STATE OF ALASKA

THE REGULATORY COMMISSION OF ALASKA

Before Commissioners:

Stephen A. McAlpine,
Chair
Paul F. Lisankie
Robert M. Pickett
Antony Scott
Janis W. Wilson

In the Matter of the Tariff Revision Designated as TA xxx-122, filed by MUNICIPALITY OF ANCHORAGE d/b/a ANCHORAGE WATER AND WASTEWATER UTILITY, for its Water Utility, for Interim and Permanent Rate Relief

TAxxx 122

In the Matter of the Tariff Revision Designated as TA xxx-126, filed by MUNICIPALITY OF ANCHORAGE d/b/a ANCHORAGE WATER AND WASTEWATER UTILITY, for its Wastewater Utility, for Interim and Permanent Rate Relief

TAxxx 126

PRE-FILED DIRECT TESTIMONY OF DR. BENTE VILLADSEN

DECEMBER 10, 2018

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EXHIBITS

I. INTRODUCTION AND SUMMARY

Q1. Please state your name, occupation and business address.

A. My name is Bente Villadsen and I am a Principal of The Brattle Group, whose business address is One Beacon Street Suite 2600, Boston, MA 02108.

Q2. Please summarize your professional qualifications.

A. I have 20 years of experience working with regulated utilities and other stakeholders on cost of capital and other regulatory finance and accounting matters. I have testified or filed expert reports on cost of capital in Alaska, Arizona, California, Illinois, New Mexico, Oregon as well as before the Bonneville Power Administration, the Surface Transportation Board, the Alberta Utilities Commission, and the Ontario Energy Board. I have provided white papers on cost of capital to the British Columbia Utilities Commission, the Canadian Transportation Agency as well as to European and Australian regulators on cost of capital. I am also the co-author of the book "Risk and Return for Regulated Industries."[1]

I have testified or filed testimony, expert reports or affidavits on regulatory accounting issues before the Regulatory Commission of Alaska,[2] Federal Energy Regulatory Commission (FERC), the Michigan Public Service Commission, the Texas Public Utility Commission as well as in international and U.S. arbitrations and regularly provide advice to utilities, investors or regulators on regulatory matters as well as risk management. I have previously testified on cost of capital before the Regulatory Commission of Alaska

[1] Bente Villadsen, Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe, "*Risk and Return for Regulated Industries*," Academic Press, May 2017 (Villadsen et al. 2017).

[2] U-17-083.

(Commission or RCA). I hold a Ph.D. from Yale University and a BS/MS from University of Aarhus, Denmark. Exhibit BV-01 contains more information on my professional qualifications as well as a list of my prior testimonies.

Q3. Please summarize your testimony.

A. Anchorage Water Utility (AWU) and Anchorage Wastewater Utility (ASU) have asked me to determine the cost of equity and a capital structure that leads to a fair rate of return on equity for AWU and ASU in connection with AWU's and ASU's requests to increase rates. At year-end 2017, AWU had and 61% debt (39% equity), while ASU had 64% debt (36% equity) on its financial statements, while the average water utility had about 50% debt on its balance sheet.[3] Thus, AWU's equity percentage and even more so ASU's equity percentage is below that of other water and wastewater utilities. Additionally, ASU is expected to have an actual equity percentage between 28 and 37 percent equity through 2028.[4] I therefore recommend that ASU's return on equity be determined using a hypothetical capital structure. Relying on a hypothetical capital structure for ASU makes a comparison between ASU and the sample more useful. AWU is expected to increase the equity portion in its capital structure to above 40 percent over the next several years.[5] Based on this information, I recommend that the average book capital structure of the water utilities I consider in my comparable sample be used to benchmark the capital structure used to regulate ASU. As AWU's equity percentage is higher, I recommend using AWU's actual capital structure.

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[3] Sources: ASU 2017 Wastewater Statistical Information, AWU 2017 Water Statistical Information and Exhibit BV-4.

[4] AWWU 2019 Long-Range Financial Plan.

[5] *Ibid*. It is expected to reach 41% equity by 2021.

