in a way that would create more systematic risk for GAWB's revenues and costs compared to the water utilities in the comparator sample; and
- GAWB's pricing structure ensures that only a small proportion of its revenue is variable, and its hybrid revenue cap provides it with protection for material (greater than 10%) under or over recovery in a similar way to the comparators in the sample.

Therefore, we do not consider that we need to add an additional group of comparators (such as Synergies' approach discussed in the text box below) to estimate an asset beta for GAWB. While GAWB's growth options may be lower than the comparator group, we do not consider that this would lead to materially different systematic risk from the sample.

Box 1: Synergies' inclusion of mining and industrial services companies in its sample

Synergies included four mining and industrial services companies into its broader comparator sample on the basis of GAWB's customer mix.

We do not consider that Synergies has presented evidence that demonstrates that GAWB's customer mix would lead to an increase in GAWB's systematic risk, and therefore we do not consider that there is a justification for including industrial companies in our sample. Even if there was, GAWB's pricing structure and market power would mitigate this risk.

We do not consider that including mining and industrial companies simply on the basis that some companies in this broad sector might be similar to some of GAWB's customers would be a robust way to make an adjustment even if it were justified. Synergies' approach assumes that the systematic demand risk of mining and industrial companies is passed through on a one-to-one basis to GAWB. In addition, the way in which Synergies includes mining and industrial services companies in its sample leads to an arbitrary adjustment. As Synergies reports the average across its sample(s), the impact of including mining and industrial companies is dependent on the relative mix of mining and industrial customers to water utility companies in the sample. This means the number of mining and industrial services companies making it through Synergies' filter affects the sample average.

3.3. Asset beta estimation

As outlined in the sections above, asset beta (unlevered beta) is a measure of a company's inherent or systematic risk. There are several different approaches to estimating the asset beta and we have applied the following:

- **Data source** – We have relied upon data from Bloomberg.
- **Period of estimation** – We have set this at Period A (five years to 30th August 2019), Period B (five years to 30th August 2014).
- **Choice of index** – We have used the local market index for each stock as identified by Bloomberg.

- **De-levering assumption** – We estimate equity betas and then de-lever these using the QCA's preferred approach, the Conine formula, to obtain asset betas. We have applied a debt beta of 0.12, the average effective tax rate based on Bloomberg data, and average gearing.
- **Periodicity** – We have used two methods to set periodicity:
    - Weekly – We estimate the returns for every business day in the estimation period from the business day exactly one week prior. We undertake separate regressions for each of these 'reference days', meaning there are five separate regressions for each comparator in our sample. We then take an average of these beta estimates.
    - Four-weekly – We believe there is value in considering lower frequency estimates of beta. We have applied a similar technique to weekly and have applied a rolling four-weekly window.

Below we set out our reasons for our choice of 'period of estimation' and 'periodicity'.

Period of estimation

We have chosen to estimate asset betas for two separate five-year periods. This allows us to assess how the betas for our water utilities samples have changed over time. This can help us identify whether there are any changes in the asset betas over time that may need investigating, but also provides a range of beta values.

We consider that a five-year period is a sufficiently long period to estimate the equity beta over, while reducing the risk of the beta capturing trends from less relevant periods. As Aswath Damodaran, Professor of Finance at the Stern School of Business at New York University, points out:

> *"By going back further in time, we get the advantage of having more observations in the regression, but this could be offset by the fact that the firm itself might have changed its characteristics, in terms of business mix and leverage, over that period. Our objective is not to estimate the best beta we can over the last period but to obtain the best beta we can for the future."*[32]

The five-year estimation period also aligns with GAWB's pricing period.

As we are attempting to estimate the best forward-looking asset beta to apply for the next price monitoring period, we consider that the recent evidence (Period A) should be considered more relevant. Period B provides additional information and a check to our Period A estimate. Synergies also uses a five-year estimation period.

Periodicity (returns frequency)

The returns frequency determines the period over which returns are calculated. Conventional options include daily, weekly, monthly, and annual returns, although theoretically, return frequency can be any discrete period over which prices are recorded.

Using a higher return frequency (e.g., daily) increases the number of observations in the OLS regression, however this may introduce a non-trading bias. A non-trading bias is when the equity stock in question does not trade every day, but the market does. This systematically reduces the correlation with the market index for reasons that do not represent market risk.

