BEFORE THE

CALIFORNIA PUBLIC UTILITY COMMISSION

DIRECT TESTIMONY OF AKARSH SHEILENDRANATH

ON BEHALF OF

CALIFORNIA WATER SERVICE COMPANY

APPLICATION NO. 21-05-____

CONCERNING

COST OF CAPITAL

May 3, 2021

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I. INTRODUCTION AND SUMMARY

Q1: Please state your name and address for the record.

A1: My name is Akarsh Sheilendranath. My business address is The Brattle Group, One Beacon Street, Suite 2600, Boston, MA 02108, USA.

Q2: Please describe your current position and your education experience.

A2: I am a Senior Associate at The Brattle Group. My work concentrates on financial and regulatory economics as well as on transmission, renewables and wholesale electricity markets. I received an M.B.A. in Finance from New York University Stern School of Business and an M.S. in Electrical Engineering with a specialization in Power Systems Engineering from Michigan Technological University. Exhibit F, Schedule AS-2 contains a more detailed description of my qualifications.

Q3: Please describe your responsibilities at The Brattle Group.

A3: I work in the areas of cost of capital, investment risk, and related matters for many industries, regulated and unregulated alike. I have assisted numerous clients, including regulated utilities, ISOs/RTOs, public utility commissions, and private entities, and have testified and authored publications and reports on subject areas related to the cost of capital, including return on equity estimation, the economic benefits of transmission and generation investments, renewable generation integration, transmission congestion risks, transmission and resource planning, and a wide range of issues relating to wholesale energy and capacity markets. I have testified at public utility commissions and filed sworn affidavits and testimonies on behalf of energy market clients, including generation companies, on complex ISO/RTO market rule issues. I have also filed testimonies on behalf of utility clients in several ongoing FERC proceedings, including electric transmission companies in ISO/RTO footprints, on the return on equity estimation using the FERC's return on equity methodology.

Q4: What is the purpose of your testimony in this proceeding?

A4: I have been asked by the California Water Service Company ("Cal Water" or the "Company") to estimate the cost of equity that the California Public Utilities Commission (the "Commission" or the "CPUC") should allow the Company an opportunity to earn on the equity financed portion of their rate base. Specifically, I provide return on equity ("ROE") estimates derived from a sample of comparable risk, regulated water utility companies. I also consider the relative risk of the Company compared to the sample companies to arrive at my ROE recommendation.

Q5: Are you sponsoring any exhibits?

A5: Yes, I am sponsoring Exhibit F, which includes the following schedules:

Exhibit	Schedule	Description
F	**AS-2**	Resume of Akarsh Sheilendranath
F	**AS-3**	Summary of Cost of Equity Analyses

Q6: Were these attachments prepared by you or under your direction?

A6: Yes

Q7: Please summarize your recommended ROE for the California Water Company?

A7: My recommended range of ROE estimates for Cal Water is 10 percent to 10 ¾ percent. I understand that the Company is requesting a 10.35% ROE, which is at the middle of my recommended range. After reviewing risks specific to Cal Water and the area in which it operates, I find that Cal Water is above average-risk relative to the other water utilities in my proxy group sample. Cal Water faces high costs and operational uncertainty related to sourcing and treating groundwater. The company also incurs significant costs to mitigate risks associated with wildfires in the states. In addition, Cal Water's Water Revenue Adjustment Mechanism (WRAM) will be terminated in 2023, which increases the company's risk of under recovery of its fixed costs. Finally, Cal Water's capital expenditure program as a proportion of its assets is higher in comparison with other sample companies.

High capital expenditure coupled with increased revenue risks going forward further increases Cal water's business risk relative to the sample average. Therefore, I find Cal Water's request for a 10.35% ROE to be conservative. Table 1 below summarizes the estimates in support of my recommendation.

TABLE 1
SUMMARY OF REASONABLE RANGE OF ROE ESTIMATES
(FOR 53.4% EQUITY COMPOSITION)

	Core Sample	Expanded Sample
CAPM	10.0% - 11.1%	9.8% - 10.9%
ECAPM	10.0% - 11.6%	9.9% - 11.4%
DCF	7.3% - 10.3%	NA[1]
Risk Premium	9.7%[2]	9.7%[2]

Notes: 1 – DCF estimates cannot be calculated as growth rate projections for the two additional water companies in the expanded sample are unavailable.
2 – Risk Premium model is based on the relationship between historical authorized ROEs and the contemporaneous interest rates. The model yields a point estimate of the ROE. It does not employ a sample of companies in the ROE estimation calculations.

Q8: Please summarize the main steps in your analysis to estimate the return on equity capital for Cal Water?

A8: To estimate the Company's cost of capital, I analyzed a sample of water utilities, identified as being similar in business operations to Cal Water. I estimated the ROE for each sample company using both the risk positioning (i.e., Capital Asset Pricing Model) and the discounted cash flow ("DCF") approaches. The risk positioning approach consists of analyses based upon the Capital Asset Pricing Model ("CAPM") and the Empirical CAPM ("ECAPM"). The ROE estimates from both models are then adjusted to account for the differences in financial risk between the sample companies and Cal Water. For the risk positioning models, this is accomplished through adjustments to the beta estimate for a company. To perform this adjustment, I use the method originally proposed by Professor Robert S. Hamada to account for the differences in financial risk through adjustments to the beta estimate for a company. This procedure is common among finance practitioners and is well-established in academic literature. I present this method, which I refer to as the Hamada adjustment procedures, for the risk positioning analyses.

For DCF model estimates, I account for differences in financial risk by combining with market value capital structure information, the market costs of debt, and preferred stock for each sample company, and compute each company's overall cost of capital, i.e., its after-tax weighted-average cost of capital ("ATWACC").

Accounting for differences in financial risk results in an ROE that is consistent with both the financial risk inherent in the Company's proposed capital structure and the market-determined information on the sample's average overall cost of capital.

Finally, my analysis also develops an ROE estimate based upon an additional model—the Risk Premium model. To narrow the range of results across all the estimation models I employ, I weight more heavily certain implementations and scenarios of each model. I do this to capture the current uncertainty in the capital markets and the conditions that will prevail over the relevant rate period.

Q9: How does the prevailing uncertainty in the financial markets affect the cost of capital for a regulated utility such as Cal Water?

A9: Over the past year, financial markets have experienced historic levels of uncertainty because of the on-going COVID-19 pandemic. At the start of 2020, large portions of the U.S. economy were shut down as governments worked to contain infections. This resulted in significant declines in economic activity and increased unemployment. U.S. Government bond yields fell to historic lows due to flight-to-quality behavior by investors and monetary policy responses by the Federal Reserve. In addition, market uncertainty, as measured by the Chicago Board of Option's Volatility Index (VIX) reached historic highs of 82.69 on March 16, 2020, surpassing the previous high of 80.86 during the 2008 Financial Crisis.[1]

More recently, financial and economic conditions are improving as vaccine distribution accelerates and social distance measures are relaxed. U.S. real GDP increased by 4.3% in

[1] Bloomberg, accessed February 28, 2021.

the fourth quarter of 2020, after declining by 31.4% in the second quarter.[2] The Federal Reserve in their recent FOMC Statement notes that indicators of economic activity and employment levels have improved recently but there is still "considerable risk" to the economic outlook due to the on-going public health crisis.[3] Interest rates remain near historic lows with the yield on the 10-year U.S. Government Bonds currently at 1.73%.[4] It is clear that uncertainty from the COVID-19 pandemic continues to weigh on financial and economic conditions, although conditions are beginning to improve.

It is important to note that the cost of equity set forth in this proceeding is expected to be in place for 2022 to 2024. Therefore, it is important to consider the financial and economic conditions that will prevail going forward and not solely rely on current conditions that remain uncertain. Else, it could lead to inadvertently setting an ROE that may not be commensurate with normalized market conditions expected to prevail over the rate period. In Section III below, I further discuss capital market conditions and the impacts they have on inputs to the cost of equity estimation.

Q10: What is your conclusion on the market-determined cost of capital for Cal Water based on the results from your sample of regulated water utilities?

A10: The sample estimates from my analysis range from 7.3 percent to 11.6 percent. Given the elevated market uncertainty, for the risk-positioning model, I rely more heavily on the scenarios that account for forward-looking market expectations in the Market Risk Premium ("MRP") and whose estimates are appropriately adjusted for financial risk using the Hamada adjustments. For the DCF model estimates, at this time, I rely more heavily on the single-stage implementation. I also consider the ECAPM results from the Risk Premium Model as support of the estimates from the risk positioning and DCF models. My analysis, including

[2] Bureau of Economic Analysis, "Gross Domestic Product by State, 4th Quarter 2020 and Annual 2020 (Preliminary)", U.S. Department of Commerce, March 26, 2021. Accessed April 13, 2021, https://www.bea.gov/news/2021/gross-domestic-product-state-4th-quarter-2020-and-annual-2020-preliminary

[3] Board of Governors of the Federal Reserve System, "Federal Reserve issues FOMC statement," March 17, 2021, https://www.federalreserve.gov/newsevents/pressreleases/monetary20210317a.htm.

[4] U.S. Federal Reserve, H.15 Selected Interest Rates, as of March 30, 2021.

considerations of the various model inputs and assumptions in the context of the current capital market conditions, indicates a reasonable range of 10.0 percent to 10.75 percent for a rate regulated water utility company with a 53.4% equity capital structure.

To determine where my recommendation falls within this reasonable range, I evaluate the specific business risks of Cal Water relative to the other water utilities in my sample. Specifically, Cal Water's operations are primarily concentrated in California, which creates some unique challenges, for example, elevated operational risks due to the frequency and scale of wildfires.[5] The Company also sources a significant portion of its water supply from groundwater sources; this provides a lower cost source of supply for customers but creates additional uncertainties and risks (e.g. from contamination). Additionally, the recent Commission decision terminating Cal Water's Water Revenue Adjustment Mechanism (WRAM) effective on January 1, 2023, elevates the risk that Cal Water may not be able to recover fully its fixed costs, unless the actual sales match the adopted sales forecast. However, as witness Milleman testifies, over the last ten-year period of 2009-2020, the Company's actual sales have consistently been lower than the adopted sales forecast. If this trend were to continue, the termination of WRAM imposes new fixed-cost recovery risk for Cal Water. Finally, Cal Water's capital expenditure and operating leverage ratio are higher than the Sample average. At the same time, the company's revenue risks are greater with the termination on WRAM. A high operating leverage ratio and a large capital expenditure program, coupled with higher revenue risk, can impact the credit quality and the financial position of the company.

For all these reasons, I find Cal Water to have above-average business risk, relative to other water utilities in my sample.

5 See Exhibit I Testimony of Company Witness Robert Kuta.

Q11: What ROE do you recommend for Cal Water in this proceeding?

A11: Given the prevailing uncertainty in the financial markets, the downward pressure on risk-free rates, and the relative business risk on Cal Water's regulated operations compared with that of the water utility sample, I find a recommended range 10 to 10 ¾ percent for Cal Water on the equity financed portion of its rate base.[6] I understand that Cal Water is requesting a 10.35% ROE, which is in the middle of my recommended range. Therefore, I consider the request at 10.35% to be reasonable.

Q12: How is the remainder of your testimony organized?

A12: Section II formally defines the cost of capital and touches on the principles relative to estimating the cost of capital and the effect of capital structure on the cost of equity. Section III discusses the impact of the current capital market conditions on the cost of capital. Section IV discusses the selection of the water utility sample. Section V presents the methods used to estimate the cost of capital for the sample; provides the associated numerical analyses; and explains the basis of my conclusion for the sample's overall cost of capital. Finally, Section VI summarizes my cost of capital recommendation. The calculations supporting my analysis are provided in the Schedules as part of Exhibit F.

II. COST OF CAPITAL THEORY

A. COST OF CAPITAL AND RISK

Q13: How is the "cost of capital" formally defined?

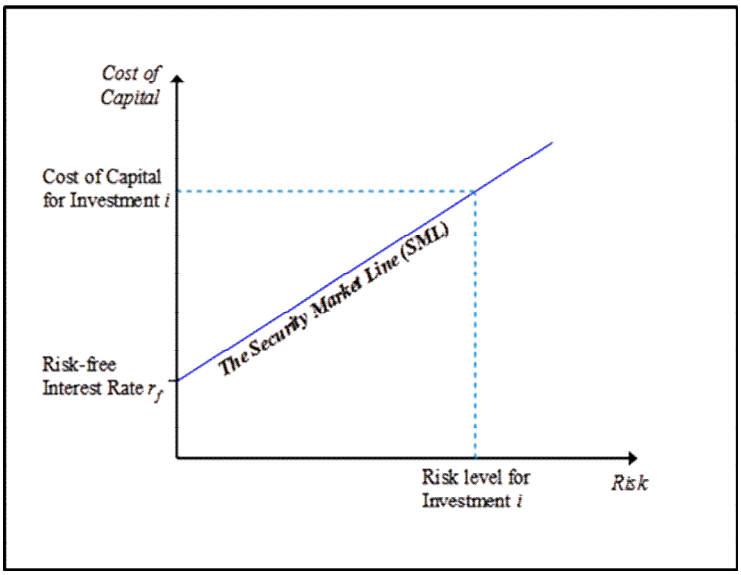
A13: The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. In other words, it is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean

6 I report my recommended ROE ranges to the nearest ¼-percentage point.

of the distribution of possible outcomes. The terms "expect" and "expected," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 1 below. The higher the risk, the higher the cost of capital required.

FIGURE 1
THE SECURITY MARKET LINE



Q14: Why is the cost of capital relevant in rate regulation?

A14: It has become routine in U.S. rate regulation to accept the "cost of capital" as the right expected rate of return on utility investments.[7] That practice is viewed as consistent with the U.S. Supreme Court's opinions in *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia*, 262 U.S. 679 (1923), and *Federal Power Commission v. Hope Natural Gas Co.*, 320 U.S. 591 (1944).

7 A formal link between the cost of capital as defined by financial economics and the right expected rate of return for utilities is set forth by Stewart C. Myers, Application of Finance Theory to Public Utility Rate Cases, Bell Journal of Economics & Management Science 3:58-97 (1972).

From an economic perspective, rate levels that give investors a fair opportunity to earn the cost of capital are the lowest levels that compensate investors for the risks they bear. Over the long run, an expected return above the cost of capital makes customers overpay for service. Regulatory commissions normally try to prevent such outcomes unless there are offsetting benefits (e.g., from incentive regulation that reduces future costs). At the same time, an expected return below the cost of capital does a disservice not just to investors but, importantly, to customers as well. Such a return denies the company the ability to attract capital, to maintain its financial integrity, and to expect a return commensurate with that of other enterprises attended by corresponding risks and uncertainties.

More important for customers, however, are the broader economic consequences of providing an inadequate return to the company's investors. In the short run, deviations from the expected rate of return on the rate base from the cost of capital may seemingly create a "zero-sum game"—investors gain if customers are overcharged, and customers gain if investors are shortchanged. But in fact, in the short run, such actions may adversely affect the utility's ability to provide stable and favorable rates because some potential efficiency investments may be delayed or because the company is forced to file more frequent rate cases. Moreover, in the long run, inadequate returns are likely to cost customers—and society generally—far more than may be saved in the short run. Inadequate returns lead to inadequate investment, whether for maintenance or for new plant and equipment. Without access to investor capital, the company may be forced to forgo opportunities to maintain, upgrade, and expand its systems and facilities in ways that decrease long run costs. Indeed, the cost to consumers of an undercapitalized industry can be far greater than any short-run gains from shortfalls in the cost of capital. This is especially true in capital-intensive industries (such as water utilities), which feature systems that take a long time to decay. Such long-lived infrastructure assets cannot be repaired or replaced overnight, because of the time necessary to plan and construct the facilities. Thus, it is in the customers' interest not only to make sure the return investors expect does not exceed the cost of capital, but also to make sure that the return does not fall short of the cost of capital. In other words, the customers of utilities in more supportive regulatory environments have higher satisfaction in the quality of service.

The cost of capital cannot be estimated with perfect certainty, and other aspects of the way the revenue requirement is set may mean investors expect to earn more or less than the cost of capital, even if the allowed rate of return equals the cost of capital exactly. However, a commission that sets rates so investors expect to earn the cost of capital on average treats both customers and investors fairly, and acts in the long-run interests of both groups.

B. Relationship Between Capital Structure and the Cost of Equity

Q15: How does capital structure of companies affect their cost of capital?

A15: Financial risk is a function of the market value capital structure, and return on equity estimates for the sample companies reflect both systematic risk (i.e., business risk) and financial risk, which can be different because of the differences in capital structure of companies. The cost of equity and the capital structure are entwined in that the use of debt increases the financial risk of the company and therefore increases the cost of equity. The more debt, the higher is the cost of equity for a given level of business risk. The cost of capital depends primarily on the business the company is in, while the costs of the debt and equity components depend not only on the business risk, but also on the distribution of revenue between debt and equity. The cost of capital is thus the more basic concept. Although the overall cost of capital is constant (ignoring taxes and costs of excessive debt), the distribution of the costs among debt and equity is not. Simply reporting the average cost of equity estimates from the water utility sample without consideration of the differences in financial risk among the sample companies and Cal Water may result in material errors in the allowed return for the Company.

Q16: How is financial risk measured?

A16: Financial risk is properly measured on market value capital structure. The notion that financial leverage is and should be measured on a market value basis is well supported in

academic literature, including basic textbook on corporate finance[8] and professional valuation books and guides alike.[9] Morningstar and Duff and Phelps—both off-the-shelf cost of capital providers using Ibbotson data and analysis—also use market-value capital structure in cost of capital estimates.[10] Similar views were also endorsed by legal decisions on bankruptcy proceedings.[11]

Q17: Can you provide academic evidence that financial leverage is and should be measured on a market value basis?

A17: Yes. The impact of financial leverage on cost of equity has been developed since the 1958 paper by Prof. Franco Modigliani and Merton Miller ("MM"), two economists who eventually won Nobel Prizes in part for their body of work on the effects of debt on company value.[12] One key corollary of the MM theorems and their various extensions is that cost of equity increases as financial leverage increases. Although the exact speed of increase in cost of equity differs by models of capital structure, it is universally accepted that as a company adds debt, its cost of equity increases as a result.

While acknowledging that the cost of equity increases with financial leverage, some assert that financial risk is measured on a book value basis. This belief is incorrect for two reasons. First, in MM's classic paper and subsequent extensions of their original paper, financial

8 See, e.g., Richard A. Brealey, Stewart C. Myers, and Franklin Allen, 2017, Principles of Corporate Finance, 12th edition, McGraw-Hill Irwin, at p. 467; Stephen A. Ross, Randolph W. Westerfield, and Jeffrey Jaffe, 2002, Corporate Finance, 6th edition, McGraw-Hill Irwin, at p.386; and Mark Grinblatt and Sheridan Titman, 1998, Financial Markets and Corporate Strategy, 1st edition, Irwin/McGraw-Hill, at p. 464.

9 See, e.g., Tom Copeland, Tim Koller, and Jack Murrin, 2000, Valuation: Measuring and managing the value of companies, 3rd edition John Wiley & Sons, p. 204; and Shannon P. Pratt and Alina V. Niculita, 2008, Valuation a business: The analysis and appraisal of closely held companies, 5th edition, McGraw-Hill, at pp. 216 – 217.

10 See, e.g., Morningstar, Duff & Phelps Cost of Capital Navigator, 2019.

11 See, e.g., Bernstein, Stan, Susan H. Seabury, and Jack F. Williams, 2008, "Squaring bankruptcy valuation practice with Daubert Demands," ABI Law Review, at p. 190.

12 Franco Modigliani and Merton H. Miller (1958), "The cost of capital, corporation finance and the theory of investment," American Economic Review, 48, pp. 261-297. For a modern textbook exposition of the capital structure theories, see Brealey, Myers, and Allen, op cit., Chapter 17.

leverage has been consistently measured on a market value basis. This is because MM's basic insight is that, under perfect market conditions, financial leverage does not increase the market value of a company as long as different combinations of debt and equity can be selected by the investors themselves.[13] To implement such a self-help financial engineering, investors have to be able to buy and sell debt and equity to achieve their desired combination. The prices at which they transact are, by definition, market prices. Second, as a more practical matter, economists generally prefer to use market values because they convey timely information, rather than historical data, about the assets. Business decisions on investment, capital budgeting, and financing are all based on real time market value information.

Q18: Are there any other academic articles that discuss how a company's cost of equity changes as its capital structure changes?

A18: Yes. An important example is from Professor Robert S. Hamada, who addressed this issue in "The Effect of the Company's Capital Structure on the Systematic Risk of Common Stocks."[14] I present the results of the risk positioning models using Professor Hamada's financial leverage adjustment method. To provide further insight on the range of ROE estimates after adjusting for financial leverage, I also present the after-tax weighted cost of capital approach (ATWACC), which is consistent with the Hamada adjustment method. For the DCF estimate for the Company, I adjust for financial leverage by employing only the ATWACC approach.[15] Both approaches are widely accepted in academic literature and commonly used amongst finance practitioners.

13 In developing the theory, MM assumed that investors can adjust the capital structures of their portfolios at no cost.

14 The Journal of Finance, Vol. 27, No. 2, Papers and Proceedings of the Thirtieth Annual Meeting of the American Finance Association, New Orleans, Louisiana, December 27- 29, 1971 (May, 1972), pp. 435-452.