I selected a sample of water utilities that are subject to regulation and reviewed the average and median capital structure as of Q3 2018 and over the most recent five year period. I did so both for all publicly traded companies in my sample and for a sample that excludes companies currently contemplating merging. The average and median equity percentage as of Q3, 2018 was 49.9 and 50.2% on a book value basis, respectively, while the five-year average and median was about 52%.[6] The current equity percentages are below those estimated in AWU and ASU's last rate case in dockets U-18-002 and U-18-003. At that time, ASU applied to use 52% equity for regulatory purposes. As the current sample average is about 50% equity, I recommend using a hypothetical capital structure with 50% equity in this case, which will allow ASU on a stand-alone basis to have metrics that are comparable to those of other utilities.

I calculated the cost of equity for the sample companies using standard models and methods such as the Capital Asset Pricing Models (CAPM), Discounted Cash Flow (DCF) models and a risk premium model. Having estimated the cost of equity for the sample, I then considered specific risks of AWU and ASU to derive a range of cost of equity estimates for AWU and ASU. I concluded that a range of reasonable return on equity (ROE) estimates for a generic water and wastewater utility with 50% equity is as indicated below.[7] Because publicly traded water companies engage in regulated activities in both the water and wastewater industry, I consider the group comparable to both AWU and ASU. I find results from my models reasonably fall in a range of 10 to 11½ percent with an ROE of 10.75 percent being the most reasonable for AWU and ASU

[6] Exhibit BV-04.

[7] I select my water and wastewater utility sample from Value Line's Water Utility group, which included companies in the water and wastewater industry. All sample companies engage in both water and wastewater activities.

at the current time. I therefore recommend an ROE of 10.75% for both AWU and ASU along with the reliance on AWU's actual capital structure and a hypothetical capital structure including 50% equity for ASU. The results are displayed below.

Return on Equity at 50% Equity

	Estimated Range	Reasonable Range[8]
CAPM-Based Methods	**10.2% - 12.0%**	**10¼% - 11%**
DCF methods	**8.8% - 16.1%**	**9½% - 13%**
Risk Premium	**10.0% - 10.1%**	**10% - 10¼%**
Recommended ROE		**10.75%**

Based on my estimates' results, a reasonable return for water and wastewater utilities is in the range of 9½% to 13%, when the equity percentage is 50%. The midpoint of that estimate is slightly above 11%, while the average of the midpoints is about 10.7%. Consequently, I consider 10.75% to be a reasonable albeit conservative point estimate. I note this is within the range of both the DCF and the CAPM as well as several of the results from the Gordon growth model the Commission has relied upon in the past.[9] I also recommend that ASU uses a hypothetical capital structure including 50% equity and

[8] To determine the reasonable range I look only to figures rounded to ¼ of a percent. For the CAPM-based Methods, I focus on the traditional CAPM and estimates that rely on the Hamada methodology; this is a conservative approach. For the DCF method, I eliminate the highest company-specific estimates in the single stage DCF and the lowest company-specific estimates from the multi-stage DCF to get my reasonable range (this results in a range of 9.5 to 13.2 percent, which I rounded to 9½ to 13 percent).

[9] See Table No. BV-6, Panel A in Exhibit BV-3.

AWU uses its actual capital structure for ratemaking purposes. The estimate is conservative as I consider ASU and AWU to be of higher risk than the average sample company due to due to their smaller size and high level of Contributions in Aid of Construction (CIAC). Additionally, the recommendation does not consider AWU's lower than average equity percentage, which all else equal would merit a higher ROE.

Further, the Commission has in the past assigned primary weight to the single-stage DCF, which results in an ROE of 14.9% if I use a subsample with no ongoing merger activity. The Commission has in the past assigned lesser weight to the CAPM, which results in ROE estimates of approximately 10¼% to 11% when using the subsample. Even before any consideration of financial risk, the average from the single-stage DCF model is 11.1% (using the subsample, which is lower than the full sample), so in that light 10.75% is a very modest request.[10] Therefore, my recommendation is consistent with the results that would obtain from the Commission's weighting of the DCF and CAPM in Order 10. I discuss the details of my analysis of AWU and ASU specific factors later in my testimony.