We have calculated the equity betas on the basis of four-weekly and weekly observations. The four-weekly results were calculated by estimating equity betas for each of the 20 possible reference trading days (1st day to 21st day, 2nd day to 22nd day, etc) in a four-weekly period and then averaging the results. Similarly, the weekly results were estimated for each of the five possible reference days (Monday to Monday, Tuesday to Tuesday, etc), with the results averaged. This approach is intended to reduce the small risk of estimation error resulting from the choice of reference day. Bloomberg, for example, provides equity beta estimates using the last trading day of the period i.e.

[32] Damodaran (undated), 'Estimating Risk Parameters', accessed on 19 November 2019: http://people.stern.nyu.edu/adamodar/pdfiles/papers/beta.pdf

end of month for monthly periodicity. There is evidence that the choice of reference day has a material impact on beta estimation.[33] We want to minimise the impact from an arbitrary choice of reference day.

The method we have used for the periodicity of the beta estimation is in line with the one adopted by the New Zealand Commerce Commission since 2016, which included weekly and four-weekly estimates. It is also consistent with the approaches used by advisors to regulators and regulated companies.[34] The four-weekly approach avoids the issue associated with choosing a specific reference day (e.g., last day of the month) that will differ from month to month, i.e., it provides a monthly frequency without the end of month differences.[35]

Synergies' approach is to estimate betas using end of month returns.

3.3.1. Asset beta estimates

The table below provides our estimates of asset beta using the method described above. While the comparator sample includes countries listed by FTSE Russell as 'Advanced emerging', these countries have less developed financial markets and regulation compared to Australia. Therefore, we have included in the table an average for the sub-sample of companies in FTSE Russell 'Developed' countries as another comparison point.

[33] NZCC (2016), 68.

[34] For example, see SFG (2013) and Indepen (2018).

[35] We note that a four-weekly approach has its own disadvantage if the underlying assumption is that the regression analysis should be done on the basis of when days fall in a calendar month. For example, the Monday in the third week in each calendar month is not the same as the Monday in the third week of each four-week 'month'. The longer the period of the analysis the further away a four-weekly approach will get from a calendar month analysis.

Table 3.6: Estimates of asset beta

	Period A		Period B	
	Weekly	Four-weekly	Weekly	Four-weekly
China Water Affairs Group	0.51	0.54	0.55	0.57
American Water Works Co Inc	0.25	0.13	0.40	0.33
American States Water Co	0.35	0.04	0.57	0.60
CIA Saneamento Minas Gerais	0.55	0.70	0.37	0.39
California Water Service Group	0.40	0.29	0.49	0.48
Easter Water Resources Dev. & Man.	0.36	0.39		
Middlesex Water Co	0.47	0.27	0.51	0.50
Pennon Group PLC	0.44	0.45	0.35	0.35
CIA Saneamento Do Parana-PRF	0.45	0.59		
CIA Saneamento Basico De SP	0.66	0.64	0.46	0.39
Suez	0.48	0.42	0.46	0.61
SJW Group	0.32	0.32	0.63	0.60
Severn Trent PLC	0.41	0.45	0.31	0.28
TTW PCL	0.33	0.30	0.40	0.50
United Utilities Group PLC	0.39	0.42	0.29	0.25
Veolia Environnement	0.52	0.48	0.72	0.80
Aqua America Inc	0.34	0.27	0.50	0.43
York Water Co	0.45	0.18	0.49	0.41
Mean	**0.43**	**0.38**	**0.47**	**0.47**
Mean ('Developed' countries)	**0.40**	**0.31**	**0.48**	**0.47**
Median	**0.43**	**0.40**	**0.48**	**0.45**
Median ('Developed' countries)	**0.40**	**0.31**	**0.49**	**0.45**

Source: Bloomberg; CEPA analysis

The estimates in the table above show that the asset beta mean for the whole sample varies between 0.38 and 0.47 depending on the period and approach, and the mean for companies in developed countries is between 0.31 and 0.48. On average the asset beta appears to have fallen between Period B and Period A.

Period A provides the most recent evidence and therefore we assume that it will provide a more appropriate predictor of future market conditions.

We note that for three companies – American Water Works Co Inc, American States Water Co and York Water Co – the Period A four-weekly regression returns very low asset betas compared to their weekly beta estimates (between 48% and 89% lower). These estimates have a significant impact on the means. Removing these estimates increases the mean to 0.44, and the developed countries mean to 0.38 (but with a sample size of nine). While, there does not appear to be any specific issues with the underlying data, we note that the four-weekly beta estimates have significantly fewer observations than weekly (65 compared to 260). A small number of observations coupled with significant price movements from month to month can lead to materially different results than the weekly beta estimates.