15 Implementation of the Hamada adjustment method requires beta unlevering and relevering, and since beta is not an input to DCF model, the method cannot be implemented on DCF results. Therefore, I employ only the ATWACC method for adjusting for financial leverage, to arrive at the appropriate DCF based ROE estimate for the Company.

Q19: Please explain the Hamada adjustment method used to adjust for financial leverage?

A19: The Hamada adjustment procedures account for the impact of financial risk recognizing that, under general conditions, the value of a company can be decomposed into its value with and without a tax shield (Value of Company = Present Value of Cash Flows without Tax Shield plus Value of Tax Shield).

Assuming that the CAPM is valid, Professor Hamada showed the following relationship between the beta for a company with no leverage (e.g., 100 percent equity financing) and a company with leverage is as follows:[16]

$$\beta_L = \beta_U + \frac{D}{E}(1 - \tau_c)(\beta_U - \beta_D) \quad (2)$$

Where β_L is beta associated with the "levered cost of capital"—the required return on assets if the company's assets are financed with debt and equity—β_U is the beta associated with an unlevered company—assets are financed with 100% equity and zero debt—, and β_D is the beta on the company's debt. Finally, τ_c is the corporate income tax rate. Since the beta on an investment grade company's debt is much lower than the beta of its assets (i.e., $\beta_D < \beta_U$), this equation embodies the fact that increasing financial leverage (and thereby increasing the debt to equity ratio) increases the systematic risk of levered equity (β_L).

An alternative formulation derived by Harris and Pringle (1985) provides the following equation:

$$\beta_L = \beta_U + \frac{D}{E}(\beta_U - \beta_D) \quad (3)$$

Unlike Equation (2), Equation (3) does not include an adjustment for the corporate tax deduction. However, both equations account for the fact that increased financial leverage increases the systematic risk of equity that will be measured by its market beta. Both equations allow an analyst to adjust for differences in financial risk by translating back and forth between β_L and β_U. In principle, Equation (2) is more appropriate for use with regulated utilities, which are typically deemed to maintain a fixed book value capital structure.

16 Technically, the relationship requires that there are no additional costs to leverage and that the book value capital structure is fixed.

However, I employ both formulations when adjusting my CAPM and ECAPM estimates for financial risk, and consider the results as sensitivities in my analysis.

It is clear that the beta of debt needs to be determined as an input to either Equation (2), or Equation (3). Rather than estimating debt betas, I note that the standard financial textbook of Professors Berk & DeMarzo report a debt beta of 0.05 for A rated debt and a beta of 0.10 for BBB rated debt[17] while other academic literature has reported debt betas of 0.25.[18] I consider this range of 0.05 to 0.25 to be reasonable for debt betas.

Once a decision on debt betas is made, the levered equity beta of each sample company can be computed (in this case by *Value Line*) from market data and then translated to an unlevered beta at the company's market value capital structure. The unlevered betas for the sample companies are comparable on an "apples to apples" basis, since they reflect the systematic risk inherent in the assets of the sample companies, independent of their financing. The unlevered betas are averaged to produce an estimate of the industry's unlevered beta. To estimate the cost of equity for the regulated target company, this estimate of unlevered beta can be "re-levered" to the regulated company's capital structure, and the CAPM can be reapplied with this levered beta, which reflects both the business and financial risk of the target company. Hamada adjustment procedures are ubiquitous among finance practitioners when using the CAPM to estimate discount rates.

Q20: Please explain the "ATWACC" method.

A20: The ATWACC is calculated as the weighted average of the after-tax cost of debt capital and the cost of equity. Specifically, the following equation pertains:

17 Berk, J. & DeMarzo, P., Corporate Finance, 2nd Edition. 2011 Prentice Hall, p. 389.

18 "Explaining the Rate Spread on Corporate Bonds," Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, The Journal of Finance, February 2001, pp. 247-277.

$$ATWACC = r_D \times (1 - T_c) \times \%D + r_E \times \%E \quad (1)$$

where r_D = market cost of debt,

r_E = market cost of equity,

T_C = corporate income tax rate,

$\%D$ = percent debt in the capital structure, and

$\%E$ = percent equity in the capital structure

The ATWACC is commonly referred to as the WACC in financial textbooks and is used in investment decisions.[19] The return on equity consistent with the sample's overall cost of capital estimate (the ATWACC), the market cost of debt, the corporate income tax rate, and the amount of debt and common equity in the capital structure can be determined by solving Equation (1) for r_E. Alternatively, if r_E is given and the capital structure is not, one can solve for $\%E$ instead. Having determined the ATWACC for the sample companies, I can apply that same ATWACC or an ATWACC adjusted for risk differences to the regulated entity, in this case the Company.[20]

III. IMPACT OF THE RECENT ECONOMIC UNCERTAINTY

Q21: What is the topic of this section of your testimony?

A21: This section addresses the effect of the current economic situation on the cost of capital and the adjustments to my standard procedures required to estimate the cost of capital more accurately.

19 See, for example, Brealey, Myers, and Allen (2017), Principles of Corporate Finance, 12th Edition, McGraw-Hill Irwin, New York, pp. 448-453.

20 I refer to the ATWACC to distinguish it from the WACC used in regulatory proceedings, which is the weighted-average of the after-tax cost of equity and the pre-tax cost of debt instead of the after-tax cost of debt.

Q22: Can you provide a summary of recent events that have impacted capital market conditions?

A22: Over the past year, capital markets experienced unprecedented levels of uncertainty due to the impacts of the COVID-19 pandemic on the global economy. Following the formal pandemic declaration by the World Health Organization in March 2020, governments around the world sought to limit the health and economic impacts from the outbreak. States – including California[21] – issued stay-at-home orders and major portions of the U.S. economy shut down. This also led to a significant rise in unemployment with over 76 million people filing initial unemployment claims since March 21, 2020.[22]

To mitigate the economic impact, the U.S. Federal Reserve cut its policy rate to 0 to 0.25 percent and announced "unlimited" quantitative easing and emergency liquidity programs.[23] The U.S. also passed the $2.1 trillion CARES Act, which provided direct aid to people and businesses and also bolstered unemployment benefits. Despite these efforts, the U.S. economy contracted substantially and by June 2020 the U.S. entered a recession.[24] In the 1st and 2nd Quarter of 2020, real GDP decreased by an annualized rate of 5.0% and 31.4%, respectively.[25]

In the second half of 2020, economic conditions began to improve as the economy began to reopen, albeit many businesses operated at reduced capacity to comply with social distancing guidelines. In the 3rd and 4th Quarter, real GDP increased by an annualized rate of 33.4% and

21 Executive Department, State of California, Executive Order N-33-20, March 19, 2020, https://www.gov.ca.gov/wp-content/uploads/2020/03/3.19.20-attested-EO-N-33-20-COVID-19-HEALTH-ORDER.pdf

22 U.S. Department of Labor, Unemployment Insurance Weekly Claims Data, accessed April 1, 2021, https://oui.doleta.gov/unemploy/claims.asp.

23 U.S. Federal Reserve, "Federal Reserve Announces Extensive New Measures to Support the Economy," Press Release, March 23, 2020.

24 National Bureau of Economic Research, "Determination of the February 2020 Peak in US Economic Activity," June 8, 2020, accessed September 21, 2020, https://www.nber.org/cycles/june2020.html.

25 Bureau of Economic Analysis, "Gross Domestic Product, (Third Estimate); Corporate Profits, (Revised), and GDP by Industry, Second Quarter 2020", U.S. Department of Commerce, September 30, 2020. Accessed April 13, 2020, https://www.bea.gov/news/2020/gross-domestic-product-third-estimate-corporate-profits-revised-and-gdp-industry-annual

4.3%, respectively.[26] Despite the rebound, real GDP declined by 3.5% in 2020.[27] The Federal Reserve also remains cautious about the pace and extent of the recovery. In the March 2021 FOMC Press Conference, Federal Reserve Chair Powell noted that economic indicators have improved recently but reiterated that "economic recovery remains uneven and far from complete, and the path ahead remains uncertain."[28] The Federal Reserve has kept its policy interest rate at 0 to 0.25 percent and also continues to support financial markets through its expanded quantitative easing programs.[29]

Lastly, I note that substantial progress has been made on distributing the COVID-19 vaccine. While the length and extent of the economic impacts from the COVID-19 pandemic are unknown, the impacts are expected to persist for some time while social distancing measures remain in place and the vaccine is distributed to the global population.

Q23: What are the expectations going forward?

A23: The economy is expected to continue to recover from the nadir in mid-2020, but the pace of recovery will largely depend on the progress of vaccinations. Recent survey by Economist, such as the *Blue Chip Economic Indicators* ("BCEI") survey, indicate that U.S. real GDP will increase by 5.7% in 2021 and 4.1% in 2022.[30] Likewise, the Congressional Budget Office projects real GDP growth at 3.7% in 2021 and 2.4% in 2022.[31] In August, the U.S. Federal Reserve announced a policy change whereby they would target inflation of 2% on

26 Bureau of Economic Analysis, "Gross Domestic Product, (Third Estimate), GDP by Industry, and Corporate Profits, Fourth Quarter and Year End", U.S. Department of Commerce, March 25, 2021. Accessed April 1, 2021, https://www.bea.gov/news/2021/gross-domestic-product-third-estimate-gdp-industry-and-corporate-profits-4th-quarter-and

27 Ibid.

28 Board of Governors of the Federal Reserve System, "Transcript of Chair Powell's Press Conference," March 17, 2021, https://www.federalreserve.gov/mediacenter/files/FOMCpresconf20210317.pdf.

29 Ibid.

30 Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, March 2021, p. 2-3.

31 U.S. Congressional Budget Office, "Additional Information About the Economic Outlook: 2021 to 2031," February 2021, https://www.cbo.gov/publication/57014

average, indicating that the Federal Reserve may hold interest rates lower for longer.[32] Recent projections from the FOMC indicate that policy rates will remain at current levels through at least 2023.[33] This will likely continue to exert downward pressure on interest rates over the near to medium term.

Q24: How have you reflected recent market conditions and future expectations in the cost of equity estimation for Cal Water?

A24: I understand that the cost of equity and capital structure that will be adopted for Cal Water in this proceeding will be in effect through 2024. This time-period is beyond the current period that continues to be extraordinarily impacted by the COVID-19 pandemic. To set rates through 2024, the analysis for the appropriate cost of equity and capital structure should reflect the *expected* market conditions covering the intended rate period. However, since there is considerable uncertainty about the extent and timing of the economic recovery, I have estimated the cost of equity for Cal Water under various sets of scenarios that capture a reasonable range of economic and financial conditions expected to prevail over the rate period of this proceeding.

A. INTEREST RATES

Q25: Please describe the impact of ongoing uncertainty in market conditions on interest rates?

A25: Government bond yields remain at near historic lows due to the on-going uncertainty from the COVID-19 pandemic, as depicted in Figure 2 below. At the end of 2019, 10-year U.S. Government bond yields were at 1.92%.[34] As large portions of the U.S. economy began to

[32] U.S. Federal Reserve, "Federal Open Market Committee announces approval of updates to its Statement on Longer-Run Goals and Monetary Policy Strategy," August 27, 2020, accessed March 2, 2021, https://www.federalreserve.gov/newsevents/pressreleases/monetary20200827a.htm.

[33] U.S. Federal Reserve, "March 17, 2021: FOMC Projections materials, accessible version," March 17, 2021, https://www.federalreserve.gov/monetarypolicy/fomcprojtabl20210317.htm.

[34] U.S. Federal Reserve, Selected Interest Rates (Daily H.15), accessed April 13, 2021, https://www.federalreserve.gov/releases/H15/default.htm.

shut down in March 2020, investors chose safer assets such as U.S. government bonds, causing rapid decline in government bond yields. On March 9, 2020, the entire U.S. treasury yield curve fell below 1.00 percent for the first time in history and the 10-year U.S. government bond yields reached a historic low of 0.339%.[35] Later that month, the Federal Reserve lowered the federal funds target rate to the 0 to 0.25 percent range, and announced "unlimited" quantitative easing to support the financial markets.[36] Since then, the U.S. government bond yields have risen—particularly in light of recent progress with vaccine distribution—but still remain near historic lows and below end of 2019 levels. The current 10-year U.S. Government bond yields are at 1.73%.[37]

Looking forward, treasury bonds are forecasted to increase, which is depicted in Figure 2 below. BCEI forecasts that 10-year U.S. Government bond yields will increase to 1.9% in 2022, 2.3% in 2023 and 2.5% in 2024, as shown in red horizontal bars in Figure 2.[38]

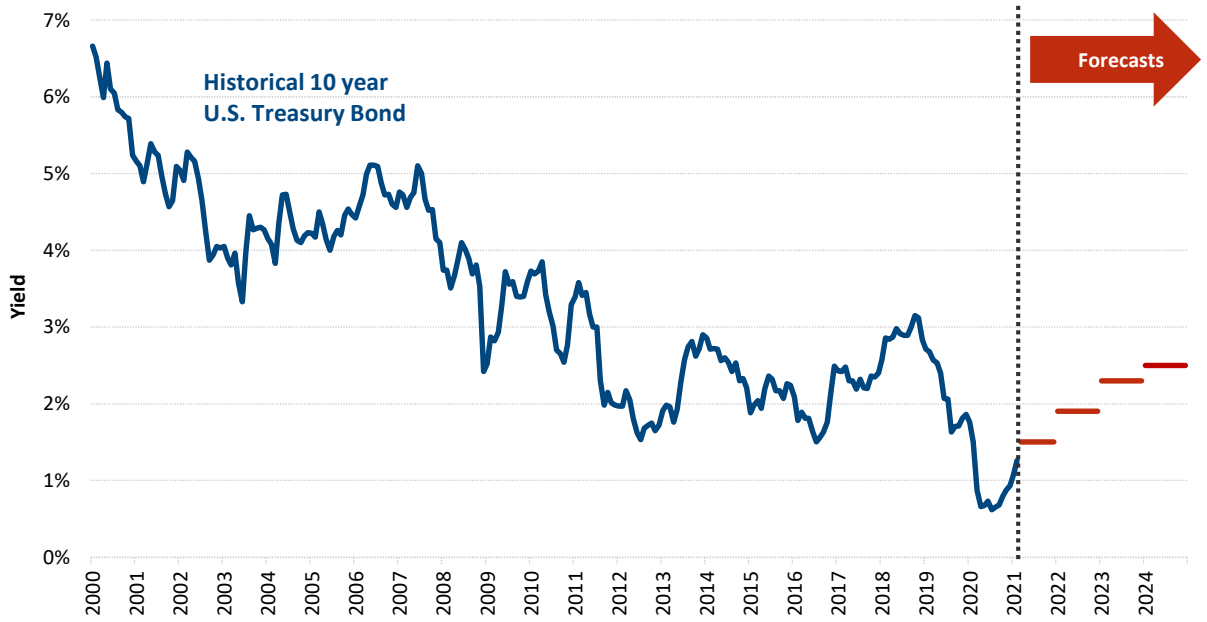
[35] Sunny Oh, "Treasury yield curve sinks below 1% after oil and coronavirus worries rout stocks," Market Watch, March 9, 2020, accessed March 2, 2021, https://www.marketwatch.com/story/30-year-treasury-yield-tumbles-below-1-after-oil-and-coronavirus-worries-rout-stocks-2020-03-09

[36] U.S. Federal Reserve, "Federal Reserve Announces Extensive New Measures to Support the Economy," Press Release, March 23, 2020.

[37] Federal Reserve, H.15 Selected Interest Rates, as of March 30, 2021. Accessed April 1, 2021. https://www.federalreserve.gov/releases/h15/

[38] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, March 2021, pp. 3 and 14.

FIGURE 2
HISTORICAL AND FORECASTED 10-YEAR U.S. TREASURY BOND YIELDS



Source: Historical data from Bloomberg. Forecasts from Blue Chip Economic Indicators March 2021.

B. YIELD SPREADS

Q26: Why are bond yield spreads relevant to your cost of equity analysis?

A26: Bond yield spreads (also called credit spreads) reflect the premium that investors demand to hold debt securities (specifically corporate bonds) that are not risk-free, such as U.S. government bonds. Analogously, the Market Risk Premium (MRP)—which is a key input to the CAPM cost of equity estimation—represents the risk premium that investors require to hold equities rather than risk-free government bonds.

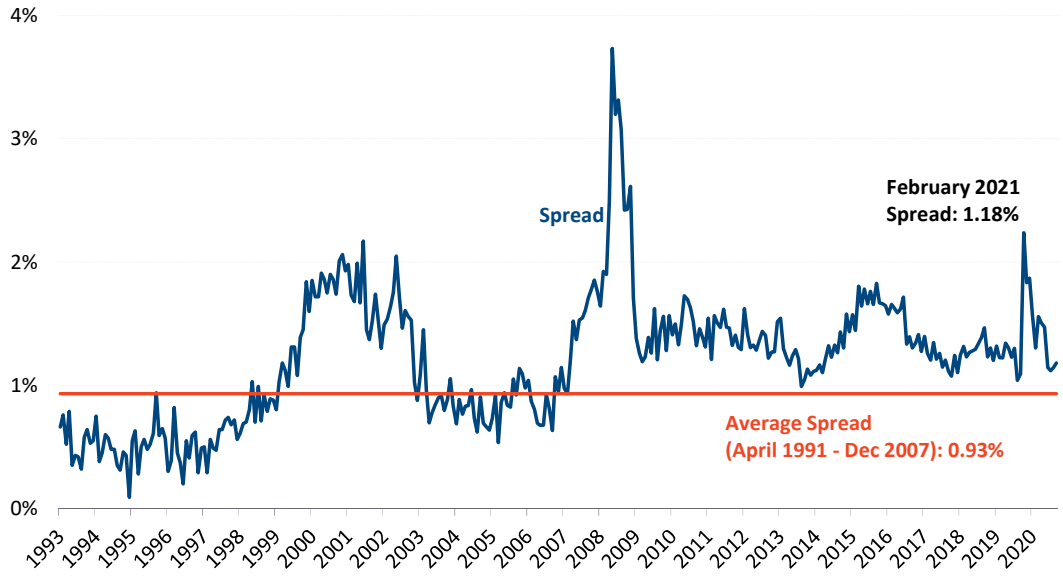
When bond yields are influenced to some extent by the same underlying market factors that drive the systematic risk premium for equities (i.e., the MRP), shifts in directly observable

bond yield spreads can assist with inference about changes in the MRP, which itself must be estimated.[39]

Q27: Please describe how the yield spread between U.S. government and utility bonds has changed recently?

A27: The spread between utility bonds and U.S. government bonds increased substantially in the past year due to the ongoing market uncertainty indicating investors are requiring additional compensation to hold riskier assets, such as utility bonds. As shown below in Figure 3, the spread between 20-year A-rated utility bond yields and 20-year U.S. government bond yields are currently at 1.18%. While yield spreads has decreased somewhat since the height of the pandemic, they remain approximately 25 basis points higher than the pre-financial crisis average of 0.93%.

FIGURE 3
YIELD SPREAD BETWEEN 20-YEAR A-RATED UTILITY BOND YIELDS AND 20-YEAR U.S. GOVERNMENT BOND YIELDS

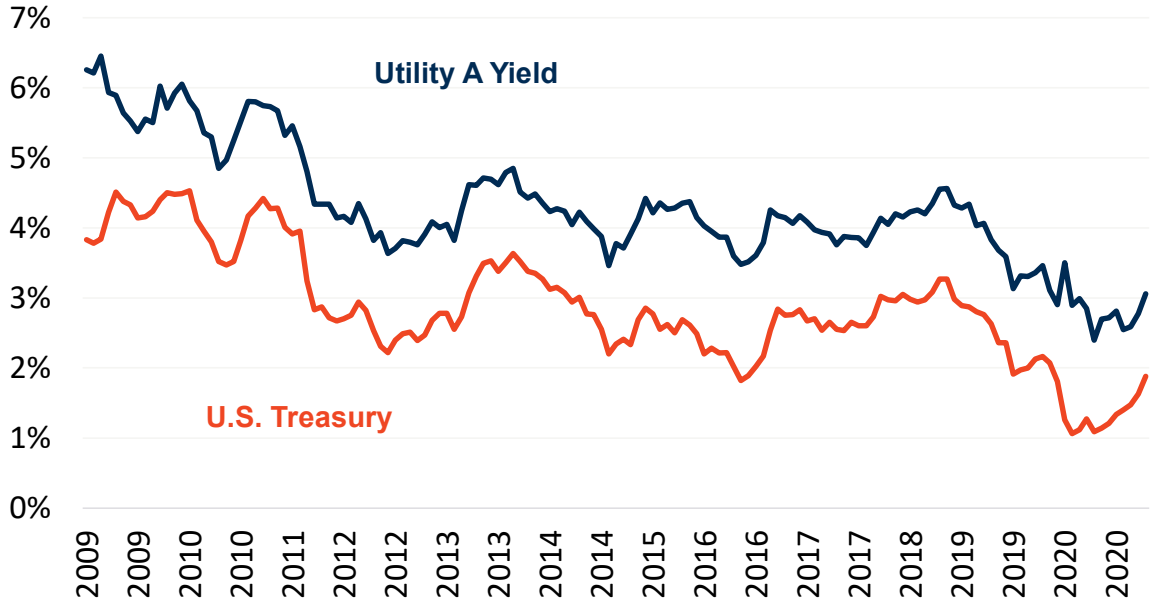


Source: Bloomberg as of 2/28/2021.