[10] Assigning a weight of 60% to the single-stage DCF estimate of 14.9%, and 40% weight to the lowest CAPM estimates of 10.25%, results in an ROE of over 13%. Using the figures prior to any consideration of financial risk, the single-stage DCF results in an average ROE 11.1% of while the CAPM results in an average ROE of 9.23% for an ROE of 10.4% if weighted by 60% and 40%, respectively. *See* Regulatory Commission of Alaska (RCA) Order No. 10 in dockets U-08-157 and U-08-158 ("Order 10") dated March 1, 2010, at p. 44. This estimate assigns no weight to the risk premium result. Thus, taking into account ASU's and AWU's higher risk, 10.75% is fully justified under the Commission's Order 10 approach.

II. APPROACH TO ESTIMATING THE COST OF CAPITAL

A. PRELIMINARY COMMENTS

Q4. What are the guiding principles for determining a just and reasonable rate of return on utility investments?

A. Fortunately, there has been a lot of guidance provided on this topic over the years. Perhaps the seminal guidance was provided by the U.S. Supreme Court in the Hope and Bluefield cases, which found that:[11]

1. The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[12]

2. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and

3. The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[13]

Q5. Please describe how you conducted your cost of equity analysis.

A. I selected a sample of regulated water utilities that are comparable to AWU and ASU, estimated the return that investors required to provide capital for those utilities and reviewed the return on equity authorized in other jurisdictions. I also reviewed the

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[11] *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia*, 262 U.S. 679 (1923) (Bluefield), and *Federal Power Com'n v. Hope Natural Gas Co.*, 320 U.S. 591 (1944) (Hope).

[12] *Hope*.

[13] *Bluefield*.

specific risks for AWU and ASU including business, financial, and regulatory risk. I discuss the Water Utility Sample in detail later on in my testimony.

In order to provide additional support for my recommendation, I undertake several analyses. Specifically, I use the CAPM, DCF and Risk Premium analyses; all of which are widely used in the utility and ratemaking setting. The wisdom of employing multiple methodologies has been acknowledged by the Commission in prior decisions.[14]

To arrive at my final ROE recommendation, I considered (i) the ranges of my calculated cost of equity numbers, (ii) the current economic outlook, (iii) the financial risk differences between the recommended 50% equity for ASU and the sample, (iv) the business risks of AWU and ASU relative to that of the benchmark samples, and (v) the regulatory environment in which AWU and ASU operates. The analyses or assessments I undertook to arrive at my final ROE recommendation is discussed below. Based upon my analyses of the factors noted above, I determined that a reasonable ROE for AWU and ASU is 10.75% assuming AWU relies on it actual capital structure and ASU is allowed a hypothetical capital structure including 50% equity.

1. Cost of Capital and Risk

Q6. How is the "cost of capital" defined?

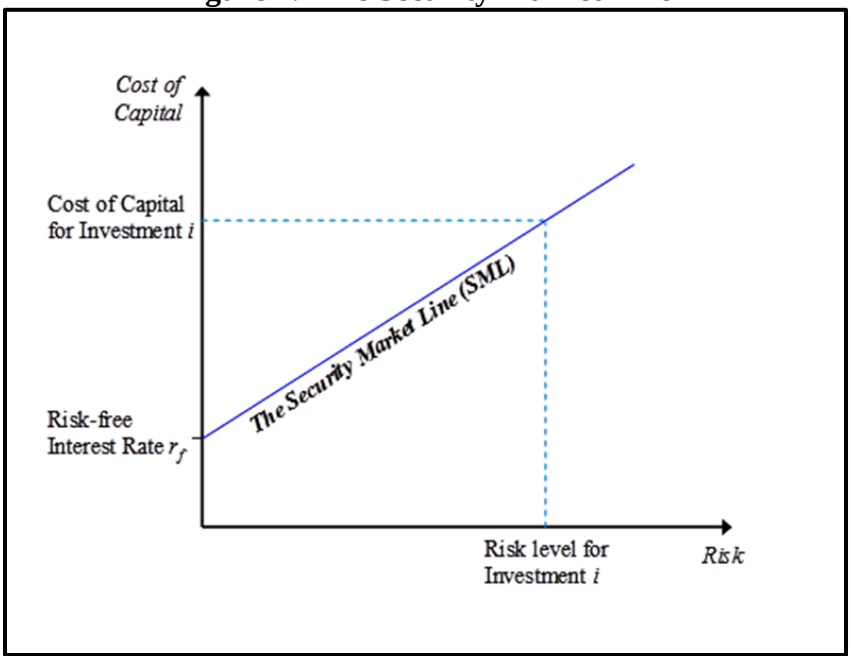
A. The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution

[14] Order 10 at 33, lines 7-9.

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**



Q7. Why is the cost of capital relevant in utility rate regulation?

A. The "cost of capital" for rate regulation purposes is the return that utility investors expect to earn on investments of comparable risk[15] and is one of the relevant factors set forth in the Hope and Bluefield cases.

Q8. What does this mean from an economic perspective?

A. 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. A utility's ability to attract capital and maintain its financial integrity requires that the combined equity return and equity ratio be such that not only is the expected return commensurate with that of other enterprises, but it also meets the expectations of credit market participants.

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. In the longer term, 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 decrease its costs through timely maintenance, upgrading, and expanding of its systems and facilities. Indeed, the cost to consumers of an undercapitalized industry can be far greater than any short-run gains from shortfalls in the

[15] See Stewart C. Myers, "The Application of Finance Theory to Public Utility Rate Cases," *The Bell Journal of Economics & Management Science* 3:58-97 (1972).

cost of capital. This is especially true in capital-intensive industries (such as the water, electric and gas utility industry), which feature systems that take 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 customers' interest not only to make sure the expected return of the investors does not exceed the cost of capital, but also that the expected return does not fall short of the cost of capital. Details on infrastructure assets and needed investments are discussed in the pre-filed direct testimony of AWWU witnesses Brett Jokela, Stephen Nuss and David Persinger.

2. The Impact of Risk on the Cost of Capital

Q9. Please summarize how you factored in risk when determining the cost of capital.

A. I attempted to select a group of sample companies with business risks similar to those of ASU and AWU. However, because the number of comparable water and wastewater utilities is limited, it is important to consider what effect, if any, differences in business risk have on the recommended ROE or capital structure. Similarly, different companies operate with different degrees of leverage (or level of debt in the capital structure),[16] so I consider what difference there is between that of the sample utilities and the regulatory capital structure of AWU and ASU, respectively. Specifically, I compared the business risk of ASU and AWU to that of the sample and determined the impact of any difference in financial risk. The details are discussed below.

Q10. Why is capital structure important for the determination of the cost of equity?

[16] Financial economists refer to leverage as financial risk.

A. Owners of a company with more debt face more equity risk and therefore the return on equity needs to be greater.[17] This is irrespective of the ownership structure. In liquidation, debt holders are paid prior to owners, therefore debt increases risk for the residual claimants / owners. There are several manners in which the impact of financial risk can be taken into account in an analysis of cost of equity; including that for a regulated utility. Financial risk considerations are standard in modern finance and used by providers of financial data such as Duff & Phelps, which explicitly relies on the Hamada methodology when determining the cost of equity for companies.[18] Similarly, recent developments in the regulatory treatment of cost of capital for, for example, telecommunication carriers have recognized the importance hereof. Consequently, the Federal Communications Commission (FCC) in a 2016 order acknowledged that it is reasonable (1) to use market values to estimate the capital structure and (2) derive an implied return on equity from the estimated WACC (weighted average cost of capital).[19] Thus, the FCC acknowledged that market value capital structures are the relevant measure of leverage and impact the ROE.[20] Similarly, the Florida Public Service

[17] Robert S. Hamada, "Portfolio Analysis, Market Equilibrium and Corporate Finance," *The Journal of Finance* 24: 13-31 (March 1969).

[18] Duff & Phelps, *2017 Valuation Handbook: US Industry Cost of Capital*, p. 39.