Ignoring the Period A four-weekly results, the range over our sample means is 0.40 to 0.48, and 0.40 to 0.49 for the medians. The ranges for Period A weekly results are 0.40 to 0.43 for the means and 0.40 to 0.43 for the medians.

QCA also asked us to estimate the betas using a ten-year period (i.e., Period A and B combined). The detailed results are provided in Appendix D. For the ten-year period, the full sample mean varies between 0.44 and 0.45 and the mean for companies in developed countries varies between 0.40 and 0.45. The median ranges are 0.40 to 0.47 and 0.38 to 0.46 respectively.

3.3.2. Regulatory precedent

The table below sets out recent regulatory precedent on estimates of asset beta for water utilities. Most regulatory decisions provide the equity beta used directly in the WACC calculation.

Comparing different Australian regulators' beta estimates is complicated as they adopt different approaches to de-levering and re-levering. To enable comparability to QCA's preferred approach, we have used the equity beta estimates in other regulators' decisions and obtained asset betas using the Conine formula. We have made the following assumptions to obtain asset betas:

- A corporate tax rate of 30%, a gamma of 0.484 resulting in an imputation adjusted tax rate of 15.48%.
- A debt beta of 0.12.
- The regulator's chosen gearing level (shown in the table below).

We believe this approach provides reasonably comparable asset betas. The equity beta, and not the asset beta, is what is used in the capital asset pricing model to determine the cost of equity for the regulated companies. As we are de-levering and re-levering on a consistent basis, the asset beta estimates lead to the same equity betas set by the regulators and therefore the same cost of equity. This does mean that the asset betas shown in the table below are not comparable to the asset betas provided in the regulatory decisions examined.

Table 3.7: Recent regulatory precedent – Asset beta

Regulator	Company(ies)	Decision	Equity beta	Gearing	Asset beta
ESC	Melbourne Water	2016	0.65	60%	0.35
ESC	Goulburn-Murray Water	2016	0.70	60%	0.38
ESCOSA	SA Water	2016	0.70	60%	0.38
ERA	Water Corporation, Aqest and Busselton Water	2016	0.70	55%	0.41
ICRC	Icon Water	2018	0.70	60%	0.38
IPART	Various[36]	2019	0.70	60%	0.38
OTTER	TasWater	2018	0.65	60%	0.35
QCA	GAWB	2015	0.64	50%	0.40
QCA	Seqwater	2018	0.77	60%	0.41
QCA	Sunwater and Seqwater (irrigation) – draft decision	2019	0.755	60%	0.40

Source: ESC (2016a); ESC (2016b); ESCOSA (2016); ERA (2017); ICRC (2018); IPART (2019a); OTTER (2018); QCA (2018); Incenta (2017); QCA (2019); CEPA analysis

A further potential comparison is to regulated electricity networks in Australia. This is because the move to a hybrid revenue cap regime from 2015 onwards moved GAWB's regulatory framework closer to that of Australian electricity

[36] This is IPART's mid-point equity beta estimate that it has adopted for recent decisions for the water industry up to this date.

networks. The most recent AER decision provided an equity beta of 0.60.[37] This results in a lower asset beta, of 0.33, when compared to recent regulatory decisions by water regulators.

3.4. SUMMARY

We are inclined to place more emphasis on weekly estimates in Period A, which provides a mean range between 0.40 and 0.43, for both the developed countries sub-sample and the whole sample. As noted above:

- Period A provides the most recent evidence and is more appropriate to use for a future period. This is consistent with Synergies' use of a recent five-year period.
- The four-weekly beta is producing 'outlier' results for three companies in Period A.

Therefore, our proposed range is 0.40 to 0.43. This range is largely within the regulatory precedent range, but it is towards the top end. We note that if a 10-year period is used the estimated asset beta range is slightly higher at 0.44 to 0.45.

While Synergies proposed an asset beta of 0.45 for GAWB, in contrast to our analysis Synergies:

- estimated a mean asset beta of 0.48 using a sample of 11 water utilities; and
- estimated a mean asset beta of 0.55 using its water utilities sample plus four mining and industrial services companies.[38]

Appendix B provides a comparison between Synergies' and our estimates of the asset betas for companies that appear in Synergies' and our samples. Of note, we have included Veolia in our water utility sample. Synergies includes Veolia in its wider sample as a mining and industrial services company. We also note that, similar to our method, Synergies used a five-year period to estimate the betas.