39 This is the same issue as in cost of capital estimation more generally: the cost of debt can often be directly observed in the form of market bond yields, whereas the cost of equity must be estimated based on financial models.

Figure 4 below illustrates that the increased spread is attributable both to lower yields on government bonds as well as on the increased premium required by investors to hold riskier assets.

FIGURE 4
UTILITY A-RATED BOND YIELDS AND 20-YEAR U.S. TREASURY YIELDS



Source: Bloomberg, data as of February 28, 2021

Q28: What is the implications of a higher than normal yield spread?

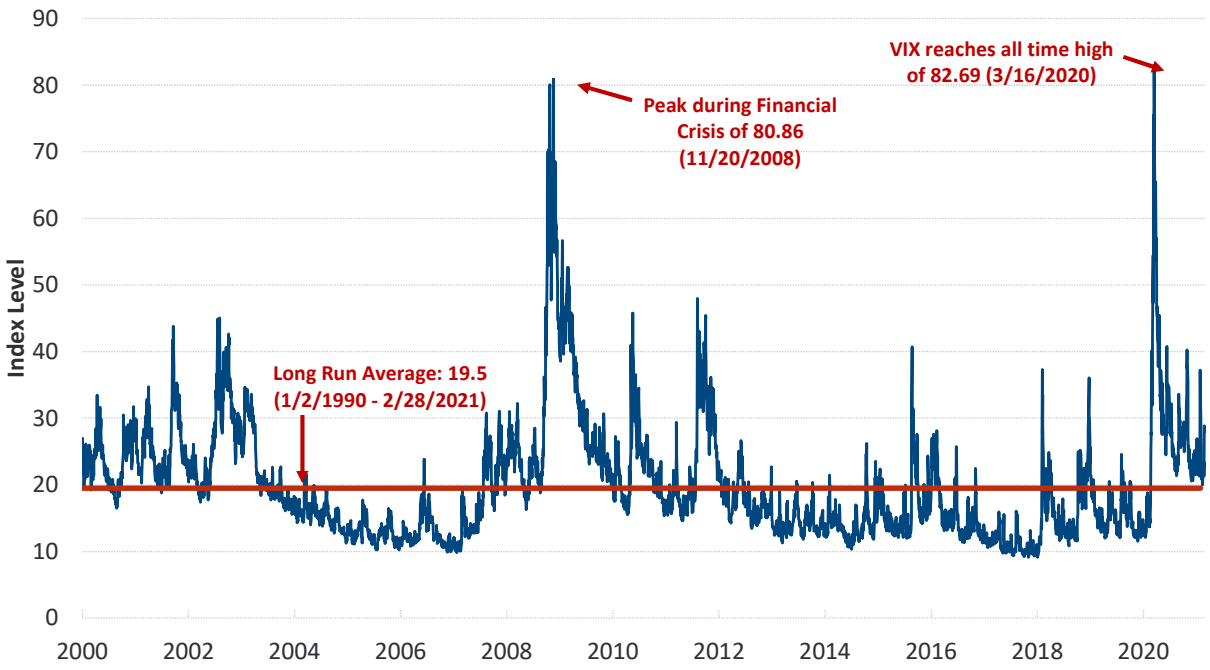
A28: A higher than normal yield spread is one indication of the higher cost of capital prevailing in the capital markets. Investors consider a risk-return tradeoff like the one displayed in Figure 1 above and select investments based upon the desired level of risk. The expected return on debt (i.e., the cost of debt) is higher relative to government bond yields than is normally the case even for regulated utilities. Because debt is less risky than equity, the cost of equity is also higher relative to government bond yields than is usually observed. If this fact is not recognized, the traditional cost of capital estimation models will underestimate the cost of capital prevailing in the capital markets.

C. RISK PREMIUMS

Q29: Please describe the recent developments related to market volatility.

A29: In 2020, financial markets became extremely volatile because of the heightened uncertainty from the COVID-19 pandemic. One common measure of market volatility is the Chicago Board of Option Exchange's volatility index (VIX). At the beginning of 2020, the VIX was at 12.47 but as the market uncertainty and volatility increased, the VIX reached an all-time high of 82.69 on March 16, 2020.[40] That exceeded the previous all-time high of 80.86, which occurred during the height of the Financial Crisis (Figure 5).[41] The VIX has declined since its March 2020 all-time high and is currently at about 19.6.[42]

FIGURE 5
VIX



Source: Bloomberg as of 2/28/2021

40 Bloomberg, as of April 1, 2021.

41 Id.

42 Cboe, VIX, as of March 30, 2021, accessed April 1, 2021, https://www.cboe.com/tradable_products/vix/

Q30: What does the current evidence on market volatility indicate about the market risk premium?

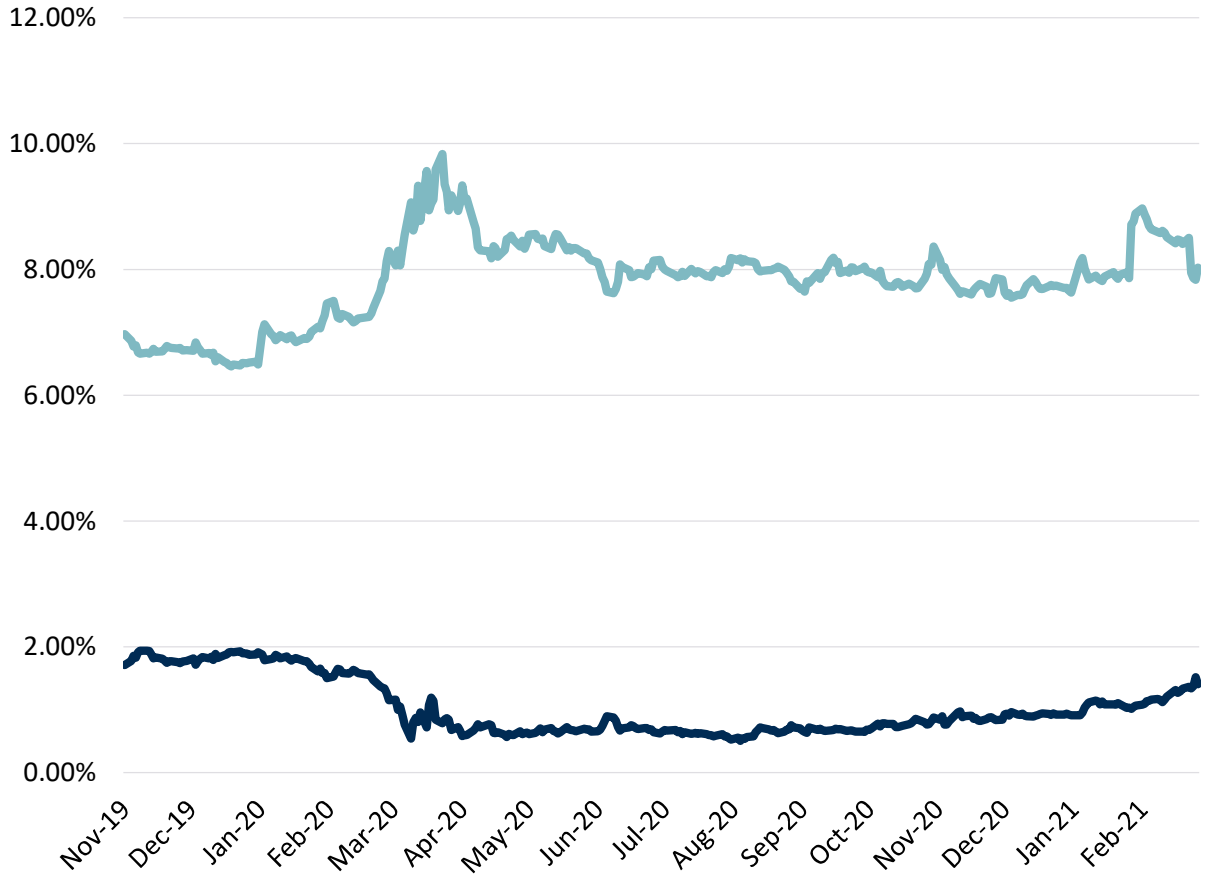
A30: The heightened volatility in the market indicates that the premium that investors require to hold risky assets has increased. This is evident in MRP measurements that are based on forward-looking methodologies, such as that published by Bloomberg.

Bloomberg's forward-looking MRP—which is based on the expected market returns, referenced relative to current dividend yields—was 6.48 percent at the end of 2019. At the end of the first quarter of 2020, the estimate had spiked to a high of 9.84 percent. Currently, Bloomberg's estimate of the MRP is at 8.03 percent[43], measured over a 10-year U.S. Government bond yield or at 7.53 percent, relative to a 20-year Government bond. This MRP remains elevated at approximately 30 basis points higher than the long-term historic average of 7.25 percent, (measured relative to the 20-year Government bond yield) by Duff & Phelps.[44] Clearly, the heightened market uncertainty has increased the premium that investors demand to hold risky assets.

43 Bloomberg, as of February 28, 2021, measured over a 10-year U.S. Government bond yield.

44 Duff & Phelps Cost of Capital Navigator, U.S. Cost of Capital Module, 2020.

FIGURE 6
BLOOMBERG'S DAILY MARKET RISK PREMIUM AND RISK FREE RATE
(NOV. 2019 TO FEB. 2021)



Q31: How do economic and financial conditions compare to those prevailing at the time of Cal Water's prior cost of capital proceeding?

A31: Economic and financial conditions have changed substantially since the March 2018, when the Commission authorized a return on equity for Cal Water of 9.20%.[45] At the time, economic conditions were recovering from the financial crisis but major global events such as Brexit and internal trade-disputes were creating uncertainty about the global economy. In March 2018, yields on 10-year U.S. Government bonds were 2.84%.[46] The Federal Reserve

[45] California Public Utilities Commission, Decision 18-03-035, March 27, 2018.

[46] Bloomberg, as of March 31, 2018, accessed February 28, 2021

was gradually scaling back its accommodating monetary policy by raising its policy rate to 1.50% to 1.75% and it was starting to scale back its quantitative easing programs.[47] The GDP was expected to grow by 4.1% in 2020 and 2021.[48] Measures of investors risk perceptions had moderated since the height of the financial crisis. For example, the forward-looking Bloomberg MRP was 6.84% relative to the 20-year U.S. Government Bond (or 7.34% relative to the 10-year U.S. Government Bond).[49]

As discussed above, economic and financial conditions today are still being impacted by the on-going global public health crisis. Relative to March 2018, yields on U.S. government bond yields have fallen by 111 basis points to 1.73%[50] The Federal Reserve's policy rate was cut and quantitative easing programs expanded. However, the decline in interest rates has been accompanied by an increase in the premium that investors require to hold risky assets. For example, the Bloomberg MRP (measured relative to the 10-year Government bond yield) reached a high of 9.05% in March 2020 and currently stands at 8.03% -- a 69 to 171 basis point increase relative to when the Commission issued its last decision.[51] Lastly, in 2018 10-year U.S. Government bond yields were expected to increase by approximately 41 basis points in the two years following the Commission's decision. Currently, yields are expected to increase by approximately 57 basis points from 1.73% today to 2.3% in 2023.

In summary, economic and financial conditions have changed substantially since March 2018, when the Commission issued its prior decision. The increased uncertainty due to the pandemic has caused interest rates to decline relative to 2018 but this is offset by an increase in the premium required by investors to hold non-risk free assets. Forecasted increases on U.S. Government bond yields are also higher today than they were in 2018.

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[47] U.S. Federal Reserve, "Implementation Notes issued March 21, 2018", March 21, 2018, https://www.federalreserve.gov/newsevents/pressreleases/monetary20180321a1.htm.

[48] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, March 2018, pp. 14.

[49] Bloomberg, as of March 31, 2018, measured over a 10-year U.S. Government Bond, accessed February 28, 2021.

[50] U.S. Federal Reserve, H.15 Selected Interest Rates, as of March 30, 2021.

[51] Bloomberg, as of March 31, 2018, measured over a 10-year U.S. Government Bond, accessed February 28, 2021.

IV. SAMPLE SELECTION

A. THE WATER UTILITY SAMPLE

Q32: What factors do you consider in selecting a proxy group?

A32: The cost of capital for any part of a company depends on the risk of the lines of business in which the part is engaged, not on the overall risk of the parent company on a consolidated basis. According to financial theory, the overall risk of a diversified company equals the market-value weighted average of the risks of its components, so selecting a sample concentrated in the regulated company's line of business is important. Cal Water is a regulated water utility; therefore, I look to other regulated water utilities whose primary lines of business are in water production, storage, treatment, transmission, and distribution. Publicly traded companies (i.e. companies whose shares are traded on stock exchanges) are ideal because the best way to infer the cost of capital is to examine evidence from capital markets on companies in a given line of business.

Q33: Can you summarize how you selected the water utility samples?

A33: I formed the samples from the universe of publicly traded water utilities as classified by Value Line. This resulted in an initial group of 11 companies. I then eliminated companies by applying additional selection criteria designed to remove companies with unique circumstances that may bias the cost of capital estimates. This ultimately yielded a core sample of 7 water utilities.

Q34: What additional selection criteria did you apply?

A34: My standard sample selection procedures require that the sample companies have the following:

- Investment grade credit rating from S&P Global Ratings;
- No significant merger activity in the previous five years; and
- No recent dividend cuts or other activity that could cause the growth rates or beta estimates to be biased.

Applying these selection criteria ultimately yield a Core Sample of 7 water utilities. Table 2, below, list the companies included in the Core Water Utility Sample and highlights some of their important characteristics.

TABLE 2
CORE WATER UTILITY SAMPLE

Company	Annual Revenue (Q4 2020) ($MM)	Regulated Assets	Market Cap. (Q4 2020) ($MM)	Value Line Beta	S&P Credit Rating	Long-Term Growth Estimate
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	$488	R	$2,874	0.65	A+	4.8%
Amer. Water Works	$3,777	R	$27,177	0.85	A	6.0%
California Water	$794	R	$2,672	0.75	A+	8.2%
Essential Utilities	$1,463	R	$11,431	0.65	A	8.1%
Middlesex Water	$142	R	$1,264	0.95	A	4.8%
SJW Group	$565	R	$1,953	0.75	A-	9.4%
York Water Co. (The)	$54	R	$619	0.70	A-	5.3%
Average	$1,040		$6,856	0.76	A	6.7%

Sources and Notes:
[1]: Bloomberg as of February 28, 2021.
[2]: Key R - Regulated (80% or more of assets regulated).
MR - Mostly Regulated (less than 80% of assets regulated).
[3]: See Schedule No. AS-3 Panels A through I.
[4]: See Schedule No. AS-10
[5]: Bloomberg as of February 28, 2021.
[6]: See Schedule No. AS-5.

Q35: Please describe your Expanded Sample.

A35: Given the relatively small number of companies in the Core Sample, it is important to consider a larger sample of regulated water utilities to confirm the reasonableness of the return on equity estimates derived from the Core Sample. To do so, I relax my sample selection criteria and include two water utilities—Artesian Resources Corp. and Global Water Resources Inc., —which failed my initial sample selection criteria because neither company is rated by S&P Global Ratings.[52] However, the absence of a credit rating does not mean that the company would have a sub-investment grade rating or poor financial health metrics. Therefore, I reviewed solvency metrics of the companies, capital structure, and cost

[52] Bloomberg, as of February 28, 2021.

of recent debt issuances and found these metrics to be in line with those of the Core Sample water utilities.

TABLE 3
EXPANDED SAMPLE CREDIT ANALYSIS

		FFO/ Debt	Debt/ EBITDA	Book % Equity	Weighted Average Cost of Debt
		[1]	[2]	[3]	[4]
American States Water	[a]	21%	3.16	52%	5.15%
American Water Works	[b]	13%	5.51	38%	4.03%
California Water	[c]	10%	4.53	45%	4.76%
Essential	[d]	9%	7.81	45%	3.73%
Middlsex	[e]	19%	4.78	54%	3.02%
SJW	[f]	7%	7.34	38%	4.30%
York	[g]	16%	4.04	54%	3.44%
Average	[h]	**13%**	**5.31**	**47%**	**4.06%**
Median	[i]	**13%**	**4.78**	**45%**	**4.03%**
Artesian Resources Corp.	[j]	12%	4.37	50%	4.71%
Global Water Resources	[k]	13%	5.91	22%	4.53%

Sources and Notes:
[1],[2]: S&P CapIQ.
[3]: Schedule No. AS-4.
[4]: Year Ending 2020 SEC Form 10-K for the respective company.
[h]: Average of [a]-[g].
[i]: Median of of [a]-[g].

As a result, I consider an Expanded Sample that includes the 7 water utilities in my core sample plus these two additional water utilities. Table 4 below lists the 9 water utilities included in the Expanded Sample along with some important characteristics.

TABLE 4
EXPANDED WATER UTILITY SAMPLE

Company	Annual Revenue (Q4 2020) ($MM)	Regulated Assets	Market Cap. (Q4 2020) ($MM)	Value Line Beta	S&P Credit Rating	Long-Term Growth Estimate
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	$488	R	$2,874	0.65	A+	4.8%
Amer. Water Works	$3,777	R	$27,177	0.85	A	6.0%
Artesian Res Corp	$88	R	$354	0.75	N/A	N/A
California Water	$794	R	$2,672	0.65	A+	8.2%
Essential Utilities	$1,463	R	$11,431	0.95	A	8.1%
Global Water Resources Inc	$39	R	$334	0.75	N/A	N/A
Middlesex Water	$142	R	$1,264	0.70	A	4.8%
SJW Group	$565	R	$1,953	0.85	A-	9.4%
York Water Co. (The)	$54	R	$619	0.80	A-	5.3%
Average	$823		$5,409	0.77	A	6.7%

Sources and Notes:
[1]: Bloomberg as of February 28, 2021.
[2]: Key R - Regulated (80% or more of assets regulated).
MR - Mostly Regulated (less than 80% of assets regulated).
[3]: See Schedule No. AS-3 Panels A through I.
[4]: See Schedule No. AS-10
[5]: Bloomberg as of February 28, 2021.
[6]: See Schedule No. AS-5.

B. CAPITAL STRUCTURE

Q36: What regulatory capital structure is Cal Water requesting in this proceeding?

A36: Cal Water is requesting a capital structure consisting of approximately 53.4 percent equity and 46.6 percent debt.[53]

Q37: How will Cal Water's planned debt issuance impact your cost of equity estimates?

A37: Cal Water intends to issue $280 million in long-term debt in May 2021, which will cause its average capital structure in 2022 to be approximately 49.9 percent equity and 50.1 percent debt.[54] As discussed in Section II.B, all else equal, a capital structure with a higher percentage of debt capital will increase the risk to equity investors and therefore increase the

53 See Exhibit G Testimony of Company Witness Thomas Smegal.
54 Ibid.

cost of equity. However, it is my understanding that Cal Water intends to infuse additional equity capital through 2024, which will result in an average capital structure of 53.4 percent equity and 46.6 percent debt during the three-year regulatory period.[55] As a result, I use the three-year average capital structure when estimating Cal Water's return on equity.

V. COST OF CAPITAL ESTIMATES

Q38: How do you estimate the sample companies' costs of equity?

A38: As noted earlier, I apply two general methodologies—risk positioning and DCF—both of which are standard ways of estimating a company's cost of equity. For my CAPM (risk positioning) based estimates, I consider a range of sensitivities to reflect well-documented empirical deficiencies in the CAPM when used in conjunction with an equity market index. These sensitivities are called the Empirical CAPM. I also report results generated by two versions of the DCF approach: the single-stage and the multistage DCF models.

A. THE CAPM-BASED ESTIMATES

Q39: Can you explain the CAPM?

A39: Modern models of capital market equilibrium express the cost of equity as the sum of a risk-free rate and a market risk premium. The CAPM is the longest-standing and most widely used theoretical risk-positioning model. To implement the model requires specification of (1) the current values of the benchmarks that determine the Security Market Line (see Figure 1 above); (2) the relative risk of a security or investment; and (3) how the benchmarks combine to produce the Security Market Line. Given these specifications, the company's cost of capital can be calculated based on its relative risk. Specifically, the CAPM states that the cost of capital for an investment, S (e.g., a particular common stock), is given by the following equation:

[55] Ibid.

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \quad (4)$$

where r_S is the cost of capital for investment S;
r_f is the risk-free interest rate;
β_S is the beta risk measure for the investment S; and
MRP is the market risk premium.

The CAPM relies on the empirical fact that investors price risky securities to offer a higher expected rate of return than safe securities. It says that the Security Market Line starts at the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 1, equals the risk-free interest rate). Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the risk premium on a value-weighted portfolio of all investments, which by definition has average risk.

1. THE RISK-FREE INTEREST RATE

Q40: What interest rates do your calculations require?

A40: Modern capital market theories of risk and return (e.g., the theoretical version of the CAPM as originally developed) use the short-term risk-free rate of return as the starting benchmark, but regulatory bodies frequently use a version of the risk positioning model that is based upon the long-term risk-free rate. In this proceeding, I rely upon the long-term version of the risk positioning model, which requires the use of long-term U.S. Treasury bond interest rates.