[19] Federal Communications Commission, "Report and Order, Order and Order on Reconsideration, and Further Notice of Proposed Rulemaking," FCC 16-33, issued March 30, 2016 pp 3189-3190 and p. 3210.

[20] Other regulators that consider financial leverage include the Florida PUC for water and wastewater utilities (Order No. PSC-2017-0361-FOF-WS); "Florida Order"), the Federal Energy Regulatory Board in Cost of New Entry studies for electric (Docket ER14-2940-000, November 28, 2014, ¶81), the Surface Transportation Board (Docket No. EP 558 (Sub-No 18), and to a degree, the Alabama Public Utilities Commission (Dockets 18117 and 18416, August 21, 2013) as well as foreign regulators.

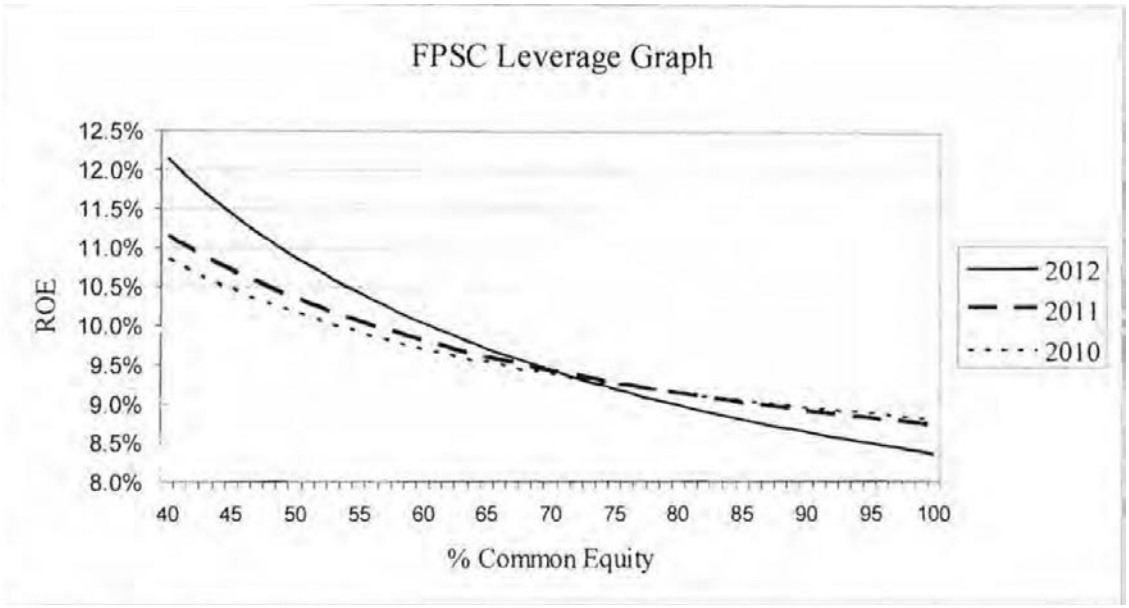
Commission bases its formulaic approach to water and wastewater utilities on several assumptions including: [21]

- The cost of equity is an exponential function of the equity ratio but a linear function of the debt to equity ratio over the relevant range;
- The marginal weighted average cost of investor capital is constant over the equity ratio range of 40 percent to 100 percent.

A. As a result, the Florida PUC depicts the relationship between equity and the return on equity as illustrated in

Figure **2** below.

Figure 2: Florida PSC's Depiction of ROE and Equity Percentage for Water Utilities[22]



[21] Florida Order p. 4.

[22] Florida Order p. 3.

Thus, the Florida PSC recognized that a lower equity percentage merits a higher return on equity.

One way is to determine the after-tax weighted-average cost of capital for the entities and let that figure be constant between the estimate obtained for the sample and the entity to which it is applied. This assumes that the after-tax weighted-average cost of capital is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.[23] This is essentially what the Florida PSC does. A second approach was developed by Professor Hamada, who unlevered the beta estimates in the CAPM to obtain a so-called all-equity or assets beta and then re-levered the beta to determine the beta associated with the target regulatory capital structure. This requires an estimate of the systematic risk associated with debt (i.e., the debt beta), which is usually quite small. In Exhibit BV-02, I set forth additional technical details related to methods to account for financial risk when estimating the cost of capital.