We consider that our approach, and asset beta range, is more appropriate for GAWB compared to Synergies' on the basis that:

- Our relative risk assessment does not indicate that GAWB's customer mix would result in a materially different systematic risk than our water utilities sample. Therefore, we see no reason to include mining and industrial services sector companies in our sample.
- We have a larger sample of water utilities and each of the estimates of asset beta use a larger sample of observations as a result of our methodological choices.
- Synergies' sample has a heavier weight on companies in developing countries than ours. Of its sample of 11 water utilities, only four operate in FTSE Russell developed countries. The remaining seven companies operate in Brazil, Chile (which is classified as 'Secondary emerging'), Thailand, Hong Kong and Estonia. If we use Synergies' estimates of asset beta for those four companies that operate in the UK and US, the average asset beta is 0.37.[39]

Notwithstanding the above, the top end of our proposed range of 0.40 to 0.43, is only slightly below GAWB's proposal of 0.45. and our 10-year asset beta estimate range of 0.44 to 0.45 is in line with GAWB's proposal.

[37] AER (2018a).

[38] Synergies (2019), pages 29 to 30.

[39] If Veolia is included in Synergies' estimate the average asset beta would be 0.38.

4. CAPITAL STRUCTURE AND CREDIT RATING

In this section we set out our consideration of the reasonableness of GAWB's proposed capital structure and credit rating. In this context, when we refer to capital structure, we are referring to companies' gearing (debt to capital) levels.

GAWB has proposed the same gearing level for 2020-25 as it proposed for the 2015-20 pricing period. QCA, in its 2015-20 price monitoring decision also determined that a 50% gearing target was reasonable. GAWB has also proposed the use of a BBB credit rating.

To determine whether this proposed gearing level is reasonable we have examined two pieces of evidence:

- The gearing levels and, where available, the credit ratings of our comparator sample.
- Recent regulatory precedent for water utilities.

Our analysis is set out below.

4.1. COMPARATOR SAMPLE

The table below provides the estimates of gearing for our comparator sample for Period A, and their associated credit ratings.

Table 4.1: Gearing and credit ratings for comparator sample

Company	Average five-year gearing	Credit rating
United Utilities Group PLC	54%	BBB+
Severn Trent PLC	50%	BBB
Suez	50%	A-*
Veolia Environnement	44%	BBB
Pennon Group PLC	44%	
CIA Saneamento Minas Gerais	43%	BB-*
China Water Affairs Group	42%	BB+
CIA Saneamento Basico De SP	36%	BB-
CIA Saneamento Do Parana-PRF	35%	BB*
American Water Works Co Inc	35%	A
SJW Group	29%	A-
California Water Service Group	29%	A+
Aqua American Inc	25%	BBB*
Easter Water Resources Dev. & Man.	25%	
Middlesex Water Co	22%	A
York Water Co	19%	A-
American States Water Co	17%	A+
TTW PCL	14%	
Mean	34%	

Source: Bloomberg; CEPA analysis Note: S&P local long-term rating used where available. * Moody's rating converted to S&P rating to assist with comparability.

We also examined gearing ratios for our comparator sample for Period B. The average is higher at 40%. Despite a different comparator sample, Synergies' mean gearing, 39%, is similar to ours. GAWB reports an actual gearing level of 41%.[40] However, this value is based on its book value of equity while the comparator estimates are based on market capitalisation.

The lowest possible rating to still be considered "investment-grade" by S&P is BBB-. Of those companies where we could obtain a credit rating, four had ratings below BBB-. Three operate in Brazil and one operates in Hong Kong. If we focus only on developed countries, which we consider to be a better comparison to Australia, all companies have credit ratings that exceed BBB with several companies having much higher credit ratings. For those companies that have credit ratings in the BBBs – United Utilities Group, Severn Trent, Veolia Environnement, and Aqua American – the mean gearing is 43%. The UK incorporated companies, United Utilities and Severn Trent, operate under regulatory regimes most similar to QCA's building block approach.

4.2. REGULATORY PRECEDENT

The table below provides the assumed gearing levels and credit ratings for recent regulatory decisions for water utilities. Of those regulatory decisions for water utilities we reviewed, the most common notional gearing assumption applied was 60% with a BBB credit rating.