To obtain a risk-free rate, I start with the most recent long-term forecast for 10-year U.S. Treasury bond yields from Blue Chip Economic Indicators ("BCEI") for the relevant rate period. Since rates are expected to be in effect from 2022 to 2024, I use the forecasted 10-year U.S. Treasury Bond yield for the middle of this period (2023), which gives me a 10-year U.S. Treasury Bond yield of 2.30%.[56] I then adjust this upward by 50 bps, which is my

56 Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, March 2021, p. 14.

estimate of the representative maturity premium for the 20-year over the 10-year Treasury bonds, which gives me a risk-free rate of 2.80%.

2. THE MARKET RISK PREMIUM

Q41: Why is a risk premium necessary?

A41: Recent experiences (e.g., COVID-19 pandemic, the recent credit crisis in stock markets worldwide) demonstrates that shareholders, even well- diversified shareholders, are exposed to enormous risks. By investing in stocks instead of risk-free government Treasury bills, investors subject themselves not only to the risk of earning a return well below that which they expected in any year but also to the risk that they might lose much of their initial capital. This is fundamentally, why investors demand a risk premium.

Q42: What MRP do you use in your analysis?

A42: The correct level of MRP to use in cost of capital estimation has been controversial. The correct level of MRP cannot also be precisely estimated. Therefore, I rely on scenarios that utilize different estimates for the MRP. In the first instance, I use the long-term historic MRP of 7.25% as measured by *Duff & Phelps*.[57] However, investors may require a higher or lower risk premium, reflecting the investment alternatives and aggregate level of risk aversion at any given time. As discussed in Section III, investors' level of risk aversion is likely to remain elevated for some time relative to levels before the COVID-19 pandemic. As such, I also use Bloomberg's forecasted MRP of 7.53%.[58]

57 Duff & Phelps Cost of Capital Navigator, U.S. Cost of Capital Navigator, 2020.

58 Bloomberg, as of February 28, 2021 measured over a 20-year U.S. Treasury Bond yield.

3. BETA

Q43: Can you more fully explain beta?

A43: The basic idea behind beta is that risks that cannot be diversified away in large portfolios matter more than those that can be eliminated by diversification. Beta is a measure of the risks that cannot be eliminated by diversification. That is, it measures the "systematic" risk of a stock—the extent to which a stock's value fluctuates more or less than average when the market fluctuates.

Diversification is a vital concept in the study of risk and return. (Harry Markowitz won a Nobel Prize for work showing just how important it was.) Over the long run, the rate of return on the stock market has a very high standard deviation, on the order of 20 percent per year.[59] Many individual stocks have much higher standard deviations than this. The stock market's standard deviation is "only" about 15-20 percent because when stocks are combined into portfolios, some of the risk of individual stocks is eliminated by diversification. Some stocks go up when others go down, and the average portfolio return—whether positive or negative—is usually less extreme than that of many individual stocks within it. The fact that the market's actual annual standard deviation is so large means that, in practice, the returns on stocks are positively correlated with one another, and to a material degree. The reason is that many factors that make a particular stock go up or down also affect other stocks. Examples include the state of the economy, the balance of trade, and inflation. Thus some risk is "non-diversifiable" in that even a well-diversified portfolio of stocks will experience changes in value caused by these shared risk factors. Single-factor equity risk premium models (such as the CAPM) are based upon the assumption that all of the systematic factors that affect stock returns can be considered simultaneously, through their impact on one factor: the market portfolio. Other models derive somewhat less restrictive conditions under which several factors might be individually relevant.

59 See Brealey, Myers and Allen (2017), Principles of Corporate Finance, 12th Edition, McGraw-Hill Irwin, New York, p. 172.

Again, the basic idea behind all of these models is that risks that cannot be diversified away in large portfolios matter more than those that can be eliminated by diversification, because there are a large number of large portfolios whose managers actively seek the best risk-reward tradeoffs available. (Of course, undiversified investors would like to get a premium for bearing diversifiable risk, but they cannot).

Q44: What does a particular value of beta signify?

A44: By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk: it goes up or down by 10 percent on average when the market goes up or down by 10 percent. Stocks with betas above 1.0 exaggerate the swings in the market: stocks with betas of 2.0 tend to fall 20 percent when the market falls 10 percent, for example. Stocks with betas below 1.0 are less volatile than the market. A stock with a beta of 0.5 will tend to rise 5 percent when the market rises 10 percent.

Q45: How is beta measured?

A45: The usual approach to calculating beta is a statistical comparison of the sensitivity of a stock's (or a portfolio's) return to the market's return. Many investment services report betas, including Bloomberg and the Value Line Investment Survey. Betas are not always calculated in precisely the same way, and therefore must be used with a degree of caution. However, the basic principle that a high beta indicates a risky stock has long been widely accepted by both financial theorists and investment professionals, and is universally reflected in all calculations of beta. Value Line calculates betas using five years of weekly return data for a company.[60] In my analyses for this proceeding, I present results using the beta estimates reported by Value Line. The betas for my sample companies are shown in Table 2 and Table 4 above.

60 Value Line Glossary, http://www.valueline.com/Glossary/Glossary.aspx

4. THE EMPIRICAL CAPM

Q46: What other equity risk premium model do you use?

A46: Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted. A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly, using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

This second model makes use of these empirical findings. It estimates the cost of capital with the equation,

$$r_S = r_f + \alpha + \beta_S \times (MRP - \alpha) \quad (5)$$

where α is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see Equation (4) above).

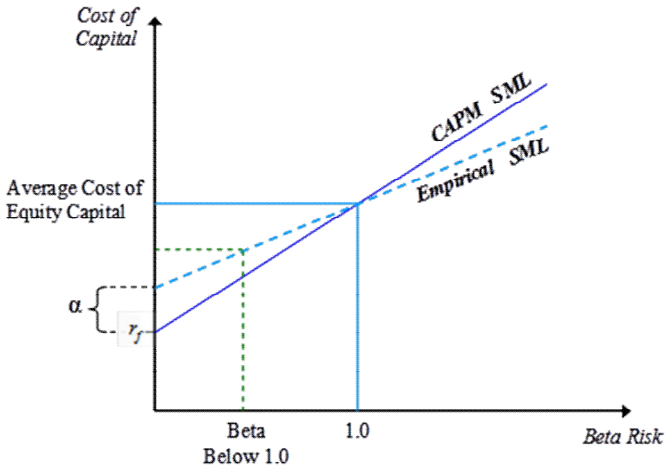
I label this model the Empirical Capital Asset Pricing Model, or "ECAPM." The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 1 earlier in my testimony which results in a Security Market Line that more closely matches the results of empirical tests. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

Q47: Why is it appropriate to use the Empirical CAPM?

A47: The CAPM has not generally performed well as an empirical model, but its short-comings are directly addressed by the ECAPM. Specifically, the ECAPM recognizes the consistent empirical observation that the CAPM underestimates (overestimates) the cost of capital for low (high) beta stocks. In other words, the ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been

established by repeated empirical tests of the CAPM. The difference between the CAPM and the type of relationship identified in the empirical studies is depicted in Figure 7 below.

FIGURE 7
THE EMPIRICIAL SECURITY MARKET LINE (SML)



Q48: Does Value Line make any adjustments to the beta estimates it reports?

A48: Yes, but Value Line's adjustments are fundamentally different and separate from the ECAPM adjustment I perform. Value Line's adjustments do not correct for the issues raised by the empirical tests of the CAPM. The adjustment to beta corrects the estimate of the relative risk of the company, which is measured along the horizontal axis of the SML. The ECAPM adjusts the risk-return tradeoff (i.e., the slope) in the SML. In other words, the expected return (measured on the vertical axis) for a given level of risk (measured on the horizontal axis) is different from the predictions of the theoretical CAPM. Getting the relative risk of the investment correct does not adjust for the slope of the SML, nor does adjusting the slope correct for errors in the estimation of relative risk.

Q49: Can you explain further why using Value Line's adjusted betas do not correct for the issues raised by empirical tests of the CAPM?

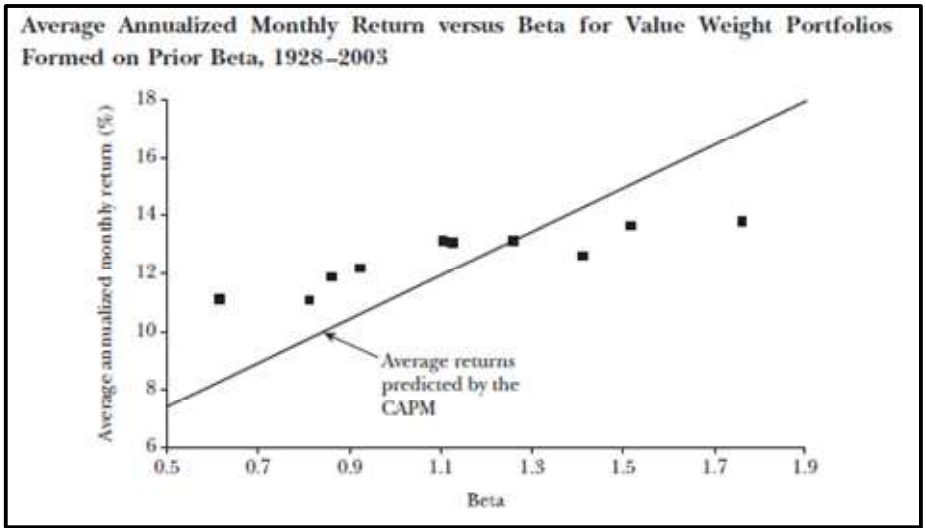
A49: Yes. It is because the issues raised by the empirical tests are completely independent from the reason betas are adjusted. The beta adjustment performed by Value Line is based on the method outlined by Professor Marshall Blume,[61] based on his empirical observation that historical measurements of a company's beta are not the best predictors of what the company's systematic risk will be going forward. Professor Blume was able to apply a consistent adjustment procedure to historical betas that increased their accuracy in forecasting eventual realized betas. Essentially, Professor Blume's adjustment transforms a historical beta into a better estimate of expected future beta. It is this expected "true" beta that drives investors' expected returns according to the CAPM. Therefore, it is appropriate to use Value Line's adjusted betas, rather than raw historical betas, when employing the CAPM to estimate the forward-looking cost of equity capital.

However, the backward-looking empirical tests of the CAPM that gave rise to the ECAPM did not suffer from bias in the measurement of betas. Researchers plotted realized stock portfolio returns against betas measured over the same time period to produce plots such as Figure 8 below, which comes from the 2004 paper by Professors Eugene Fama and Kenneth French.[62] The fact that betas and returns were measured contemporaneously means that the betas used in the tests were already the best possible measure of the "true" systematic risk over the relevant rate period. In other words, no adjustments were needed for these betas. Despite this, researchers observed that the risk-return trade-off predicted by the CAPM was too steep to accurately explain the realized returns. As explained above the ECAPM explicitly corrects for this empirical observation.

61 Blume, Marshall E. (1971), "On the Assessment of Risk," The Journal of Finance, 26, pp. 1-10.

62 Fama, Eugene F. & French, Kenneth R, (2004), "The Capital Asset Pricing Model: Theory and Evidence," Journal of Economic Perspectives, 18(3), pp. 25-46.

FIGURE 8
EVIDENCE FROM EMPIRICAL TESTS OF THE CAPM[63]



Q50: Did the empirical tests that gave rise to the ECAPM use raw betas in their analyses?

A50: They did. However, this is simply because the researchers were able to measure raw betas and realized returns from the same historical period. In other words, no adjustment to the raw beta was necessary to evaluate the market return realized for the same historical period. Hence, the raw betas they measured accurately captured the systematic risk that impacted the returns they measured. In a sense, the measured betas and realized returns were already contemporaneous in the tests of the CAPM that identified the effect shown in Figure 7 and Figure 8.

Q51: Does using adjusted betas in the ECAPM double count the adjustment to the estimated required return on equity?

A51: No. The Blume adjustment to beta and the ECAPM are separate adjustments with no redundancy between them. In fact, both adjustments are necessary to produce the most accurate possible forward-looking estimate of the required return on equity.

A rate of return analyst must use a historical measurement of beta to make a forecast of the expected future return on equity. Therefore, the analyst should first apply the Blume

63 Ibid., p. 33

adjustment (as *Value Line* does) to get the best estimate of the systematic risk over the (future) period in which they will estimate the ROE. Once the risk measurement is contemporaneous with the returns to be estimated, the analyst should apply the ECAPM to adjust for the empirical shortcomings of the CAPM.

Q52: Can you summarize the independent reasons for using adjusted betas and employing the ECAPM?

A52: Raw historical betas are adjusted to provide a better estimate of expected "true" betas, which are the appropriate measure of risk that predicts expected future returns in the CAPM. The ECAPM is used because empirical tests show that even when the best possible estimate of "true" beta is used, the CAPM tends to under-predict required returns for low-beta stocks and over-predict required returns for high-beta stocks.

These are independent but complementary adjustments supported by empirical tests of this model of financial theory. Both adjustments are appropriate when using risk-positioning models to estimate the cost of equity.

5. RESULTS FROM THE RISK POSITIONING MODELS

Q53: What are the parameters of the two scenarios you considered in your risk positioning analyses?

A53: The parameters for the two scenarios I consider are shown in Table 5 below. In Scenario 1, I use an unadjusted historic MRP with an estimate of the forecasted risk-free rate. Whereas in Scenario 2, I use the forecasted risk-free rate with the forecasted estimate of the MRP forecasted by Bloomberg.

TABLE 5
RISK POSITIONING SCENARIO PARAMETERS

	Scenario 1	Scenario 2
Risk-Free Interest Rate	2.80%	2.80%
Market Risk Premium	7.25%	7.53%

Q54: What are the results from the risk-positioning model?

A54: Table 6 below illustrates the ROE estimates at the proposed capital structure with 53.4% for the Core and Expanded Samples. These estimates reflect the financial risk adjustment based on the difference in the average market-value capital structure of the sample companies and that of Cal Water.

TABLE 6
RISK POSITIONING COST OF EQUITY ESTIMATES AT 53.4% EQUITY

Estimated Return on Equity	Scenario 1 [1]	Scenario 2 [2]
Core Water Sample		
Financial Risk Adjusted Method		
CAPM	10.8%	11.1%
ECAPM (α = 1.5%)	11.3%	11.6%
Hamada Adjustment Without Taxes		
CAPM	10.4%	10.7%
ECAPM (α = 1.5%)	10.3%	10.6%
Hamada Adjustment With Taxes		
CAPM	10.0%	10.2%
ECAPM (α = 1.5%)	10.0%	10.3%
Expanded Water Sample		
Financial Risk Adjusted Method		
CAPM	10.6%	10.9%
ECAPM (α = 1.5%)	11.1%	11.4%
Hamada Adjustment Without Taxes		
CAPM	10.2%	10.5%
ECAPM (α = 1.5%)	10.2%	10.5%
Hamada Adjustment With Taxes		
CAPM	9.8%	10.1%
ECAPM (α = 1.5%)	9.9%	10.1%

Sources and Notes:
[1]: Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.25%.
[2]: Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.53%.

Q55: What conclusions do you draw from the risk positioning model (i.e. CAPM and ECAPM) results?

A55: The risk positioning model ROE estimates for the Core Sample range from 10.0 percent to 11.6 percent. These estimates are supported by the ROE estimates for the Expanded Sample, which range from 9.8% to 11.4%. Of the equity risk premium results, I place less weight on the CAPM values because this method does not adjust for the empirical findings that the cost of capital is less sensitive to beta than predicted by the CAPM. Conversely, the ECAPM results get the most weight, because this method adjusts for these empirical findings. All ROE estimates reflect Cal Water's requested regulatory capital structure of 53.4 percent equity. Based on estimates from the Core Sample, I find the reasonable range for Cal Water's ROE to be between 10.0 percent and 11.5.[64] This reasonable range is consistent with the ECAPM results of the Expanded Sample.

B. THE DCF BASED ESTIMATES

Q56: Can you describe the discounted cash flow approach to estimating the cost of equity?

A56: The DCF method assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow stream:

$$P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \cdots + \frac{D_T}{(1+r)^T} \quad (8)$$

where P_0 is the current market price of the stock;
D_t is the dividend cash flow expected at the end of period t;
T is the last period in which a dividend cash flow is to be received; and
r is the cost of equity capital

64 Rounded to the nearest ¼ of a percentage point.

The formula says that the stock price is equal to the sum of the expected future dividends, each discounted for the time and risk between now and the time the dividend is expected to be received.

In regulatory settings, DCF applications go even further, and often make strong assumptions that yield a simplification of the standard formula, which then can be rearranged to estimate the cost of capital. Specifically, the model assumes investors expect a dividend stream that will grow *forever* at a steady rate, therefore the market price of the stock will be given by a very simple formula,

$$P_0 = \frac{D_1}{r-g} \quad (9)$$

where D_1 is the dividend expected at the end of the first period, g is the perpetual growth rate, and P_0 and r are the current market price and the cost of equity capital, as before.

Equation (9) is a simplified version of Equation (8) that can be solved to yield the well-known "DCF formula" for the cost of capital:

$$r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1+g) + g \quad (10)$$

where D_0 is the current dividend, which investors expect to increase at rate g by the end of the next period, and the other symbols are defined as before. Equation (10) says that if Equation (9) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the "simple DCF" (or "single stage DCF") model. Of course, the "simple" model is simple because it relies on strong assumptions.[65]

65 In this context "strong" means assumptions that are unlikely to reflect reality but that also are not expected to have a large effect on the estimate.

Q57: Are there other versions of the DCF models in addition to the "simple" DCF?

A57: Yes. The "simple" or constant growth rate DCF model requires that dividends and earnings grow at a constant rate for companies that earn their cost of capital on average.[66] It is inconsistent with the theory on which this formulation is based to have varying growth rates in earnings and dividends. If the dividend growth rates and earnings were expected to vary over some number of years before settling down into a constant growth period, then it would be appropriate to utilize a multi-stage DCF model. A difference between forecasted dividend and earnings rate is, therefore, a signal that the facts do not fit the assumptions of the simple DCF model.

I consider a variant of the DCF model that relies on slightly less strong assumptions, in that it allows for varying dividend growth rates in the near-term before assuming a perpetual growth rate beginning in year eleven. I use the forecasted growth of nominal GDP as the forecast of long-term growth rate. This variant of the DCF methodology is called the "multi-stage DCF" model.

Q58: Does the multi-stage DCF improve upon the simple DCF?

A58: Potentially, but the multi-stage method assumes a particular smoothing pattern and a long-term growth rate afterwards. These assumptions may not be a more accurate representation of investor expectation than those of the simple DCF. The smoother growth pattern, for example, might not be representative of investor expectations, in which case the multistage model would not increase the accuracy of the estimates. Indeed, amidst uncertainty in capital markets, assuming a simple constant growth rate may be preferable to attempting to model growth patterns in greater detail over multiple stages. While it is difficult to determine which

66 Why must the two growth rates be equal in a steady-growth DCF model? Think of earnings as divided between reinvestment, which funds future growth, and dividends. If dividends grow faster than earnings, then there is less investment and slower growth each year. Sooner or later dividends will equal earnings. At that point, growth is zero because nothing is being reinvested (dividends are constant). If dividends grow more slowly than earnings, each year a bigger fraction of earnings are reinvested. That makes for ever faster growth. Both scenarios contradict the steady-growth assumption. So if you observe a company with different expectations for dividend and earnings growth, you know the company's stock price and its dividend growth forecast are inconsistent with the assumptions of the steady-growth DCF model.

set of assumptions comprises a closer approximation of the actual conditions of capital markets, I believe both forms of the DCF model provide useful information about the cost of capital.

Q59: What is your assessment of the DCF model?

A59: The DCF approach is grounded in solid finance theory. It is widely accepted by regulatory commissions and provides useful insight regarding the cost of capital based on forward-looking metrics. DCF estimates of the cost of capital complement those of the CAPM and the ECAPM because the two methods rely on different inputs and assumptions.

However, I recognize that the DCF model, like most models, relies upon assumptions that do not always correspond to reality. For example, the DCF approach assumes that the variant of the present value formula that is used matches the variations in investor expectations for the growth of dividends, and that the growth rate(s) used in that formula match current investor expectations. Less frequently noted conditions, such as the value of real options incorporated in a company's market price, may create issues that the DCF model does not incorporate. Nevertheless, because of its forward-looking nature, the strengths of the DCF method far outweigh any weaknesses the method may have.

Q60: What growth rate information do you use?

A60: The first step in my DCF analysis (either constant growth or multistage formulations) is to examine a sample of investment analysts' forecasted earnings growth rates from Thomson Reuters IBES and from Value Line for companies in the core water utility sample.[67] The two additional water utilities in the expanded sample currently do not have growth rate projections from investment analysts as provided by Reuters IBES or Value Line.[68] Therefore, at this time, DCF estimates for the two companies in the Expanded Sample cannot

67 Short-term (5 year) EPS growth rates as of February 28, 2021. I develop a weighted average growth rate weighted by the number of analysts and counting Value Line as one analyst.

68 As of February 28, 2021.

be calculated. This means that the DCF range I estimate apply only to the Core sample. No such DCF range can be estimated for the Expanded Sample at this time.