Q11. Why is a hypothetical capital structure merited for ASU?

A. ASU's actual capital structure included approximately 64% debt as of year-end 2017, while AWU had a little less than 60% debt at year-end. AWU is expected to increase its equity percentage, while ASU is expected to operate with less than 36% equity over the next several years.[24] This is a higher debt percentage than that of any of the comparable companies. Because the cost of equity depends on the capital structure as discussed above, it is therefore necessary that ASU either be allowed a "normalized" hypothetical capital structure for ratemaking purposes or an unusually high ROE to ensure ASU has an

[23] See also the discussion in Jonathan Berk & Peter DeMarzo, "*Corporate Finance*," 3rd Edition, 2014, p. 490.

[24] *See* Pre-Filed Direct Testimony of Karen M. Bell ("Bell Testimony"), Exhibit KMB-06.

opportunity to earn a reasonable return on equity and the ability to maintain a revenue bond coverage that allows ASU to pay interest and principal on a timely schedule.[25] It is not uncommon in situations where the capital structure of the regulated utility deviates from that of the industry to allow the use of a hypothetical capital structure for ratemaking purposes. The Commission has in the past acknowledged that a hypothetical capital structure may have merit if the book capital structure is unreasonable or exposes the utility to excessive risk.[26] In the current case, ASU's book capital structure is outside of the range of what, for example, Moody's considers reasonable for an A rating.[27] As explained in the pre-filed direct testimony of Steven Kantor, Fitch in its September 2017 rating review of ASU's bonds noted that ASU's debt level is above average – in fact, Fitch calls the debt burden significant and a weakness "potentially reducing future debt capacity that may be needed to address potential regulatory capital requirements."[28]

Q12. Would your ROE recommendation change if ASU's actual capital structure is used for ratemaking purposes?

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[25] Looking at ASU's Long Range Financial Plan for years 2019-2032, which assumes an ROE of 10.75% on 50% equity, the resulting coverage ratios (Revenue Bond Debt Service Coverage and total debt service coverage) are above 1.8 and 1.2, respectively. *See* 2019 Budget LRFP. These coverage ratios would be consistent with Moody's guidelines for an investment grade credit ration.

[26] For example, RCA Order No. 22 in dockets U-13-184/U-15-096/U-15-097 re Anchorage Municipal Light and Power (April 3, 2015) at p. 51 notes that the Commission "use[s] a hypothetical capital structure when (1) the actual capital structure is inefficient or unreasonable, (2) the level of debt subjects the utility to excessive risks, or (3) the utility is part of a holding company system in which the utility's book capitalization and capital costs are not a true reflection of the system's capital costs with respect to the utility."

[27] Moody's Investors Service, "Regulated Water Utilities," December 22, 2015, pp. 14-17.

[28] Fitch Ratings, "Fitch Affirms Anchorage, AK's Sewer Revs at 'AA'; Outlook Stable," September 2017.

A. Yes. It is a common first step for cost of capital experts to rely on a sample of comparable companies to estimate the cost of equity for companies with comparable business risks. However, this is only the first step in determining the cost of equity for a specific company, because any one company may face larger business, financial, or regulatory risks than the sample. Step two is therefore an assessment of the risk associated with the target entities – AWU and ASU. Therefore if AWU or ASU has less equity than the sample, an ROE adjustment needs to be made for the added risk in AWU / ASU's capital structure. Using AWU / ASU's actual capital structure, which included approximately 60% and 64% debt at year-end, respectively, would require an ROE increase of more than 260 basis points. It is important to keep in mind that the cost to customers is the allowed dollar return on equity plus the cost of debt, if we ignore taxes, and the example below illustrates this. The cost to customers would be the same for (A) a hypothetical capital structure of 50% equity with an ROE of 10.75%, or (B) an actual capital structure of 36% equity with an ROE of 13.38%. Scenario A is simply more in line with what is commonly allowed.