Table 4.2: Recent regulatory decisions for water utilities – Gearing and credit rating

Regulator	Water utility	Year	Gearing	Credit rating*
ESC	Melbourne Water	2016	60%	BBB
ESC	Goulburn-Murray Water	2016	60%	BBB+**
ESCOSA	SA Water	2016	60%	BBB
ERA	Water Corporation, Aqest and Busselton Water	2017	55%	BBB
ICRC	Icon Water	2018	60%	BBB
IPART	Various[41]	2019	60%	BBB
OTTER	TasWater	2018	60%	BBB
QCA	Gladstone Area Water Board	2015	50%	BBB
QCA	Seqwater	2018	60%	BBB
QCA	Sunwater and Seqwater (irrigation) – draft decision	2019	60%	BBB

*Source: ESC (2016a); ESC (2016b); ACCC (2012); ESCOSA (2016); ERA (2017); ICRC (2018); IPART (2019a); OTTER (2018); QCA (2018); Incenta (2017); QCA (2019); CEPA analysis. * Where the regulator has not been explicit about the credit rating, we inferred it from the index used to estimate the cost of debt. **The ESC used the ACCC 2012 pricing principles.*

[40] GAWB (2018), page 56.

[41] These are the parameters that IPART's has adopted for recent decisions for the water industry up to this date

4.3. SUMMARY

While GAWB's proposed 50% gearing level is below the Australian regulatory precedent levels, it is above the average gearing level observed in our comparator sample. However, a 50% gearing level is in line with two UK-listed water utilities. Considering GAWB's evidence, we have not identified evidence that GAWB's capital structure would have changed since QCA's previous determination of 50%.

We have not uncovered evidence that a BBB credit rating assumption is unreasonable for GAWB. Evidence from regulatory precedent in Australia uniformly supports the use of a BBB credit rating for water utilities. On the basis of the above evidence, we consider that GAWB's proposal of 50% gearing and a credit rating of BBB is reasonable.

5. DEBT RISK PREMIUM

The QCA requested that we estimate the debt risk premium (DRP) using its preferred approach (see Section 2.1). This involves using both Bloomberg and RBA data and taking an average.

A key input into the DRP is the assumed credit rating of the notional firm. The previous section discusses this, and we proceed using an S&P BBB rating.

5.1. METHOD USING RBA DATA

To estimate the DRP using RBA data we followed the instructions in the AER Rate of Return Instrument.[42] The steps required to estimate the DRP using RBA data were as follows:

1. We used linear extrapolation to calculate the exact 10-year term to maturity yield for non-financial corporate BBB-rated bonds.[43]
2. We used linear interpolation to calculate the daily yields for a target term to maturity of 10 years for Commonwealth Government Securities (CGS).[44]
3. We converted the estimated yields in (2) to annual effective rates, assuming semi-annual compounding, and estimated the risk-free rate for the 20-business day averaging period to 30th August 2019.[45]
4. We used linear interpolation to calculate the daily band spread to CGS as calculated in (2) for our estimates in (1).[46]
5. We converted the estimate in (4) to annual effective rates, assuming semi-annual compounding.[47] We estimated the cost of debt for the 20-business day averaging period to 30th August 2019.
6. We subtracted our estimate of the risk-free rate in (3) from our estimate of the cost of debt in (5).

5.2. METHOD USING BLOOMBERG DATA

To estimate the DRP using Bloomberg data we:

1. Extracted the relevant index from Bloomberg.[48]
2. Calculated the annual equivalent rate assuming semi-annual compounding.
3. Estimated the cost of debt for the 20-business day averaging period to 30th August 2019.[49]
4. Subtracted the estimate of the risk-free rate as detailed in the sub-section on the RBA method above to estimate the DRP.

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[42] AER (2018b).

[43] Clause 14, AER Rate of Return Instrument.

[44] Clause 16, AER Rate of Return Instrument.

[45] Clause 5 and 6, AER Rate of Return Instrument.

[46] Clause 17 and 18, AER Rate of Return Instrument.

[47] Clause 12, AER Rate of Return Instrument.

[48] BVCSAB10 Index – AUD Australia Corp BBB 10Y

[49] Bloomberg does not provide a value for the BVCSAB10 Index for the 5th of August, which would be the first day in the 20-business day averaging period. We have interpolated the 5th August value by taking the average between the 2nd of August and the 6th August. This assumes a linear trend between these two values. A 20-business day averaging period from the 5th August is consistent with our approach for the risk-free rate.