For the long-term growth rate for the final, constant-growth stage of the multi-stage DCF estimates, I use the most recent long-run GDP growth forecast from Blue Chip Economic Indicators of 3.9%.[69]

Q61: How do these growth rates correspond to the theoretical criteria you discuss above?

A61: The constant-growth formulation of the DCF model, in principle, requires forecasted growth rates, but it is also necessary that the growth rates used go far enough out into the future so that it is reasonable to believe that investors expect a stable growth path afterwards. Under current economic conditions, I believe the forecasted growth rates of investment analysts provide the best available representation of the longer term, steady-state growth rate expectations of investors. Therefore, I feel these growth parameters available to apply to the simple, constant-growth DCF model provide useful estimates of the cost of capital.

Q62: What are the relative strengths and weaknesses of the DCF and risk-positioning methodologies?

A62: Current market conditions affect all cost of capital estimation models to some degree, but the DCF model has at least one advantage over the risk positioning models. Specifically, the DCF model reflects current market conditions more quickly because the market price of a company's stock changes daily. Dividend yields increase when market prices fall and reflect the increased cost of capital. The challenge for the DCF model is that the model requires forecasts of earnings growth rates that are based upon stable economic conditions, which are required to satisfy the constant dividend growth rate assumption. Although the dividend yield quickly reacts to changes in the market, the growth rate estimates may be less precise during times of market uncertainty because future growth rates may be more volatile. Nevertheless, because dividend yields and forecast growth rates change quickly, the DCF

69 Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, March 2021, p. 14

model is likely to better reflect investors' current cost of capital expectations than the CAPM and ECAPM which relies upon 5 years of historical data.

Q63: What are the DCF estimates for the sample?

A63: The corresponding estimates for the Core Sample are presented in Table 7.[70] These results reflect the necessary adjustment for financial leverage (based on the ATWACC methodology) to control for differences in the sample companies' capital structure and that of Cal Water's requested capital structure.

TABLE 7
DCF COST OF EQUITY ESTIMATES

	Simple	Multi-stage
Core Water Sample	10.3%	7.3%

Q64: What are your conclusions regarding the DCF model?

A64: The DCF results for the Core Sample range from 7.3% for the multi-stage DCF to 10.3% for the simple DCF. I rely more heavily on the results from the simple DCF due to the unprecedented levels of uncertainty and volatility in the market as a result of the pandemic. The DCF model relies on the assumption that dividends will grow at a constant rate due to stable economic conditions. To the extent that growth rates are depressed due to the on-going economic uncertainties, the results from the multi-stage DCF formulation understate an appropriate return on equity.[71] The multi-stage DCF results are below the results from all the other estimation methodologies I employed. Consequently, I place more weight on the simple DCF, which is in line with the estimates from the CAPM/ECAPM methodologies.

70 Artesian Resources Corp. and Global Water Resources Inc., do not have Value Line or IBES growth rates as of February 28, 2021. As a result, the DCF range for the Expanded Sample cannot be calculated at this time.

71 Growth rates are based on investment professionals' analyses and may be slower to reflect the level of market uncertainty.

C. RISK PREMIUM MODEL ESTIMATES

Q65: Please explain the Risk Premium Model?

A65: The Risk Premium Model estimates the cost of equity capital for utilities based on the historical relationship between allowed ROE's in utility rate cases and the risk-free rate of interest prevailing at the time the ROE's were granted. This relationship is described in Equation 6 below, where the "risk premium" implied by this relationship is added to the prevailing risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium \quad (6)$$

Q66: How did you perform your Risk Premium analysis?

A66: To perform the risk premium analysis, I rely on water utility rate case data from 2007-2020 as provided by S&P Market Intelligence's RRA Water Advisory.[72] I also use the average 20-year Treasury bond yield that prevailed in each year.[73] I then calculated the "risk premium" as the difference between allowed returns and the Treasury bond yield in each year. The risk premium represents the compensation for risk allowed by regulators. The relationship between the change in interest rates (independent variable) and the risk premium (dependent variable) is then estimated using statistical linear regression method:

$$Risk\ Premium\ =\ A_0\ +\ A_1\ \times\ (Treausury\ Bond\ Yield) \quad (7)$$

The results from my linear regression are shown in Table 8 below. The parameter estimates A_0 equals 8.87 percent and A_1 equals -0.708.[74] The negative slope parameter (A_1) reflects that regulators grant smaller premiums when U.S. Treasury bond yields are higher. This is consistent with empirical observations that the premium investors require to hold equity

72 Doerr, Heike, 'RRA Water Advisory: Major Rate Case Decisions January-December 2020', S&P Global Market Intelligence, February 8, 2021, p. 4

73 I rely on the 20-year government bond to be consistent with my CAPM/ECAPM analysis.

74 I note that the regression has a high degree of explanatory power with a R^2=0.93.

rather than government bonds increases as U.S. Treasury bond yields decline. Using the same risk-free rate as in my CAPM/ECAPM analysis, the Risk Premium model results in an ROE estimate of 9.7 percent.[75]

TABLE 8
IMPLIED RISK PREMIUM MODEL ESTIMATES

	Forward Looking 20 year Treasury Bond Estimate	Intercept	Slope	Estimated Risk Premium	Estimated Return on Equity
	[1]	[2]	[3]	[4] = [2] + [1] × [3]	[5] = [1] + [4]
Water Utilities:	2.80%	8.87%	-0.708	6.89%	9.7%

Sources and Notes:

[1]: Blue Chip Economic Indicators Forecast for 10 year Treasury Bond in 2023, adjusted to 20 year horizon.
[2] & [3]: see tab SS1-Regression Output.

Q67: What are your conclusions regarding the Risk Premium Model?

A67: The risk premium model is based on the historic relationship between allowed returns and U.S. Treasury bond yields. Unlike the CAPM or DCF models, it is not underpinned by fundamental financial principles. However, the risk premium analysis, when properly designed, executed, and placed in the proper context, can be used as benchmark for assessing whether the ROE estimates resulting from the DCF and CAPM methodologies are consistent with the actions of water utility regulators. The results from my implementation of the DCF are in line with my risk premium ROE estimates, whereas the risk premium results are below my CAPM/ECAPM estimates.

75 Results for the Risk Premium analysis can be found in Exhibit F, Schedule No. AS-3.

D. SUMMARY OF RESULTS

Q68: Please summarize your ROE evidence for the water utility sample with a 53.4% equity capital structure.

A68: Table 9 below summarizes the ROE results from the risk positioning (CAPM/ECAPM), DCF, and Risk Premium models for Cal Water. Next, I consider Cal Water and California specific risks to inform my recommendation of a reasonable ROE for the Company.

TABLE 9
REASONABLE RANGES OF ROE ESTIMATES AT 53.4% EQUITY

	Core Sample	Expanded Sample
CAPM	10.0% - 11.1%	9.8% - 10.9%
ECAPM	10.0% - 11.6%	9.9% - 11.4%
DCF	7.3% - 10.3%	NA[1]
Risk Premium	9.7%[2]	9.7%[2]

Notes: 1 – DCF estimates cannot be calculated as growth rate projections for the two additional water companies in the expanded sample are unavailable.
2 – Risk Premium model is based on the relationship between historical authorized ROEs and the contemporaneous interest rates. The model yields a point estimate of the ROE. It does not employ a sample of companies in the ROE estimation calculations.

E. BUSINESS RISK CONSIDERATIONS

Q69: What are the risk factors for Cal Water relative to the sample of water utilities?

A69: Cal Water operates the third largest regulated water utility in the United States. The Company's service territory consists of about 40 systems across California ranging in size from Class A to Class D systems.[76] To serve those districts, Cal Water owns about 700 wells and obtains approximately half of its water supply from groundwater wells.[77] The reliance on groundwater provides benefits for ratepayers through lower costs, but it also increases the Company's business risk due to potential contamination and other operational uncertainties related to groundwater supplies. Cal Water is responsible for treating the

76 Exhibit H Testimony of Company Witness Greg Milleman.

77 Exhibit I Testimony of Company Witness Robert Kuta.

groundwater and ensuring that there is no contamination. As discussed in Company witness Kuta's testimony, the costs associated with the operation and treatment of these groundwater sources can be variable and unpredictable and therefore may not be fully captured in the Company's general rate case. This puts the Company at risk of under-recovering its costs.[78]

Cal Water also faces operational risks due to wildfires in its service territory. This can lead to equipment damage, such as in the Woolsey Fire in 2018. It can also lead to service disruptions, such as with the River Fire in 2020, or can lead to operational challenges providing water supply to fire fighters and communities during a wildfire event.[79] As a result, Cal Water is investing in its system to protect its equipment and mitigate wildfire related risks. However, factors outside of its control, such as Power Safety Power Shutoff (PSPS) events, can still leave Cal Water at risk from responding to or mitigating the impacts to wildfires.[80] While wildfire risk is not unique to California, Cal Water's concentrated operations in the state puts it at above average risk, relative to the sample.

In addition, the recent Commission decision terminating Cal Water's Water Revenue Adjustment Mechanism (WRAM) beginning January 1, 2023, elevates the risk that Cal Water may not be able to recover its fixed costs fully, unless the actual sales match the adopted sales forecast. However, as witness Milleman testifies, over the last ten-year period of 2009-2020, the Company's actual sales have consistently been lower than the adopted sales forecast. If this trend were to continue, the termination of WRAM imposes new fixed-cost recovery risk for Cal Water. According to witness Milleman, the average annual net revenue deficiency is $27.5 million.[81]

[78] Ibid.

[79] Ibid.

[80] Ibid.

[81] Exhibit H Testimony of Company Witness Milleman.

Q70: Have you analyzed Cal Water's capital expenditures?

A70: Yes. Cal Water and the other California water utilities are making large capital investments to upgrade existing water infrastructure to strengthen its resiliency and help the State achieve its sustainability goals as part of the California Water Plan.[82] To do so, Cal Water will need to attract sufficient capital to fund its capital expenditure program.

I reviewed the core water utility sample companies' recent historical and forecasted investments in utility plant assets. I used this information to compare Cal Water's historic capital expenditures to that of the other water utilities in my Core Sample. In Table 10 below, I normalized each company's capital expenditures by its net property, plant, & equipment (PP&E) balance. This gives me a measure of the level of capital expenditures relative to the size of the company's existing plant.

As can be seen in Table 10, Cal Water's normalized capital expenditures were higher than of the other core sample water utilities from 2016 to 2018. Since 2019, Cal Water has had the second highest level of normalized capital expenditures (after Middlesex Water). Over the prior five years, Cal Water has consistently expanded its net PP&E by a larger percentage than the average core sample water utility. This higher level of capital investments, considering higher revenue risks due to termination of WRAM provisions, increases the risk profile of Cal Water relative to the other utilities. Higher capital expenditure also means that the company will need to continue to attract sufficient capital to fund its capital investment program.

[82] California Department of Water Resources, "California Water Plan," accessed March 15, 2021, https://water.ca.gov/Programs/California-Water-Plan

TABLE 10
CAPITAL EXPENDITURES / NET PP&E

		2016	2017	2018	2019	2020
		[1]	[2]	[3]	[4]	[5]
Amer. States Water	[A]	11.2%	9.3%	9.7%	10.4%	8.5%
Amer. Water Works	[B]	8.7%	8.8%	9.1%	9.0%	9.2%
California Water	[C]	12.4%	12.7%	12.2%	11.4%	11.3%
Essential Utilities	[D]	7.7%	8.9%	8.4%	8.7%	8.7%
Middlesex Water	[E]	9.0%	8.9%	11.5%	12.3%	13.0%
SJW Group	[F]	10.9%	11.0%	10.0%	7.4%	8.3%
York Water Co. (The)	[G]	4.9%	8.7%	5.6%	6.5%	9.7%
Core Sample Average	**[H]**	**9.3%**	**9.8%**	**9.5%**	**9.4%**	**9.8%**
California Water	[J]	12.4%	12.7%	12.2%	11.4%	11.3%

Sources and Notes:
[A] - [G] and [J]: S&P Capital IQ
[H]: Average ([A] - [G])

Q71: How does Cal Water's operating leverage compare to that of the sample?

A71: Water utilities incur a substantial amount of fixed costs in order to operate a network of assets to deliver water to end-users. Companies with higher fixed costs are at a higher business risk as they must earn sufficient revenues—which are variable—each period to cover those fixed costs. To evaluate Cal Water's fixed costs relative to that of the other core water utilities, I look to each companies operating leverage which is the ratio of a firm's operating income to their operating revenues. The results are shown in Table 11 below.

TABLE 11
OPERATING LEVERAGE (OPERATING INCOME / OPERATING REVENUE)

		2016	2017	2018	2019	2020
		[1]	[2]	[3]	[4]	[5]
Amer. States Water	[A]	0.78	0.79	0.76	0.79	0.79
Amer. Water Works	[B]	0.87	0.88	0.87	0.87	0.87
California Water	[C]	0.72	0.75	0.73	0.72	0.74
Essential Utilities	[D]	0.87	0.87	0.86	0.87	0.85
Middlesex Water	[E]	0.75	0.75	0.74	0.72	0.73
SJW Group	[F]	0.78	0.77	0.75	0.70	0.75
York Water Co. (The)	[G]	0.83	0.80	0.79	0.79	0.79
Sample Average	[H]	0.80	0.80	0.79	0.78	0.79
California Water	[I]	0.72	0.75	0.73	0.72	0.74

Sources and Notes:
[A] - [G] and [I]: S&P Capital IQ
[H]: Average ([A] - [G])

As shown in Table 11, Cal Water has a higher degree of operating leverage relative to the sample companies. That is, for every dollar of revenue, Cal Water earns a lower amount of operating income relative to the average sample company.

Q72: How does Cal Water's earned ROE compare to that of the sample?

A72: As shown in Table 12 below, Cal Water earned ROE was below that of the average sample water utility from 2016 to 2019. Note that Table 12 reflects the financials as reported in each parent company's annual financial disclosures. In all years except 2020, Cal Water under earned the sample average ROE.

TABLE 12
EARNED ROE (NET INCOME/ TOTAL EQUITY)[83]

		2016	2017	2018	2019	2020
		[1]	[2]	[3]	[4]	[5]
Amer. States Water	[A]	12.1%	13.1%	11.4%	14.0%	13.5%
Amer. Water Works	[B]	9.0%	7.9%	9.7%	10.1%	11.0%
California Water	[C]	7.4%	10.4%	9.0%	8.1%	10.5%
Essential Utilities	[D]	12.7%	12.2%	9.6%	5.8%	6.1%
Middlesex Water	[E]	10.3%	9.8%	12.9%	10.4%	11.0%
SJW Group	[F]	12.5%	12.8%	4.4%	2.6%	6.7%
York Water Co. (The)	[G]	10.4%	10.9%	10.6%	10.7%	11.6%
Sample Average	**[H]**	**10.6%**	**11.0%**	**9.6%**	**8.8%**	**10.1%**
California Water	[I]	7.4%	10.4%	9.0%	8.1%	10.5%

Sources and Notes:
[A] - [G] and [I]: S&P Capital IQ
[H]: Average ([A] - [G])

Q73: Can you please summarize your assessment of Cal Water's business risk relative to that of the sample?

A73: Cal Water's operations are primarily concentrated in California, which creates some unique challenges, for example, elevated operational risks due to frequency and scale of wildfires. The Company also incurs high costs and operational uncertain related to sourcing and treatment of groundwater. The termination of the WRAM elevates the risk that Cal Water may not be able to fully recover its fixed costs. Finally, the Company's high operating leverage ratio and large capital expenditure program, coupled with higher revenue risk, could impact the credit quality and financial position of the Company. Consequently, I find Cal Water to have above average business risk, relative to my sample.

[83] Earned ROE are shown at the parent company level, based on each company's 10-K. For California Water Service Company's earned ROE, see Exhibit H Testimony of Company Witness Greg Milleman.

VI. COST OF CAPITAL RECOMMENDATION

Q74: Please summarize your conclusions regarding a reasonable range for Cal Water's return on equity.

A74: In reviewing the estimates from the different methodologies, I rely more heavily on the scenarios that account for forward-looking market expectations in the Market Risk Premium ("MRP") and whose estimates are appropriately adjusted for financial risk using the Hamada adjustments. As noted earlier, the estimates based upon the CAPM are not as reliable as those based upon the ECAPM because the CAPM estimates do not account for the empirical observation that low beta stocks have higher costs of capital than estimated by the CAPM, and high beta stocks have lower costs of capital. The risk positioning model estimates are supported by the estimates from the Risk Premium model. For the DCF model, I believe that the multi-stage DCF currently should get less weight than the single-stage DCF. Overall, this narrows the range of reasonable ROE estimates I find most applicable to Cal Water at this time, to be 10 percent to 10 ¾ percent.

Q75: What is your recommended range of the ROE for the Company?

A75: My recommended range of ROE estimates for Cal Water is 10 percent to 10 ¾ percent. Within this range, I find that Cal Water is of above average risk relative to the other water utilities in my sample given its specific operational and regulatory business risks. I understand the Company is requested a return on equity of 10.35%, which falls in the middle of my range. Therefore, I find Cal Water's requested ROE to be conservative.

Q76: Does this conclude your testimony?

A76: Yes.

Exhibit F
Schedule AS-2

Akarsh Sheilendranath
Senior Associate

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Mr. Akarsh Sheilendranath is a Power & Utilities expert with over 13 years of consulting, ISO and transmission utility experience leading strategic analyses of large-scale renewables and transmission grid investments, renewable generation procurements, strategic planning, cost of capital assessments, financial valuation, electricity markets and public policy. He has a dual specialization—specializing in both the evaluation of the economics of renewables and transmission grid investments, and in regulatory finance, including return on equity estimation for FERC and state jurisdictional electric transmission, generation, distribution assets, water companies, and natural gas pipelines. He has testified on behalf of a wide range of clients, including utilities, electric transmission and generation asset owners, and competitive electric market participants, and has advised them, including ISO/RTOs and PUCs, in the economics of transmission and large-scale renewable investments, on renewable generation procurement, on cost of capital and return on equity estimations, on designing public policy and competitive transmission procurement frameworks (now adopted by NYISO), and on a wide spectrum of strategic business and policy decision making for transmission clients. Mr. Sheilendranath's experience in regulatory finance and in the estimation of return on equity for regulated entities is extensive, wherein he has sponsored expert testimonies, has assisted clients and counsel on deep strategic matters on settlement discussions, participated on FERC settlement calls on behalf of clients, led the ROE estimation analyses for various transmission and pipeline projects, and is currently assisting several utility clients, including FERC-regulated electric transmission company in CAISO and regulated electric utilities in the Southwest Power Pool and PJM, in submitting his expert testimony and analyses in separate state and FERC proceedings on the topics of return on equity estimation using the FERC's revised return on equity policy, and on the benefits of procurement of significant wind generation assets. His testimonies have addressed risks, the effect of regulatory policies such as must-run generation on a regulated company's cost of capital and the appropriate way to estimate the cost of capital for unique single-asset companies without access to capital markets, as well as electric cooperatives joining FERC-jurisdictional ISO/RTO markets. His expertise also includes deep understanding of the evolution of FERC's ROE policy both pre- and post- Opinion 531, and brings significant knowledge of FERC's models and methodologies, its preferred sample selection criteria, and the commission's preferred use of various financial data sources for inputs to FERC ROE estimation assessment. Recently Mr. Sheilendranath has also co-authored a whitepaper delineating how FERC should approach resetting its Return on Equity Policy for Electric Transmission in light of the D.C. Circuit Court of Appeals' remand of Opinion 531 in Emera Me. v. FERC, 854 F.3d 9, 17 (Emera).

At The Brattle Group, he assists a wide range of utility clients throughout North America and Oceania in utility planning and strategy, regulatory corporate finance and cost of capital assessment, and all matters related to investments, valuation and integration of large-scale wind generation and electric transmission.

EDUCATION

Mr. Sheilendranath received an MBA from the New York University Stern School of Business, an M.S. in Electrical Engineering from Michigan Technological University, and a BS in Instrumentation Engineering from Siddaganga Institute of Technology.

REPRESENTATIVE EXPERIENCE

Mr. Sheilendranath has served as the consulting manager and as testifying expert, advising energy clients in several cases on a wide-range of topics in electric transmission & renewables, electricity markets and utility resource planning and cost of capital.