5.3. SUMMARY

The table below provides our estimates of the DRP for a 20-business day averaging period to 30th August 2019 using the methods described above.

Table 5.1: Debt risk premium estimate (to 30th August 2019)

	RBA	Bloomberg	Average
CEPA	2.24%	1.88%	2.06%
Synergies	2.23%	1.86%	2.05%

Estimating the debt risk premium required the estimation of a risk-free rate. The estimation of the risk-free rate is an intermediate step when estimating the DRP using RBA data. Our estimate of the risk-free rate using RBA data is the same as Synergies, namely 0.94%.

Despite applying the same method, we arrive at slightly different estimates for the DRP than Synergies. This could be due to a number of reasons, including a slightly different averaging period being used or our adjustment to annualise semi-annual yields.

Appendix A COMPARISON OF ADVISER SAMPLES

Table A.1 overleaf compares our Period A comparator sample and the comparator samples produced by Synergies (2019) and Incenta (2015). The table includes the full Incenta sample, but Incenta based its conclusions on a sub-sample of these companies. Table A.2 indicates why a company was not included in our sample if Synergies or Incenta included it.

Table A.1: Comparator sample comparison table

Name of company	Country	CEPA sample	Synergies (2019)	Incenta (2015) full sample
Acque Potabili SPA	Italy			Yes
Aguas Andinas	Chile		Yes	
American States Water Co	US	Yes		Yes
American Water Works Co Inc	US	Yes		Yes
Aqua America Inc	US	Yes	Yes	Yes
Artesian Resources Corporation	US			Yes
AS Tallinna Vesi	Estonia		Yes	
Athens Water Supply & Sewage	Greece			Yes
California Water Service Group Holding	US	Yes		Yes
China Water Affairs Group	China	Yes	Yes	
Cia de Saneamento Basico do Estado de Sao Paulo	Brazil	Yes	Yes	
Cia de Saneamento de Minas Gerais-COPASA	Brazil	Yes		
Cia de Saneamento do Parana	Brazil	Yes	Yes	
Connecticut Water Service Inc	US			Yes
Consolidated Water Co Ltd	US			Yes
Dee Valley Group PLC	UK			Yes
Eastern Water Resources Development and Management	Thailand	Yes		
Eaux De Royans SA	France			Yes
Kangda International Environmental Co., Ltd.	China		Yes	
Middlesex Water Co	USA	Yes		Yes
Pennon Group	UK	Yes	Yes	Yes
Pure Cycle Corporation	US			Yes
Severn Trent	UK	Yes	Yes	Yes
SJW Group	US	Yes		Yes
Societe Dex Eaux De Douai	France			Yes
Thessaloniki Water & Sewage	Greece			Yes
TTW	Thailand	Yes	Yes	
Two Rivers Water & Farming Co	US			Yes
United Utilities Group	UK	Yes	Yes	Yes
York Water Co	USA	Yes		Yes
Suez	France	Yes		
Veolia Environnement SA	France	Yes		
Total number of companies		**18**	**11**	**21**

Table A.2: Reason for exclusion in our sample

Company	Included by	Stage removed	Reason for non-inclusion in CEPA preliminary sample
Acque Potabili SPA	Incenta (2015)	Stage 1	This company has been delisted.
Aguas Andinas	Synergies (2019)	Stage 4	This is a Chilean company. FTSE Russell categorises Chile as a "Secondary Emerging" market. We have excluded it on this basis.
Artesian Resources Corporation	Incenta (2015)	Stage 3	This company does not pass the liquidity filter.
AS Tallinna Vesi	Synergies (2019)	Stage 4	This is an Estonian company. FTSE Russell categorises Estonia as a "Frontier" market. Synergies included this company as Estonia is part of the European Union.
Athens Water Supply & Sewage	Incenta (2013)	Stage 4	We have removed this company as it is listed in Greece. Incenta removed this company in its sub-samples, on the basis of the economic conditions in Greece.
Connecticut Water Service Inc	Incenta (2013)	Stage 1	This company has been acquired.
Consolidated Water Co Ltd	Incenta (2013)	Stage 4	This is a company that operates in the Cayman Islands, Bahamas and the British Virgin Island, but listed in the USA.
Dee Valley Group PLC	Incenta (2013)	Stage 1	This company has been acquired.
Eaux De Royans SA	Incenta (2013)	Stage 3	This company does not pass the liquidity filter.
Kangda International Environmental Co., Ltd.	Synergies (2019)	Stage 4	This is listed on the Hong Kong stock exchange but Bloomberg classifies its "country of risk" as China.
Pure Cycle Corporation	Incenta (2013)	Stage 3	This company does not pass the liquidity filter.
Societe Des Eaux De Douai	Incenta (2013)	Stage 1	This company has been delisted
Thessaloniki Water & Sewage	Incenta (2013)	Stage 3	This company does not pass the liquidity filter.
Two Rivers Water & Farming Co	Incenta (2013)	Stage 3	This company does not pass the liquidity filter.

Appendix B ASSET BETA COMPARISON

Table B.1: Comparison between CEPA's and Synergies' asset beta estimates for the same company

Company	CEPA weekly estimate (Period A)	CEPA four-weekly estimate (Period A)	Synergies estimate*
United Utilities Group (PLC)	0.39	0.42	0.41
Severn Trent PLC	0.41	0.45	0.42
Pennon Group PLC	0.44	0.45	0.39
Aqua America Inc	0.34	0.27	0.32
Cia de Saneamento Basico do Estado de Sao Paulo (SABESP)	0.66	0.64	0.68
Companhia de Saneamento do Parana	0.45	0.59	0.67
China Water Affairs Group Limited	0.51	0.54	0.55
Veolia Environnement	0.52	0.48	0.38

**To two decimal places*

Appendix C STANDARD ERRORS

The table below sets out the standard errors from our regression of the equity betas.

*Table C.1: Standard errors for the sample**

	Period A		Period B	
	Weekly	Four-weekly	Weekly	Four-weekly
China Water Affairs Group	0.115	0.244	0.100	0.209
American Water Works Co Inc	0.073	0.162	0.053	0.106
American States Water Co	0.093	0.206	0.076	0.175
CIA Saneamento Minas Gerais	0.115	0.242	0.077	0.158
California Water Service Group	0.099	0.204	0.058	0.125
Eastern Water Resources Dev. & Man.	0.073	0.126		
Middlsex Water Co	0.116	0.256	0.065	0.108
Pennon Group PLC	0.083	0.184	0.062	0.143
CIA Saneamento Do Parana-PRF	0.094	0.183		
CIA Saneamento Basico De SP	0.081	0.176	0.073	0.148
Suez	0.069	0.153	0.063	0.133
SJW Group	0.118	0.252	0.076	0.142
Severn Trent PLC	0.077	0.149	0.071	0.150
TTW PCL	0.075	0.144	0.065	0.114
United Utilities Group PLC	0.079	0.175	0.065	0.143
Veolia Environnement	0.059	0.134	0.083	0.195
Aqua America Inc	0.076	0.156	0.055	0.132
York Water Co	0.118	0.238	0.074	0.139

* *The standard errors are calculated using a pooled standard error formula.*

Appendix D TEN-YEAR ASSET BETA ESTIMATES

Table D.1: Ten-year asset beta estimates (to 30 August 2019)

Company	Weekly	Four Weekly	Standard error (weekly)	Standard error (four weekly)
China Water Affairs Group	0.52	0.55	0.076	0.159
American Water Works Co Inc	0.35	0.25	0.044	0.095
American States Water Co	0.48	0.36	0.059	0.137
CIA Saneamento Minas Gerais	0.48	0.58	0.071	0.147
California Water Service Group	0.45	0.40	0.055	0.118
Eastern Water Resources Dev. & Man.	0.40	0.46	0.048	0.102
Middlsex Water Co	0.49	0.40	0.064	0.135
Pennon Group PLC	0.39	0.40	0.051	0.114
CIA Saneamento Do Parana-PRF				
CIA Saneamento Basico De SP	0.57	0.52	0.055	0.116
Suez	0.47	0.53	0.046	0.101
SJW Group	0.51	0.49	0.069	0.142
Severn Trent PLC	0.35	0.36	0.052	0.107
TTW PCL	0.39	0.46	0.048	0.087
United Utilities Group PLC	0.33	0.33	0.051	0.112
Veolia Environnement	0.63	0.66	0.053	0.124
Aqua America Inc	0.43	0.35	0.046	0.101
York Water Co	0.47	0.32	0.067	0.135
Mean	**0.45**	**0.44**		
Mean ('Developed' countries)	**0.45**	**0.40**		
Median	**0.47**	**0.40**		
Median ('Developed' countries)	**0.46**	**0.38**		

Note: 10-year regression period to 30/08/2019

Appendix E REFERENCES

Australian Competition and Consumer Commission (ACCC, 2012) *Water Charge (Infrastructure) Rules: Application by Essential Service Commission of Victoria for accreditation – Final Decision*, February.