Cost of Capital, Utility Regulatory Finance and Recent Testimonies

- *Ongoing Cases:* Mr. Sheilendranath is currently assisting four FERC-jurisdictional electric transmission utility and a must-run generation asset-owner in four separate cases, in estimating the Return on Equity using FERC's proposed revised ROE estimation methodology based on Opinion 569-A, and its predecessor decisions. *Mr. Sheilendranath is a co-sponsoring expert ROE witness at the Federal Energy Regulatory Commission, and is currently assisting these clients in their ongoing litigated hearing and/or settlement discussions.*
- Mr. Sheilendranath assisted an electric transmission utility client as an independent expert witnesses in analyzing the benefits and costs of large-scale wind generation in the Southwest Power Pool footprint, and testified at the Texas PUC in recently concluded hearings on the matter.
- Mr. Sheilendranath submitted direct testimony (with Michael Vilbert) on behalf of Corn Belt Power Cooperative, Docket No. ER15-2028-002, on the cost of capital for the Cooperative using the revised FERC ROE estimation methodology and related ROE policy, March 2020.
- Mr. Sheilendranath submitted direct and rebuttal testimony (with Michael Vilbert) on behalf of Northwest Iowa Power Cooperative, Docket No. ER15-2115-003, on the cost of capital for the Cooperative using the revised FERC ROE estimation methodology and related ROE policy, February 2020.
- Mr. Sheilendranath submitted direct testimony before the Federal Energy Regulatory Commission, Docket No. ER19-2846-000, on behalf of Trans Bay Cable LLC, regarding the appropriate ROE and capital structure to allow for its regulated electric transmission assets, September 2019.
- Mr. Sheilendranath submitted prepared affidavit and reply affidavit (with Michael Vilbert) on behalf of Constellation Mystic Power, LLC, Docket No. ER18-1639-000, on the cost of capital for the Mystic reliability must run generating using the revised FERC ROE estimation methodology, April 2019 and July 2019.
- Mr. Sheilendranath estimated ROE using FERC methodology and developed direct testimony for a Brattle expert for submission at the Federal Energy Regulatory Commission, Docket No. ER17-706-000 on behalf of Gridliance West Transco LLC, regarding Gridliance West's application pursuant to

section 205 of the Federal Power Act regarding the appropriate ROE, cost of debt, and capital structure to allow Gridliance West Transco LLC to earn on the transmission facilities acquired from Valley Electric Association, December 2016. Assisted in Gridlinace West's settlement conference calls with the commission staff and the parties, and more recently, analyzed the transmission incentives, assisting in filing and settlement discussion on incentive transco adder.

- Mr. Sheilendranath estimated ROE using FERC methodology and prepared a direct testimony and supporting exhibits for Brattle expert for submission before the Federal Energy Regulatory Commission, Docket No. EC17-049-000, on behalf of Gridliance West Transco LLC, regarding GridLiance West's application pursuant to section 203 of the Federal Power Act (FPA) to acquire certain high voltage transmission facilities from Valley Electric Transmission Association, LLC (VETA) through its parent non-profit electric cooperative parent Valley Electric Association, Inc. (Valley Electric), December 2016.
- Mr. Sheilendranath estimated ROE using FERC methodology and developed direct testimony and supporting exhibits for a Brattle expert for submission before the Federal Energy Regulatory Commission, Docket No. ER16-2632-000, on behalf of Trans Bay Cable LLC, regarding the appropriate ROE and capital structure to allow for its regulated electric transmission assets, September 2016. He also provided long-term, continual strategic advisory support to Trans Bay Cable's executives during the significant uncertainty surrounding the rate case as a result of Opinion 531 remand. Further, he assisted the client and its legal counsel on interrogatories, drafting of briefs.
- Mr. Sheilendranath led the estimation of Natural Gas pipeline ROE using FERC's methodology and developed direct testimony for a Brattle expert for submission before the Federal Energy Regulatory Commission, Docket No. RP17-598-000 on behalf of Great Lakes Gas Transmission Limited Partnership, regarding the appropriate ROE to allow for its regulated natural gas pipeline assets, March 2017.
- Mr. Sheilendranath led the ROE estimation analysis employing DCF, CAPM and Risk Premium financial models, and assisted in the preparation of direct and rebuttal testimony for Brattle expert for submission before the Michigan Public Service Commission on behalf of the DTE Gas Company, Case No. U-18999, on the cost of common equity capital for DTE Gas Company's regulated natural gas distribution assets, February 2018.
- Mr. Sheilendranath led the ROE estimation analysis employing DCF and CAPM financial models, and assisted in the preparation of direct and rebuttal testimony for Brattle expert for submission before the Michigan Public Service Commission on behalf of the DTE Gas Company (Case No. U-17799) on the cost of capital for DTE Gas Company's natural gas distribution assets, December 2015 and May 2016.
- Mr. Sheilendranath assisted in the ROE estimation analysis employing FERC's DCF methodology and led the Economic Conditions Impact Assessment in the preparation of direct testimony and supporting exhibits for Brattle expert for submission before the Federal Energy Regulatory Commission, Docket No. RP16-440-000, on behalf of ANR Pipeline Company, regarding the appropriate ROE to allow for its regulated natural gas pipeline assets, January 2016.

- For the Ontario Energy Board (OEB) Staff, as project manager, Mr. Sheilendranath analyzed the appropriate capital structure for a power generator that is engaged in a nuclear refurbishment program, and assisted Brattle expert submit evidentiary report advising the OEB Staff.

Renewables, Cost Benefit Analyses, and Electric Transmission Pricing

- Submitted expert testimony before the Arkansas Public Service Commission (Docket No. 19-035-U), the Texas Public Utilities Commission (Docket No.49737), the Louisiana Public Service Commission (Docket No. U-35324), and the Corporation Commission of Oklahoma (Cause No. PUD 201900048), Testimonies of Akarsh Sheilendranath in the Matter of the Acquisition of Wind Generation Facilities on behalf of Southwestern Public Service Company and Oklahoma Public Service Company, July 2019 through February 2020.
- Mr. Sheilendranath co-authored an extensive review of competitive transmission procurement practices of North American system operators and quantified the benefits of competitive transmission procurement. His paper, and his presentation on this matter, to the American Public Power Association at the 2018 Conference can be accessed from here:

  https://brattlefiles.blob.core.windows.net/files/15987_brattle_competitive_transmission_report_finalwith_data_tables_04-09-2019.pdf

  http://files.brattle.com/files/14669_transmission_competition_under_ferc_order_no__1000_at_a_crossroads_-_reinforce_or_repeal.pdf
- Mr. Sheilendranath Developed various resource procurement strategies for American Electric Power (AEP), and analyzing economic impacts of different resource procurement futures for AEP's operating companies in connection with AEP's Wind Catcher Project. His analyses for AEP included extensive assessment of potentially contracting with resource developers via PPAs, versus build-to-own models for the operating companies, to meeting their 25-year future energy and capacity needs.
- Provided extensive strategic advisory for AEP's leadership team in AEP's Wind Catcher Project development, and assisting the company on a wide-range of issues—from ideation to regulatory approval processes, including analysis of renewable PPAs, developing market simulations, and designing benefit-cost frameworks to analyze the economics of integrating Wind Catcher's 2,000 MW of wind generating resources, delivered through a 765 kV generation tie line from the wind-rich Oklahoma Panhandle region to the company's load centers in Oklahoma, Arkansas, Louisiana and Texas.
- Provided strategic support in developing numerous renewable energy transmission investment options, valued between $0.5B-$2B, for the Board of Directors of a large utility in New England; he assisted in developing options to strategically align company's near-term growth opportunities with the long-term renewable vision of New England states, and co-presented investment options and recommendations to the company's Board of Directors.
- Conducted Benefit-Cost Analysis of New York Transmission Upgrades for New York Public Service Commission, wherein he assisted NY DPS Staff and NYISO in analyzing economic benefits of each of the proposed transmission portfolios. Mr. Sheilendranath worked extensively with NY DPS Staff in

developing detailed cost estimates and estimating revenue requirements for each proposed portfolio, and led the design and quantification analyses to analyze the full-range of benefits of avoided transmission and reduced future transmission refurbishment assessments for each transmission portfolio analyzed. In the matter of: Benefit-Cost Analysis of Proposed New York AC Transmission Upgrades," Appendix 1 to Comparative Evaluation of Alternating Current Transmission Upgrade Alternatives, Trial Staff Final Report, *Proceeding on Motion of the Commission to Examine Alternating Current Transmission Upgrades*, New York State Department of Public Service, Matter No. 12-02457, Case No. 12-T-0502, September 22, 2015.

- Led multiple stakeholder engagements on behalf of senior staff of ISO New England and Southwest Power Pool (SPP), and presented analyses of long-range strategic planning for renewable futures, near-term market integration strategies, and cost-benefit assessments of regional public policy options.
- Worked with the Southwest Power Pool (SPP) and its Committees in their efforts to develop planning approaches, assessing benefits and cost allocations of SPP's $7 billion portfolio of transmission projects, analyzing benefit metrics and evaluation frameworks for interregional transmission projects. Presented study results and recommendations to various SPP Stakeholders on behalf of the SPP Staff.
- Represented ISO New England in the Department of Energy (DOE)-funded national planning coordination process, and has presented ISO's strategic planning initiatives to ISO Board of Directors and at advisory committees.
- Analyzed for client merits- and demerits of alternative transmission solutions to integrating large-scale off-shore wind developments in the eastern US corridor for independent developers, and recently was the panelist and moderator for offshore wind transmission conference panels on financing, and on economics and viability of offshore grids.

Transmission Planning, Market Design, Public Policy and Strategic Planning

- Provided sworn Affidavit before the Federal Energy Regulatory Commission, Docket No. EL19-34-000, on behalf of Brookfield Energy Marketing LP's complaint against PJM Interconnection, L.L.C. ("PJM") with respect to PJM's application of its most recent changes to its Tariff and Reliability Assurance Agreement regarding Pseudo-ties and their eligibility for participating in PJM's Capacity Market, January 18, 2019.
- Led multiple stakeholder engagements on behalf of senior staff of ISO New England and Southwest Power Pool (SPP), and presented analyses of long-range strategic planning for renewable futures, near-term market integration strategies, and cost-benefit assessments of regional public policy options.
- Worked with the Southwest Power Pool (SPP) and its Committees in their efforts to develop planning approaches, assessing benefits and cost allocations of SPP's $7 billion portfolio of transmission projects, analyzing benefit metrics and evaluation frameworks for interregional transmission projects. Presented study results and recommendations to various SPP Stakeholders on behalf of the SPP Staff.
- Represented ISO New England in the Department of Energy (DOE)-funded national planning coordination process, and has presented ISO's strategic planning initiatives to ISO Board of Directors and at advisory committees.

- Analyzed for client merits- and demerits of alternative transmission solutions to integrating large-scale off-shore wind developments in the eastern US corridor for independent developers, and recently was the panelist and moderator for offshore wind transmission conference panels on financing, and on economics and viability of offshore grids.

ARTICLES, REPORTS, AND PUBLICATIONS

- Provided sworn Affidavit before the Federal Energy Regulatory Commission, Docket No. EL19-34-000, Affidavit of Johannes P. Pfeifenberger and Akarsh Sheilendranath on behalf of Brookfield *Energy Marketing LP's complaint against PJM Interconnection, L.L.C. ("PJM") with respect to PJM's application of its most recent changes to its Tariff and Reliability Assurance Agreement,* January 18, 2019.
- Integrating Renewables into Lower Michigan's Electric Grid: Resource Adeqaucy, Operational Analysis, and Implications, prepared for DTE Energy (with J. Chang, K. Van Horn, and J. Pfeifenberger), March 29, 2018.
- Cost Savings Offered by Competition in Electric Transmission: Experience to Date and the Potential for Additional Customer Value, prepared for LSP Transmission Holdings (with J. Pfeifenberger and J. Chang), April 2019.
- Transmission Solutions: Potential Cost Savings Offered by Competitive Planning Processes, prepared for LSP Transmission Holdings, GridLiance, presented at the 2018 National Association of Regulatory Utility Commissioners (NARUC) Annual Meeting (with J. Chang, and J. Pfeifenberger), November 13, 2018.
- Transmission Competition Under FERC Order No. 1000: What we Know About Cost Savings to Date, presented to WIRES (with J. Pfeifenberger, J. Chang), October 25, 2018
- Transmission Competition Under FERC Order No. 1000 at a Crossroads: Reinforce or Repeal?, prepared for LSP Transmission Holdings, GridLiance, presented to American Public Power Association, 2018 L&R Conference, Charleston, SC (with J. Chang, A. Sheilendranath), October 10, 2018.
- U.S. Offshore Wind Generation and Transmission Needs, presented and moderated panel discussions at the 2nd Offshore Wind Transmission Conference New York, NY (with J. Pfeifenberger and J. Chang), September 17, 2018.
- *Resetting FERC ROE Policy: A Window of Opportunity, Whitepaper & Presentation Published by The Brattle Group, Inc.,* (with R. Mudge and F. Graves), May 2018.
- *Transmission Competition Under FERC Order No. 1000 at a Crossroads: Reinforce or Repeal?*, prepared for LSP Transmission Holdings, GridLiance, presented to American Public Power Association, 2018 L&R Conference, Charleston, SC (with J. Pfeifenberger and J. Chang), October 10, 2018.

- *U.S. Offshore Wind Generation and Transmission Needs,* Presented at the Offshore Wind Transmission USA Conference in New York (with J. Chang and J. Pfeifenberger), September 17-18, 2018.
- *In the matter of: Benefit-Cost Analysis of Proposed New York AC Transmission Upgrades," Appendix 1 to Comparative Evaluation of Alternating Current Transmission Upgrade Alternatives,* Trial Staff Final Report, Proceeding on Motion of the Commission to Examine Alternating Current Transmission Upgrades, New York State Department of Public Service, Matter No. 12-02457, Case No. 12-T-0502, September 22, 2015. Presented to NYISO and DPS Staff.
- *Lake Erie Market Assessment Report*, prepared for ITC Lake Erie Connector LLC, May 2015 (with J. Chang, J. Pfeifenberger).
- *Toward More Effective Transmission Planning: Addressing the Costs and Risks of an Insufficiently Flexible Electricity Grid,* prepared for WIRES (with J. Chang and J. Pfeifenberger), April 2015.

Exhibit F
Schedule AS-3

Schedule No. AS-1

Table of Contents

Schedule No. AS-2

Water Sample

Classification of Companies by Assets

Company	Company Category
Amer. States Water	R
Amer. Water Works	R
Artesian Res Corp	R
California Water	R
Essential Utilities	R
Global Water Resources Inc	R
Middlesex Water	R
SJW Group	R
York Water Co. (The)	R

Sources and Notes:
Calculations based on EEI definitions and Company 10K filings:
R = Regulated (greater than 80 percent of total assets are regulated).
MR = Mostly Regulated (Less than 80 percent of total assets are regulated)

Schedule No. AS-3

Market Value of the Water Sample

Panel A: Amer. States Water

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$642	$642	$602	$558	$530	$494	$466	[a]
Shares Outstanding (in millions) - Common	37	37	37	37	37	37	37	[b]
Price per Share - Common	$78	$78	$87	$67	$56	$45	$42	[c]
Market Value of Common Equity	$2,895	$2,874	$3,189	$2,466	$2,055	$1,662	$1,533	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$2,895	$2,874	$3,189	$2,466	$2,055	$1,662	$1,533	[f]= [d] + [e]
Market to Book Value of Common Equity	4.51	4.48	5.30	4.42	3.88	3.36	3.29	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$157	$157	$122	$131	$155	$167	$133	[j]
Current Liabilities	$119	$119	$116	$147	$157	$178	$124	[k]
Current Portion of Long-Term Debt	$2	$2	$2	$40	$0	$0	$0	[l]
Net Working Capital	$41	$41	$9	$25	($1)	($11)	$10	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$0	$0	$5	$0	$59	$90	$28	[n]
Adjusted Short-Term Debt	$0	$0	$0	$0	$1	$11	$0	[o] = See Sources and Notes.
Long-Term Debt	$584	$584	$493	$377	$321	$321	$321	[p]
Book Value of Long-Term Debt	$587	$587	$495	$417	$322	$332	$321	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$115	$115	$91	$63	$99	$98	$78	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$702	$702	$586	$480	$421	$430	$399	[s] = [q] + [r].
Market Value of Debt	$702	$702	$586	$480	$421	$430	$399	[t] = [s].
MARKET VALUE OF FIRM	$3,597	$3,576	$3,775	$2,946	$2,476	$2,091	$1,933	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	80.48%	80.37%	84.48%	83.71%	83.00%	79.44%	79.34%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	19.52%	19.63%	15.52%	16.29%	17.00%	20.56%	20.66%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2020 balance sheet information and a 15-trading day average closing price ending on 2/28/2021.

Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel B: Amer. Water Works

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$6,454	$6,454	$6,121	$5,864	$5,385	$5,218	$5,049	[a]
Shares Outstanding (in millions) - Common	181	181	181	181	178	178	178	[b]
Price per Share - Common	$158	$150	$121	$93	$91	$73	$59	[c]
Market Value of Common Equity	$28,568	$27,177	$21,963	$16,789	$16,150	$12,972	$10,497	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$28,568	$27,177	$21,963	$16,789	$16,150	$12,972	$10,497	[f]= [d] + [e]
Market to Book Value of Common Equity	4.43	4.21	3.59	2.86	3.00	2.49	2.08	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$1,906	$1,906	$1,285	$781	$720	$784	$657	[j]
Current Liabilities	$2,881	$2,881	$2,045	$2,094	$2,325	$2,392	$1,533	[k]
Current Portion of Long-Term Debt	$342	$342	$42	$71	$322	$574	$54	[l]
Net Working Capital	($633)	($633)	($718)	($1,242)	($1,283)	($1,034)	($822)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$1,282	$1,282	$786	$964	$905	$849	$628	[n]
Adjusted Short-Term Debt	$633	$633	$718	$964	$905	$849	$628	[o] = See Sources and Notes.
Long-Term Debt	$9,414	$9,414	$8,733	$7,576	$6,498	$5,760	$5,874	[p]
Book Value of Long-Term Debt	$10,389	$10,389	$9,493	$8,611	$7,725	$7,183	$6,556	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$2,151	$2,151	$1,106	$283	$834	$724	$843	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$12,540	$12,540	$10,599	$8,894	$8,559	$7,907	$7,399	[s] = [q] + [r].
Market Value of Debt	$12,540	$12,540	$10,599	$8,894	$8,559	$7,907	$7,399	[t] = [s].
MARKET VALUE OF FIRM	$41,108	$39,717	$32,562	$25,683	$24,709	$20,879	$17,896	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	69.49%	68.43%	67.45%	65.37%	65.36%	62.13%	58.65%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	30.51%	31.57%	32.55%	34.63%	34.64%	37.87%	41.35%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2020 balance sheet information and a 15-trading day average closing price ending on 2/28/2021.

Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel C: Artesian Res Corp

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$169	$169	$160	$153	$147	$139	$132	[a]
Shares Outstanding (in millions) - Common	9	9	9	9	9	9	9	[b]
Price per Share - Common	$39	$38	$37	$36	$38	$32	$27	[c]
Market Value of Common Equity	$362	$354	$346	$329	$353	$294	$245	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$362	$354	$346	$329	$353	$294	$245	[f]= [d] + [e]
Market to Book Value of Common Equity	2.14	2.09	2.16	2.15	2.41	2.11	1.85	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$18	$18	$14	$16	$19	$15	$14	[j]
Current Liabilities	$44	$44	$26	$38	$28	$19	$22	[k]
Current Portion of Long-Term Debt	$2	$2	$2	$2	$1	$1	$1	[l]
Net Working Capital	($24)	($24)	($10)	($20)	($8)	($3)	($7)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$27	$27	$8	$16	$10	$7	$11	[n]
Adjusted Short-Term Debt	$24	$24	$8	$16	$8	$3	$7	[o] = See Sources and Notes.
Long-Term Debt	$143	$143	$145	$116	$106	$102	$104	[p]
Book Value of Long-Term Debt	$169	$169	$154	$134	$115	$107	$112	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$27	$27	$12	($1)	$4	$8	$15	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$196	$196	$166	$133	$119	$115	$127	[s] = [q] + [r].
Market Value of Debt	$196	$196	$166	$133	$119	$115	$127	[t] = [s].
MARKET VALUE OF FIRM	$558	$550	$511	$462	$471	$409	$372	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	64.87%	64.34%	67.60%	71.21%	74.83%	71.83%	65.85%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	35.13%	35.66%	32.40%	28.79%	25.17%	28.17%	34.15%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2020 balance sheet information and a 15-trading day average closing price ending on 2/28/2021.

Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel D: California Water

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$921	$921	$780	$730	$699	$659	$642	[a]
Shares Outstanding (in millions) - Common	50	50	49	48	48	48	48	[b]
Price per Share - Common	$58	$53	$51	$47	$44	$34	$23	[c]
Market Value of Common Equity	$2,911	$2,672	$2,472	$2,266	$2,097	$1,641	$1,116	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$2,911	$2,672	$2,472	$2,266	$2,097	$1,641	$1,116	[f]= [d] + [e]
Market to Book Value of Common Equity	3.16	2.90	3.17	3.10	3.00	2.49	1.74	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$266	$266	$185	$189	$228	$142	$128	[j]
Current Liabilities	$589	$589	$359	$321	$491	$250	$148	[k]
Current Portion of Long-Term Debt	$7	$7	$23	$105	$16	$26	$6	[l]
Net Working Capital	($316)	($316)	($151)	($28)	($247)	($82)	($14)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$370	$370	$175	$65	$275	$97	$34	[n]
Adjusted Short-Term Debt	$316	$316	$151	$28	$247	$82	$14	[o] = See Sources and Notes.
Long-Term Debt	$795	$795	$800	$710	$516	$532	$508	[p]
Book Value of Long-Term Debt	$1,118	$1,118	$974	$842	$779	$640	$528	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$158	$158	$64	$35	$76	$73	$82	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$1,276	$1,276	$1,038	$877	$855	$712	$610	[s] = [q] + [r].
Market Value of Debt	$1,276	$1,276	$1,038	$877	$855	$712	$610	[t] = [s].
MARKET VALUE OF FIRM	$4,187	$3,948	$3,509	$3,143	$2,952	$2,353	$1,725	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	69.53%	67.68%	70.43%	72.09%	71.05%	69.73%	64.65%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	30.47%	32.32%	29.57%	27.91%	28.95%	30.27%	35.35%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2020 balance sheet information and a 15-trading day average closing price ending on 2/28/2021.

Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel E: Essential Utilities

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$4,684	$4,684	$3,881	$2,009	$1,958	$1,850	$1,726	[a]
Shares Outstanding (in millions) - Common	245	245	221	178	178	177	177	[b]
Price per Share - Common	$46	$47	$46	$34	$38	$30	$30	[c]
Market Value of Common Equity	$11,262	$11,431	$10,168	$6,127	$6,795	$5,345	$5,248	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$11,262	$11,431	$10,168	$6,127	$6,795	$5,345	$5,248	[f]= [d] + [e]
Market to Book Value of Common Equity	2.40	2.44	2.62	3.05	3.47	2.89	3.04	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$380	$380	$2,015	$147	$131	$129	$128	[j]
Current Liabilities	$604	$604	$323	$399	$284	$302	$193	[k]
Current Portion of Long-Term Debt	$92	$92	$106	$145	$114	$151	$36	[l]
Net Working Capital	($132)	($132)	$1,798	($107)	($39)	($22)	($29)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$122	$122	$37	$24	$25	$7	$17	[n]
Adjusted Short-Term Debt	$122	$122	$0	$24	$25	$7	$17	[o] = See Sources and Notes.
Long-Term Debt	$5,563	$5,563	$2,955	$2,398	$2,008	$1,738	$1,720	[p]
Book Value of Long-Term Debt	$5,778	$5,778	$3,061	$2,567	$2,147	$1,895	$1,773	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$736	$736	$247	$24	$120	$108	$126	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$6,513	$6,513	$3,308	$2,592	$2,266	$2,003	$1,899	[s] = [q] + [r].
Market Value of Debt	$6,513	$6,513	$3,308	$2,592	$2,266	$2,003	$1,899	[t] = [s].
MARKET VALUE OF FIRM	$17,776	$17,945	$13,476	$8,719	$9,061	$7,348	$7,147	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	63.36%	63.70%	75.45%	70.27%	74.99%	72.74%	73.43%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	36.64%	36.30%	24.55%	29.73%	25.01%	27.26%	26.57%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2020 balance sheet information and a 15-trading day average closing price ending on 2/28/2021.

Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel F: Global Water Resources Inc

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$32	$32	$25	$28	$15	$15	$20	[a]
Shares Outstanding (in millions) - Common	23	23	22	22	20	20	18	[b]
Price per Share - Common	$17	$15	$13	$10	$9	$9	N/A	[c]
Market Value of Common Equity	$388	$334	$279	$218	$182	$174	N/A	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$388	$334	$279	$218	$182	$174	N/A	[f]= [d] + [e]
Market to Book Value of Common Equity	12.06	10.39	11.31	7.81	12.26	11.60	N/A	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$23	$23	$12	$17	$10	$25	$19	[j]
Current Liabilities	$12	$12	$10	$10	$9	$11	$11	[k]
Current Portion of Long-Term Debt	$2	$2	$0	$0	$0	$0	$2	[l]
Net Working Capital	$13	$13	$2	$8	$1	$14	$10	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$0	$0	$0	$0	$0	$0	$0	[n]
Adjusted Short-Term Debt	$0	$0	$0	$0	$0	$0	$0	[o] = See Sources and Notes.
Long-Term Debt	$113	$113	$115	$115	$114	$114	$102	[p]
Book Value of Long-Term Debt	$115	$115	$115	$115	$114	$114	$104	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$15	$15	$6	($7)	$1	($7)	$12	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$130	$130	$121	$108	$116	$108	$116	[s] = [q] + [r].
Market Value of Debt	$130	$130	$121	$108	$116	$108	$116	[t] = [s].
MARKET VALUE OF FIRM	$518	$464	$400	$326	$298	$282	N/A	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	74.95%	72.04%	69.70%	66.86%	61.14%	61.74%	N/A	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	N/A	[w] = [i] / [u].
Debt - Market Value Ratio	25.05%	27.96%	30.30%	33.14%	38.86%	38.26%	N/A	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

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Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel G: Middlesex Water

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$346	$346	$324	$249	$229	$218	$207	[a]
Shares Outstanding (in millions) - Common	17	17	17	16	16	16	16	[b]
Price per Share - Common	$77	$72	$63	$53	$41	$42	$26	[c]
Market Value of Common Equity	$1,347	$1,264	$1,104	$876	$670	$691	$428	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$1,347	$1,264	$1,104	$876	$670	$691	$428	[f]= [d] + [e]
Market to Book Value of Common Equity	3.89	3.65	3.41	3.52	2.92	3.16	2.07	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$2	$2	$2	$2	$2	$2	$2	[h]
Market Value of Preferred Equity	$2	$2	$2	$2	$2	$2	$2	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$34	$34	$29	$31	$29	$27	$24	[j]
Current Liabilities	$57	$57	$65	$94	$65	$47	$28	[k]
Current Portion of Long-Term Debt	$8	$8	$8	$7	$7	$6	$6	[l]
Net Working Capital	($15)	($15)	($28)	($56)	($28)	($14)	$2	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$2	$2	$20	$49	$28	$12	$3	[n]
Adjusted Short-Term Debt	$2	$2	$20	$49	$28	$12	$0	[o] = See Sources and Notes.
Long-Term Debt	$278	$278	$237	$153	$139	$135	$133	[p]
Book Value of Long-Term Debt	$288	$288	$264	$209	$174	$153	$139	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$12	$12	$10	$1	$3	$2	$3	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$300	$300	$274	$210	$177	$155	$141	[s] = [q] + [r].
Market Value of Debt	$300	$300	$274	$210	$177	$155	$141	[t] = [s].
MARKET VALUE OF FIRM	$1,649	$1,566	$1,380	$1,089	$849	$848	$571	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	81.69%	80.72%	79.97%	80.48%	78.91%	81.47%	74.82%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	0.13%	0.13%	0.15%	0.22%	0.29%	0.29%	0.43%	[w] = [i] / [u].
Debt - Market Value Ratio	18.18%	19.15%	19.88%	19.29%	20.80%	18.25%	24.76%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

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[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel H: SJW Group

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$917	$917	$890	$889	$463	$422	$384	[a]
Shares Outstanding (in millions) - Common	29	29	28	28	21	20	20	[b]
Price per Share - Common	$68	$68	$71	$55	$64	$56	$30	[c]
Market Value of Common Equity	$1,937	$1,953	$2,013	$1,566	$1,304	$1,143	$602	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$1,937	$1,953	$2,013	$1,566	$1,304	$1,143	$602	[f]= [d] + [e]
Market to Book Value of Common Equity	2.11	2.13	2.26	1.76	2.81	2.71	1.57	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$127	$127	$122	$503	$67	$100	$73	[j]
Current Liabilities	$351	$351	$235	$164	$85	$64	$80	[k]
Current Portion of Long-Term Debt	$76	$76	$22	$0	$0	$0	$3	[l]
Net Working Capital	($147)	($147)	($90)	$339	($18)	$36	($3)	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$175	$175	$117	$100	$25	$14	$35	[n]
Adjusted Short-Term Debt	$147	$147	$90	$0	$18	$0	$3	[o] = See Sources and Notes.
Long-Term Debt	$1,288	$1,288	$1,284	$431	$431	$433	$377	[p]
Book Value of Long-Term Debt	$1,511	$1,511	$1,396	$431	$449	$433	$383	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$283	$283	$112	$59	$107	$69	$119	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$1,794	$1,794	$1,509	$490	$556	$502	$503	[s] = [q] + [r].
Market Value of Debt	$1,794	$1,794	$1,509	$490	$556	$502	$503	[t] = [s].
MARKET VALUE OF FIRM	$3,731	$3,748	$3,521	$2,056	$1,860	$1,645	$1,105	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	51.91%	52.12%	57.16%	76.17%	70.09%	69.47%	54.51%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	48.09%	47.88%	42.84%	23.83%	29.91%	30.53%	45.49%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2020 balance sheet information and a 15-trading day average closing price ending on 2/28/2021.

Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-3

Market Value of the Water Sample

Panel I: York Water Co. (The)

($MM)

	DCF Capital Structure	Year End, 2020	Year End, 2019	Year End, 2018	Year End, 2017	Year End, 2016	Year End, 2015	Notes
MARKET VALUE OF COMMON EQUITY								
Book Value, Common Shareholder's Equity	$143	$143	$134	$126	$119	$114	$109	[a]
Shares Outstanding (in millions) - Common	13	13	13	13	13	13	13	[b]
Price per Share - Common	$44	$47	$46	$33	$34	$39	$25	[c]
Market Value of Common Equity	$572	$619	$597	$427	$441	$496	$318	[d] = [b] x [c].
Market Value of GP Equity	$0	$0	$0	$0	$0	$0	$0	[e] = See Sources and Notes.
Total Market Value of Equity	$572	$619	$597	$427	$441	$496	$318	[f]= [d] + [e]
Market to Book Value of Common Equity	3.99	4.32	4.45	3.38	3.70	4.35	2.92	[g] = [f] / [a].
MARKET VALUE OF PREFERRED EQUITY								
Book Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[h]
Market Value of Preferred Equity	$0	$0	$0	$0	$0	$0	$0	[i] = [h].
MARKET VALUE OF DEBT								
Current Assets	$16	$16	$9	$9	$9	$13	$12	[j]
Current Liabilities	$12	$12	$15	$11	$9	$8	$6	[k]
Current Portion of Long-Term Debt	$0	$0	$7	$0	$0	$0	$0	[l]
Net Working Capital	$4	$4	$1	($2)	($0)	$4	$5	[m] = [j] - ([k] - [l]).
Notes Payable (Short-Term Debt)	$0	$0	$0	$1	$1	$0	$0	[n]
Adjusted Short-Term Debt	$0	$0	$0	$1	$0	$0	$0	[o] = See Sources and Notes.
Long-Term Debt	$124	$124	$95	$93	$90	$85	$85	[p]
Book Value of Long-Term Debt	$124	$124	$101	$94	$91	$85	$85	[q] = [l] + [o] + [p].
Adjustment to Book Value of Long-Term Debt	$24	$24	$11	$9	$15	$12	$14	[r] = See Sources and Notes.
Market Value of Long-Term Debt	$148	$148	$112	$103	$106	$96	$99	[s] = [q] + [r].
Market Value of Debt	$148	$148	$112	$103	$106	$96	$99	[t] = [s].
MARKET VALUE OF FIRM	$720	$767	$709	$531	$547	$592	$417	[u] = [f] + [i] + [t].
DEBT AND EQUITY TO MARKET VALUE RATIOS								
Common Equity - Market Value Ratio	79.45%	80.70%	84.21%	80.50%	80.66%	83.75%	76.26%	[v] = [f] / [u].
Preferred Equity - Market Value Ratio	-	-	-	-	-	-	-	[w] = [i] / [u].
Debt - Market Value Ratio	20.55%	19.30%	15.79%	19.50%	19.34%	16.25%	23.74%	[x] = [t] / [u].

Sources and Notes:

Bloomberg as of February 28, 2021

Capital structure from Year End, 2020 calculated using respective balance sheet information and 15-day average prices ending at period end.

The DCF Capital structure is calculated using 4th Quarter, 2020 balance sheet information and a 15-trading day average closing price ending on 2/28/2021.

Prices are reported in Workpaper #1 to Schedule No. AS-6.

[e] = Market Value of GP equity is not estimated here.

[o] =

(1): 0 if [m] > 0.

(2): The absolute value of [m] if [m] < 0 and |[m]| < [n].

(3): [n] if [m] < 0 and |[m]| > [n].

[r]: Difference between fair value of Long-Term debt and carrying amount of Long-Term debt per company 10-K. Data for adjustment is from 2016 to 2020 10-Ks.

Schedule No. AS-4

Water Sample

Capital Structure Summary of the Water Sample

Company	DCF Capital Structure			5-Year Average Capital Structure		
	Common Equity - Value Ratio	Preferred Equity - Value Ratio	Debt - Value Ratio	Common Equity - Value Ratio	Preferred Equity - Value Ratio	Debt - Value Ratio
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	80.5%	0.0%	19.5%	82.2%	0.0%	17.8%
Amer. Water Works	69.5%	0.0%	30.5%	65.7%	0.0%	34.3%
Artesian Res Corp	64.9%	0.0%	35.1%	70.0%	0.0%	30.0%
California Water	69.5%	0.0%	30.5%	70.2%	0.0%	29.8%
Essential Utilities	63.4%	0.0%	36.6%	71.4%	0.0%	28.6%
Global Water Resources Inc	75.0%	0.0%	25.0%	66.3%	0.0%	33.7%
Middlesex Water	81.7%	0.1%	18.2%	80.3%	0.2%	19.5%
SJW Group	51.9%	0.0%	48.1%	65.0%	0.0%	35.0%
York Water Co. (The)	79.5%	0.0%	20.5%	82.0%	0.0%	18.0%
Core Water Sample Average	70.8%	0.0%	29.1%	73.8%	0.0%	26.1%
Expanded Water Sample Average	70.6%	0.0%	29.3%	72.6%	0.0%	27.4%

Sources and Notes:
[1], [4]:Workpaper #1 to Schedule No. AS-4.
[2], [5]:Workpaper #2 to Schedule No. AS-4.
[3], [6]:Workpaper #3 to Schedule No. AS-4.
Values in this table may not add up exactly to 1.0 because of rounding.

Schedule No. AS-5

Water Sample

Estimated Growth Rates of the Water Sample

	Thomson Reuters IBES Estimate		Value Line			
Company	Long-Term Growth Rate	Number of Estimates	EPS Year 2020 Estimate	EPS Year 2023-2025 Estimate	Annualized Growth Rate	Combined Growth Rate
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	4.9%	2	2.40	2.90	4.8%	4.8%
Amer. Water Works	8.4%	1	4.25	4.90	3.6%	6.0%
Artesian Res Corp		0	n/a	n/a	n/a	
California Water	10.8%	2	1.90	2.15	3.1%	8.2%
Essential Utilities	6.4%	1	1.20	1.75	9.9%	8.1%
Global Water Resources Inc		0	n/a	n/a	n/a	
Middlesex Water		0	2.20	2.65	4.8%	4.8%
SJW Group		0	2.55	3.65	9.4%	9.4%
York Water Co. (The)		0	1.30	1.60	5.3%	5.3%

Sources and Notes:

[1] - [2]: Thomson Reuters as of February 28, 2021.

[3] - [4]: From Valueline Investment Analyzer as of February 28, 2021.

[5]: ([4] / [3]) ^ (1/4) - 1.

[6]: ([1] x [2] + [5]) / ([2] + 1).

Weighted average growth rate. If information is missing from one source, the weighted average is based solely on the other source.

Schedule No. AS-6

DCF Cost of Equity of the Water Sample

Panel A: Simple DCF Method (Quarterly)

Company	Stock Price	Most Recent Dividend	Quarterly Dividend Yield	Combined Long-Term Growth Rate	Quarterly Growth Rate	DCF Cost of Equity
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	$78.47	$0.34	0.43%	4.8%	1.2%	6.7%
Amer. Water Works	$157.57	$0.55	0.35%	6.0%	1.5%	7.5%
Artesian Res Corp	$38.70	$0.26	n/a	n/a	n/a	n/a
California Water	$57.84	$0.23	0.41%	8.2%	2.0%	9.9%
Essential Utilities	$45.90	$0.25	0.56%	8.1%	2.0%	10.5%
Global Water Resources I	$17.18	$0.02	n/a	n/a	n/a	n/a
Middlesex Water	$77.10	$0.27	0.36%	4.8%	1.2%	6.3%
SJW Group	$67.82	$0.34	0.51%	9.4%	2.3%	11.6%
York Water Co. (The)	$43.82	$0.19	0.43%	5.3%	1.3%	7.1%

Sources and Notes:
[1]: Workpaper #1 to Schedule No. AS-6.
[2]: Workpaper #2 to Schedule No. AS-6.
[3]: ([2] / [1]) x (1 + [5]).
[4]: Schedule No. AS-5, [6].
[5]: {(1 + [4]) ^ (1/4)} - 1.
[6]: {([3] + [5] + 1) ^ 4} - 1.

Schedule No. AS-6

DCF Cost of Equity of the Water Sample

Panel B: Multi-Stage DCF (Using Blue Chip Long-Term GDP Growth Forecast as the Perpetual Rate)

Company	Stock Price	Most Recent Dividend	Combined Long-Term Growth Rate	Growth Rate: Year 6	Growth Rate: Year 7	Growth Rate: Year 8	Growth Rate: Year 9	Growth Rate: Year 10	GDP Long-Term Growth Rate	DCF Cost of Equity
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Amer. States Water	$78.47	$0.34	4.8%	4.7%	4.5%	4.4%	4.2%	4.1%	3.9%	5.8%
Amer. Water Works	$157.57	$0.55	6.0%	5.7%	5.3%	5.0%	4.6%	4.3%	3.9%	5.6%
Artesian Res Corp	$38.70	$0.26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
California Water	$57.84	$0.23	8.2%	7.5%	6.8%	6.1%	5.3%	4.6%	3.9%	6.1%
Essential Utilities	$45.90	$0.25	8.1%	7.4%	6.7%	6.0%	5.3%	4.6%	3.9%	6.9%
Global Water Resources Inc	$17.18	$0.02	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Middlesex Water	$77.10	$0.27	4.8%	4.6%	4.5%	4.3%	4.2%	4.0%	3.9%	5.5%
SJW Group	$67.82	$0.34	9.4%	8.5%	7.6%	6.6%	5.7%	4.8%	3.9%	6.9%
York Water Co. (The)	$43.82	$0.19	5.3%	5.1%	4.9%	4.6%	4.4%	4.1%	3.9%	5.9%

Sources and Notes:
[1]: Workpaper #1 to Schedule No. AS-6.
[2]: Workpaper #2 to Schedule No. AS-6.
[3]: Schedule No. AS-5, [6].
[4]: [3] - {([3] - [9])/ 6}.
[5]: [4] - {([3] - [9])/ 6}.
[6]: [5] - {([3] - [9])/ 6}.
[7]: [6] - {([3] - [9])/ 6}.
[8]: [7] - {([3] - [9])/ 6}.
[9]: BlueChip Economic Indicators, March 2021 This number is assumed to be the perpetual growth rate.
[10]: Workpaper #3 to Schedule No. AS-6.