Australian Energy Regulator (AER, 2018a) *Rate of return instrument – Explanatory Statement*, December.

Australian Energy Regulator (AER, 2018a) *Rate of return instrument*, December.

Bloomberg (2015) *Index Methodology – Global fixed Income*.

Callide Power (2019) *Submission to the Queensland Competition Authority (QCA): Gladstone Area Water Board 2020 Price Monitoring Investigation*, October.

CEPA (2019a) *Cost of capital for regulated fibre telecommunication services in New Zealand: Asset beta, leverage, and credit rating,* May.

CEPA (2019b) *Cost of capital for regulated fibre telecommunication services in New Zealand: Asset beta, leverage, and credit rating – Response to submissions*, a report prepared for the New Zealand Commerce Commission, October.

Department of Industry, Innovation and Science (DIIS, 2019) *Resources and Energy Quarterly June 2019*.

ERA (2017) *The efficient costs and tariffs of the Water Corporation, Aqwest, Busselton Water – Final Report*, November.

Essential Services Commission (ESC, 2016a) *2016 Water Price Review – Goulburn-Murray Water Determination*, June.

Essential Services Commission (ESC, 2016b) *Melbourne Water Price Review 2016 – Final decision*, June.

Essential Services Commission of South Australia (ESCOSA, 2016), *SA Water Regulatory Determination – Final Determination*.

Gladstone Area Water Board (GAWB, 2018) *Annual Report 2018*.

Gladstone Area Water Board (GAWB, 2019) *Bulk Water – Price Review: GAWB Submission 2021-25 Period - Part A*.

Incenta (2015) *WACC parameters for GAWB Price Monitoring Investigation 2015-20 – Final Report,* a report for the Queensland Competition Authority, May.

Incenta (2017) *Estimating Seqwater's firm-specific WACC parameters for the 2018-21 bulk water price investigation*, a report for the Queensland Competition Authority, November.

Indepen (2018) *Beta Study – RIIO-2: Main Report*, a report prepared for Ofgem, December.

Independent Competition and Regulatory Commission (ICRC, 2018) *Regulated water and sewerage services prices 2018-23: Final report (Report 1),* May.

Independent Pricing and Regulatory Tribunal (IPART, 2009) *Review of Rate of Return under the New South Wales Rail Access Undertaking; Rail Access — Discussion Paper*, February.

Independent Pricing and Regulatory Tribunal (IPART, 2018) *Review of our WACC method*, February.

Independent Pricing and Regulatory Tribunal (IPART, 2019a) *WACC Biannual Update (Fact Sheet)*, February.

Independent Pricing and Regulatory Tribunal (IPART, 2019b) *Estimating Equity Beta*, April.

Hoffmann, M., Higgs, H., Worthington, W., (Hoffmann et al, 2005) *Modelling residential water demand with fixed volumetric charging in a large urban municipality: the case of Brisbane, Australia,* June.

New Zealand Commerce Commission (NZCC, 2016) *Input methodologies review draft decisions – Topic paper 4: Cost of capital issues*, December

Office of the Tasmania Economic Regulator (OTTER, 2018) *TasWater – Water and Sewerage Price Determination Investigation*, May.

Queensland Competition Authority (QCA, 2015) *Gladstone Area Water Board Price Monitoring 2015-2020 – Final Report*, May.

Queensland Competition Authority (QCA, 2018) *Seqwater Bulk Water Price Review 2018-21*, April.

Queensland Competition Authority (QCA, 2019) *Rural irrigation price review 2020-2024: Part A: Overview – Draft report*, August.

S&P Global and MSCI (2018) *GICS® Global Industry Classification Standard*.

SFG Consulting (2013) *Estimation of beta for Australian water networks*, April.

Synergies (2019) *Review of the WACC for Gladstone Area Water Board*, a report prepared in the context of GAWB's 2020-25 regulatory period, September.

Wiggins Island Coal Export Terminal (2019) *Response to GAWB Proposal*¸ 28 October.

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