Schedule No. AS-7

Overall After-Tax DCF Cost of Capital of the Water Sample

Panel A: Simple DCF Method (Quarterly)

Company	4th Quarter, 2020 S&P Bond Rating	4th Quarter, 2020 Preferred Equity Rating	DCF Cost of Equity	DCF Common Equity to Market Value Ratio	Cost of Preferred Equity	DCF Preferred Equity to Market Value Ratio	DCF Cost of Debt	DCF Debt to Market Value Ratio	California Water Services Company's Representative Income Tax Rate	Overall Weighted After-Tax Cost of Capital
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Amer. States Water	A	-	6.7%	0.80	-	0.00	3.0%	0.20	28.0%	5.8%
Amer. Water Works	A	-	7.5%	0.69	-	0.00	3.0%	0.31	28.0%	5.9%
Artesian Res Corp	A	-	~~n/a~~	0.65	-	0.00	3.0%	0.35	28.0%	~~n/a~~
California Water	A	-	9.9%	0.70	-	0.00	3.0%	0.30	28.0%	7.6%
Essential Utilities	A	-	10.5%	0.63	-	0.00	3.0%	0.37	28.0%	7.5%
Global Water Resources Inc	A	-	~~n/a~~	0.75	-	0.00	3.0%	0.25	28.0%	~~n/a~~
Middlesex Water	A	A	6.3%	0.82	3.0%	0.00	3.0%	0.18	28.0%	5.5%
SJW Group	A	-	11.6%	0.52	-	0.00	3.0%	0.48	28.0%	7.0%
York Water Co. (The)	A	-	7.1%	0.79	-	0.00	3.0%	0.21	28.0%	6.1%
Simple Core Water Sample Average			8.5%	0.71	3.0%	0.00	3.0%	0.29	28.0%	6.5%
Simple Expanded Water Sample Average			8.5%	0.71	3.0%	0.00	3.0%	0.29	28.0%	6.5%

Sources and Notes:
[1]: Bloomberg as of February 28, 2021.
[2]: Preferred ratings were assumed equal to debt rating
[3]: Schedule No. AS-6; Panel A, [6].
[4]: Schedule No. AS-4, [1].
[5]: Workpaper #2 to Schedule No. AS-11, Panel C.
[6]: Schedule No. AS-4, [2].
[7]: Workpaper #2 to Schedule No. AS-11, Panel B.
[8]: Schedule No. AS-4, [3].
[9]: Provided by California Water Services Company.
[10]: ([3] x [4]) + ([5] x [6]) + {[7] x [8] x (1 - [9])}. A strikethrough indicates the utility was excluded from the full sample average calculation as a result of its cost of equity not exceeding its cost of debt by 150 basis points

Schedule No. AS-7

Overall After-Tax DCF Cost of Capital of the Water Sample

Panel B: Multi-Stage DCF (Using Blue Chip Long-Term GDP Growth Forecast as the Perpetual Rate)

Company	4th Quarter, 2020 S&P Bond Rating	4th Quarter, 2020 Preferred Equity Rating	DCF Cost of Equity	DCF Common Equity to Market Value Ratio	Cost of Preferred Equity	DCF Preferred Equity to Market Value Ratio	DCF Cost of Debt	DCF Debt to Market Value Ratio	California Water Services Company's Representative Income Tax Rate	Overall Weighted After-Tax Cost of Capital
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Amer. States Water	A	-	5.8%	0.80	-	0.00	3.0%	0.20	28.0%	5.1%
Amer. Water Works	A	-	5.6%	0.69	-	0.00	3.0%	0.31	28.0%	4.5%
Artesian Res Corp	A	-	~~n/a~~	0.65	-	0.00	3.0%	0.35	28.0%	~~n/a~~
California Water	A	-	6.1%	0.70	-	0.00	3.0%	0.30	28.0%	4.9%
Essential Utilities	A	-	6.9%	0.63	-	0.00	3.0%	0.37	28.0%	5.2%
Global Water Resources Inc	A	-	~~n/a~~	0.75	-	0.00	3.0%	0.25	28.0%	~~n/a~~
Middlesex Water	A	A	5.5%	0.82	3.0%	0.00	3.0%	0.18	28.0%	4.9%
SJW Group	A	-	6.9%	0.52	-	0.00	3.0%	0.48	28.0%	4.6%
York Water Co. (The)	A	-	5.9%	0.79	-	0.00	3.0%	0.21	28.0%	5.1%
Multi-Stage Core Water Sample Average			6.1%	0.71	3.0%	0.00	3.0%	0.29	28.0%	4.9%
Multi-Stage Expanded Water Sample Average			6.1%	0.71	3.0%	0.00	3.0%	0.29	28.0%	4.9%

Sources and Notes:
[1]: Bloomberg as of February 28, 2021.
[2]: Preferred ratings were assumed equal to debt rating
[3]: Schedule No. AS-6, Panel B, [10].
[4]: Schedule No. AS-4, [1].
[5]: Workpaper #2 to Schedule No. AS-11, Panel C.
[6]: Schedule No. AS-4, [2].
[7]: Workpaper #2 to Schedule No. AS-11, Panel B.
[8]: Schedule No. AS-4, [3].
[9]: Provided by California Water Services Company.
[10]: ([3] x [4]) + ([5] x [6]) + {[7] x [8] x (1 - [9])}. A strikethrough indicates the utility was excluded from the full sample average calculation as a result of its cost of equity not exceeding its cost of debt by 150 basis points

Schedule No. AS-8

DCF Cost of Equity at California Water Services Company's Proposed Capital Structure

Water Sample

	Overall After - Tax Cost of Capital [1]	California Water Services Company's Representative Regulatory % Debt [2]	Representative Cost of A Rated Utility Debt [3]	California Water Services Company's Representative Income Tax Rate [4]	California Water Services Company's Representative Regulatory % Equity [5]	Estimated Return on Equity [6]
Core Water Sample						
Simple DCF Quarterly	6.5%	46.6%	3.0%	28.0%	53.4%	10.3%
Multi-Stage DCF - Using the Blue Chip Economic Indicator Long-Term GDP Growth Forecast as the Perpetual Rate	4.9%	46.6%	3.0%	28.0%	53.4%	7.3%
Expanded Water Sample						
Simple DCF Quarterly	6.5%	46.6%	3.0%	28.0%	53.4%	10.3%
Multi-Stage DCF - Using the Blue Chip Economic Indicator Long-Term GDP Growth Forecast as the Perpetual Rate	4.9%	46.6%	3.0%	28.0%	53.4%	7.3%

Sources and Notes:
[1]: Schedule No. AS-7; Panels A-B, [10].
[2]: Provided by California Water Services Company.
[3]: Based on a A rating. Yield from Bloomberg as of February 28, 2021.
[4]: Provided by California Water Services Company.
[5]: Provided by California Water Services Company.
[6]: {[1] - ([2] x [3] x (1 - [4]))} / [5].

Schedule No. AS-9 Risk-Free Rates

BCEI Forecast of 10 year U.S. Treasury Yield	**[a]**	**2.30%**
Long-run Average of 20 year U.S. Treasury Yield	[b]	4.86%
Long-run Average of 10 year U.S. Treasury Yield	[c]	4.38%
Maturity Premium	**[d] = [b] - [c]**	**0.50%**
Base Projection of 20 year U.S. Treasury Yield	**[e] = [a] + [d]**	**2.80%**

Sources and Notes:
[a]: Blue Chip Economic Indicators, March 2021. Projection of 2023 Yield.
[b], [c]: Bloomberg as of 2/28/2021, see Workpaper #1 to Schedule No. AS-9.

Schedule No. AS-10

Risk Positioning Cost of Equity of the Water Sample (Using Value Line Betas)

Panel A: Scenario 1 - Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.25%

Company	Long-Term Risk-Free Rate	Value Line Betas	Long-Term Market Risk Premium	CAPM Cost of Equity	ECAPM (1.5%) Cost of Equity
	[1]	[2]	[3]	[4]	[5]
Amer. States Water	2.80%	0.65	7.25%	7.5%	8.0%
Amer. Water Works	2.80%	0.85	7.25%	9.0%	9.2%
Artesian Res Corp	2.80%	0.75	7.25%	8.2%	8.6%
California Water	2.80%	0.65	7.25%	7.5%	8.0%
Essential Utilities	2.80%	0.95	7.25%	9.7%	9.8%
Global Water Resources Inc	2.80%	0.75	7.25%	8.2%	8.6%
Middlesex Water	2.80%	0.70	7.25%	7.9%	8.3%
SJW Group	2.80%	0.85	7.25%	9.0%	9.2%
York Water Co. (The)	2.80%	0.80	7.25%	8.6%	8.9%

Sources and Notes:
[1], [3]: Sheilendranath Direct Testimony.
[2]: From Valueline Investment Analyzer as of February 28, 2021.
[4]: [1] + ([2] x [3]).
[5]: ([1] + 1.5%) + [2] x ([3] - 1.5%).

Schedule No. AS-10

Risk Positioning Cost of Equity of the Water Sample (Using Value Line Betas)

Panel B: Scenario 2 - Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.53%

Company	Long-Term Risk-Free Rate	Value Line Betas	Long-Term Market Risk Premium	CAPM Cost of Equity	ECAPM (1.5%) Cost of Equity
	[1]	[2]	[3]	[4]	[5]
Amer. States Water	2.80%	0.65	7.53%	7.7%	8.2%
Amer. Water Works	2.80%	0.85	7.53%	9.2%	9.4%
Artesian Res Corp	2.80%	0.75	7.53%	8.4%	8.8%
California Water	2.80%	0.65	7.53%	7.7%	8.2%
Essential Utilities	2.80%	0.95	7.53%	10.0%	10.0%
Global Water Resources Inc	2.80%	0.75	7.53%	8.4%	8.8%
Middlesex Water	2.80%	0.70	7.53%	8.1%	8.5%
SJW Group	2.80%	0.85	7.53%	9.2%	9.4%
York Water Co. (The)	2.80%	0.80	7.53%	8.8%	9.1%

Sources and Notes:
[1], [3]: Sheilendranath Direct Testimony.
[2]: From Valueline Investment Analyzer as of February 28, 2021.
[4]: [1] + ([2] x [3]).
[5]: ([1] + 1.5%) + [2] x ([3] - 1.5%).

Schedule No. AS-11

Overall After-Tax Risk Positioning Cost of Capital of the Water Sample (Using Value Line Betas)

Panel A: CAPM Cost of Equity Scenario 1 - Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.25%

Company	CAPM Cost of Equity	ECAPM (1.5%) Cost of Equity	5-Year Average Common Equity to Market Value Ratio	Weighted - Average Cost of Preferred Equity	5-Year Average Preferred Equity to Market Value Ratio	Weighted-Average Cost of Debt	5-Year Average Debt to Market Value Ratio	California Water Services Company's Representative Income Tax Rate	Overall After-Tax Cost of Capital (CAPM)	Overall After-Tax Cost of Capital (ECAPM 1.5%)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Amer. States Water	7.5%	8.0%	82.2%	-	0.0%	3.0%	17.8%	28.0%	6.6%	7.0%
Amer. Water Works	9.0%	9.2%	65.7%	-	0.0%	3.0%	34.3%	28.0%	6.6%	6.8%
Artesian Res Corp	8.2%	8.6%	70.0%	-	0.0%	3.0%	30.0%	28.0%	6.4%	6.7%
California Water	7.5%	8.0%	70.2%	-	0.0%	3.0%	29.8%	28.0%	5.9%	6.3%
Essential Utilities	9.7%	9.8%	71.4%	-	0.0%	3.0%	28.6%	28.0%	7.5%	7.6%
Global Water Resources Inc	8.2%	8.6%	66.3%	-	0.0%	3.0%	33.7%	28.0%	6.2%	6.4%
Middlesex Water	7.9%	8.3%	80.3%	3.0%	0.2%	3.0%	19.5%	28.0%	6.8%	7.1%
SJW Group	9.0%	9.2%	65.0%	-	0.0%	3.0%	35.0%	28.0%	6.6%	6.7%
York Water Co. (The)	8.6%	8.9%	82.0%	-	0.0%	3.0%	18.0%	28.0%	7.4%	7.7%
Core Water Sample Average	8.4%	8.8%	73.8%	3.0%	0.0%	3.0%	26.1%	28.0%	6.8%	7.0%
Expanded Water Sample Average	8.4%	8.7%	72.6%	3.0%	0.0%	3.0%	27.4%	28.0%	6.7%	6.9%

Sources and Notes:
[1]: Schedule No. AS-10; Panel A, [4].
[2]: Schedule No. AS-10; Panel A, [5].
[3]: Schedule No. AS-4, [4].
[4]: Workpaper #2 to Schedule No. AS-11, Panel C.
[5]: Schedule No. AS-4, [5].
[6]: Workpaper #2 to Schedule No. AS-11, Panel B.
[7]: Schedule No. AS-4, [6].
[8]: Provided by California Water Services Company.
[9] = [1] x [3] + [4] x [5] + [6] x [7] x (1 - [8])
[10] = [2] x [3] + [4] x [5] + [6] x [7] x (1 - [8])

Schedule No. AS-11

Overall After-Tax Risk Positioning Cost of Capital of the Water Sample (Using Value Line Betas)

Panel B: CAPM Cost of Equity Scenario 2 - Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.53%

Company	CAPM Cost of Equity	ECAPM (1.5%) Cost of Equity	5-Year Average Common Equity to Market Value Ratio	Weighted - Average Cost of Preferred Equity	5-Year Average Preferred Equity to Market Value Ratio	Weighted-Average Cost of Debt	5-Year Average Debt to Market Value Ratio	California Water Services Company's Representative Income Tax Rate	Overall After-Tax Cost of Capital (CAPM)	Overall After-Tax Cost of Capital (ECAPM 1.5%)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Amer. States Water	7.7%	8.2%	82.2%	-	0.0%	3.0%	17.8%	28.0%	6.7%	7.1%
Amer. Water Works	9.2%	9.4%	65.7%	-	0.0%	3.0%	34.3%	28.0%	6.8%	6.9%
Artesian Res Corp	8.4%	8.8%	70.0%	-	0.0%	3.0%	30.0%	28.0%	6.6%	6.8%
California Water	7.7%	8.2%	70.2%	-	0.0%	3.0%	29.8%	28.0%	6.0%	6.4%
Essential Utilities	10.0%	10.0%	71.4%	-	0.0%	3.0%	28.6%	28.0%	7.7%	7.8%
Global Water Resources Inc	8.4%	8.8%	66.3%	-	0.0%	3.0%	33.7%	28.0%	6.3%	6.6%
Middlesex Water	8.1%	8.5%	80.3%	3.0%	0.2%	3.0%	19.5%	28.0%	6.9%	7.3%
SJW Group	9.2%	9.4%	65.0%	-	0.0%	3.0%	35.0%	28.0%	6.7%	6.9%
York Water Co. (The)	8.8%	9.1%	82.0%	-	0.0%	3.0%	18.0%	28.0%	7.6%	7.9%
Core Water Sample Average	8.7%	9.0%	73.8%	3.0%	0.0%	3.0%	26.1%	28.0%	6.9%	7.2%
Expanded Water Sample Average	8.6%	9.0%	72.6%	3.0%	0.0%	3.0%	27.4%	28.0%	6.8%	7.1%

Sources and Notes:
[1]: Schedule No. AS-10; Panel B, [4].
[2]: Schedule No. AS-10; Panel B, [5].
[3]: Schedule No. AS-4, [4].
[4]: Workpaper #2 to Schedule No. AS-11, Panel C.
[5]: Schedule No. AS-4, [5].
[6]: Workpaper #2 to Schedule No. AS-11, Panel B.
[7]: Schedule No. AS-4, [6].
[8]: Provided by California Water Services Company.
[9] = [1] x [3] + [4] x [5] + [6] x [7] x (1 - [8])
[10] = [2] x [3] + [4] x [5] + [6] x [7] x (1 - [8])

Schedule No. AS-12

Risk Positioning Cost of Equity at California Water Services Company's Proposed Capital Structure

Water Sample

Using Value Line Betas

	Overall After-Tax Cost of Capital (Scenario 1)	Overall After-Tax Cost of Capital (Scenario 2)	California Water Services Company's Representative Regulatory % Debt	Representative Cost of A-Rated Utility Debt	California Water Services Company's Representative Income Tax Rate	California Water Services Company's Representative Regulatory % Equity	Estimated Return on Equity (Scenario 1)	Estimated Return on Equity (Scenario 2)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Core Water Sample								
CAPM using Value Line Betas	6.8%	6.9%	46.6%	3.0%	28.0%	53.4%	10.8%	11.1%
ECAPM (1.50%) using Value Line Betas	7.0%	7.2%	46.6%	3.0%	28.0%	53.4%	11.3%	11.6%
Expanded Water Sample								
CAPM using Value Line Betas	6.7%	6.8%	46.6%	3.0%	28.0%	53.4%	10.6%	10.9%
ECAPM (1.50%) using Value Line Betas	6.9%	7.1%	46.6%	3.0%	28.0%	53.4%	11.1%	11.4%

Sources and Notes:
[1]: Schedule No. AS-11; Panel A, [9] - [10].
[2]: Schedule No. AS-11; Panel B, [9] - [10].
[3]: Provided by California Water Services Company.
[4]: Based on a A rating. Yield from Bloomberg as of February 28, 2021.
[5]: Provided by California Water Services Company.
[6]: Provided by California Water Services Company.
[7]: {[1] - ([3] x [4] x (1 - [5])}/ [6]
[8]: {[2] - ([3] x [4] x (1 - [5]))}/ [6]

Scenario 1: Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.25%.
Scenario 2: Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.53%.

Schedule No. AS-13

Hamada Adjustment to Obtain Unlevered Asset Beta

Company	Value Line Betas	Debt Beta	5-Year Average Common Equity to Market Value Ratio	5-Year Average Preferred Equity to Market Value Ratio	5-Year Average Debt to Market Value Ratio	California Water Services Company's Representative Income Tax Rate	Asset Beta: Without Taxes	Asset Beta: With Taxes
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Amer. States Water	0.65	0.05	82.2%	0.0%	17.8%	28.0%	0.54	0.57
Amer. Water Works	0.85	0.05	65.7%	0.0%	34.3%	28.0%	0.58	0.63
Artesian Res Corp	0.75	0.05	70.0%	0.0%	30.0%	28.0%	0.54	0.58
California Water	0.65	0.05	70.2%	0.0%	29.8%	28.0%	0.47	0.51
Essential Utilities	0.95	0.05	71.4%	0.0%	28.6%	28.0%	0.69	0.75
Global Water Resources Inc	0.75	0.05	66.3%	0.0%	33.7%	28.0%	0.51	0.56
Middlesex Water	0.70	0.05	80.3%	0.2%	19.5%	28.0%	0.57	0.60
SJW Group	0.85	0.05	65.0%	0.0%	35.0%	28.0%	0.57	0.63
York Water Co. (The)	0.80	0.05	82.0%	0.0%	18.0%	28.0%	0.66	0.70
Core Water Sample Average	0.78	0.05	73.8%	0.0%	26.1%	28.0%	0.58	0.63
Expanded Water Sample Average	0.77	0.05	72.6%	0.0%	27.4%	28.0%	0.57	0.61

Sources and Notes:

[1]: Workpaper # 1 to Schedule No. AS-10, [1].
[2]: Workpaper #1 to Schedule No. AS-13, [7].
[3]: Schedule No. AS-4, [4].
[4]: Schedule No. AS-4, [5].
[5]: Schedule No. AS-4, [6].
[6]: California Water Services Company's Representative Tax Rate.
[7]: [1]*[3] + [2]*([4] + [5]).
[8]: {[1]*[3] + [2]*([4]+[5]*(1-[6]))} / {[3] + [4] + [5]*(1 -[6])}.

Schedule No. AS-14

Water Sample Average Asset Beta Relevered at California Water Services Company's Proposed Capital Structure

	Asset Beta	Assumed Debt Beta	California Water Services Company's Representative	California Water Services Company's Representative Income	California Water Services Company's Representative	Estimated Equity Beta
	[1]	[2]	[3]	[4]	[5]	[6]
Core Water Sample						
Asset Beta Without Taxes	0.58	0.05	46.6%	28.0%	53.4%	1.05
Asset Beta With Taxes	0.63	0.05	46.6%	28.0%	53.4%	0.99
Expanded Water Sample						
Asset Beta Without Taxes	0.57	0.05	46.6%	28.0%	53.4%	1.03
Asset Beta With Taxes	0.61	0.05	46.6%	28.0%	53.4%	0.97

Sources and Notes:
[1]: Schedule No. AS-13, [7] - [8].
[2]: Sheilendranath Testimony.
[3]: Provided by California Water Services Company.
[4]: California Water Services Company's Representative Tax Rate.
[5]: Provided by California Water Services Company.
[6]: [1] + [3]/[5]*([1] - [2]) without taxes, [1] + [3]*(1 - [4])/[5]*([1] - [2]) with taxes.

Schedule No. AS-15

Risk-Positioning Cost of Equity using Hamada-Adjusted Betas

Panel A: Scenario 1 - Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.25%

Company	Long-Term Risk-Free Rate	Hamada Adjusted Equity Betas	Long-Term Market Risk	CAPM Cost of Equity	ECAPM (1.5%) Cost of Equity
	[1]	[2]	[3]	[4]	[5]
Core Water Sample					
Asset Beta Without Taxes	2.80%	1.05	7.25%	10.4%	10.3%
Asset Beta With Taxes	2.80%	0.99	7.25%	10.0%	10.0%
Expanded Water Sample					
Asset Beta Without Taxes	2.80%	1.03	7.25%	10.2%	10.2%
Asset Beta With Taxes	2.80%	0.97	7.25%	9.8%	9.9%

Sources and Notes:
[1]: Sheilendranath Direct Testimony.
[2]: Schedule No. AS-14, [6].
[3]: Sheilendranath Direct Testimony.
[4]: [1] + ([2] x [3]).
[5]: ([1] + 1.5%) + [2] x ([3] - 1.5%).

Schedule No. AS-15

Risk-Positioning Cost of Equity using Hamada-Adjusted Betas

Panel B: Scenario 2 - Long-Term Risk Free Rate of 2.80%, Long-Term Market Risk Premium of 7.53%

Company	Long-Term Risk-Free Rate	Hamada Adjusted Equity Betas	Long-Term Market Risk	CAPM Cost of Equity	ECAPM (1.5%) Cost of Equity
	[1]	[2]	[3]	[4]	[5]
Core Water Sample					
Asset Beta Without Taxes	2.80%	1.05	7.53%	10.7%	10.6%
Asset Beta With Taxes	2.80%	0.99	7.53%	10.2%	10.3%
Expanded Water Sample					
Asset Beta Without Taxes	2.80%	1.03	7.53%	10.5%	10.5%
Asset Beta With Taxes	2.80%	0.97	7.53%	10.1%	10.1%

Sources and Notes:
[1]: Sheilendranath Direct Testimony.
[2]: Schedule No. AS-14, [6].
[3]: Sheilendranath Direct Testimony.
[4]: [1] + ([2] x [3]).
[5]: ([1] + 1.5%) + [2] x ([3] - 1.5%).

Schedule No. AS-16

Risk Premiums Determined by Relationship Between Authorized ROEs[1] and Long-term Treasury Bond Rate (2007-2020)

	Forward Looking 20 year Treasury Bond Estimate	Intercept	Slope	Estimated Risk Premium	Estimated Return on Equity
	[1]	[2]	[3]	[4] = [2] + [1] × [3]	[5] = [1] + [4]
Water Utilities:	2.80%	8.87%	-0.708	6.89%	9.7%

Sources and Notes:

[1] Authorized ROE Data from Doerr, Heike, 'RRA Water Advisory: Major Rate Case Decisions January-December 2020', S&P Global Market Intelligence, February 8, 2021, p. 4.

[1]: Blue Chip Economic Indicators Forecast for 10 year Treasury Bond in 2023, adjusted to 20 year horizon.
[2] & [3]: see tab SS1-Regression Output.