Example illustrating Customer Cost Associated with Cost of Capital

	Scenario A	Scenario B
Equity Percentage	50%	36%
Rate Base	$1,000	$1,000
Allowed ROE	10.75%	13.38%
Cost of Debt	4%	4%
Cost to Customers	$73.75	$73.75

The cost of equity (and debt) depends on what capital structure is used, and the use of ASU's actual capital structure with approximately 64% debt not only exposes ASU to an

excessive amount of financial risk but also is inefficient in that it makes it difficult to compare ASU to other utilities. I therefore recommend a hypothetical capital structure for ASU that includes 50% equity be used.

Q13. Are there any AWU or ASU-specific risk factors?

A. Yes. First, the book value of total assets was approximately $613 million for AWU and $461 million for ASU at year-end 2017.[29] In comparison, the average and median of total assets for the sample at year-end 2017 exceeds $4.1 billion and $1.4 billion, respectively.[30] Similarly, looking at the book equity among the sample companies the average and median was $1.2 billion and $497 million at year-end 2017, whereas AWU and ASU had only $150 million and $96 million, respectively.[31] Thus, both AWU and ASU are substantially smaller than the average / median sample company.

Second, in most years neither AWU nor ASU have achieved the allowed return on equity since 2012 although AWU earned more than its allowed ROE in 2014. This is shown in Figure 3 below.

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[29] *See* Statement of Financial Statements, Municipality of Anchorage, Alaska, Water Utility Fund and Statement of Financial Statements, Municipality of Anchorage, Alaska, Wastewater Utility Fund ("AWU Financial Statements" and "ASU Financial Statements"). Includes deferred outflows. [[Is this attached to a company witness's testimony?]]

[30] Workpaper to Exhibit BV-04.

[31] *See* ASU Financial Statements and AWU Financial Statements. [[Is this included in a company witness' exhibits?]]

Figure 3: AWU and ASU Earned Return on Net Position

	2017	2016	2015	2014	2013	2012
Allowed ROE	10.25%	11.01%	11.01%	11.01%	11.10%	11.60%
AWU Earned ROE	6.60%	6.80%	8.80%	11.30%	10.50%	7.90%
ASU Earned ROE	10.00%	5.40%	7.10%	10.00%	10.50%	9.50%

Data from ASU and AWU Statistical Information

Additionally, neither AWU nor ASU are expected to earn their allowed ROEs over the next several years.[32] Because the investment in fixed assets needs to be used and useful before the utility can recover capital cost, a utility that engages in capital expenditures necessarily faces a lag in the recovery of capital costs. This is the case for AWU and ASU. I understand that the Commission has adopted regulations that may help offset some regulatory lag pertaining to certain types of infrastructure investments.[33] While PRISM allows the earlier recovery of certain horizontal asset investment, this is a common type of regulatory mechanism among the sample companies and therefore already accounted for in the cost of equity estimates.

Third, both AWU and ASU have a very large portion of their assets financed by CIAC.[34] The presence of a large CIAC has two effects. As AWU / ASU do not earn a return on these funds, it has larger than usual operating risks; in essence, the utility is responsible for fixed costs over and above what it earns a return on. Therefore, the exposure to asset-related risks is larger than what is reflected in the rate making process. Further, as the CIAC funded assets are being replaced by utility funded assets, the utilities face financing

[32] AWWU 2019 Budget LRFP.

[33] 3 AAC 52 Amendment: Article 9. Plant Replacement and Improvement Surcharge Mechanism (PRISM), June 29, 2014

[34] *See* Johnson Testimony at Exhibit ELJ-04.

risks. Specifically, the ratio of CIAC to Net Property, Plant and Equipment (PPE) or to long-term debt is much higher than that of any sample company. For example, the CIAC to PPE ratio of both AWU and ASU is three to four times that of the average sample company and none of the sample companies are close to having a CIAC to PPE or CIAC to long-term debt ratio comparable to that of AWU or ASU. Figure 4 below summarizes the results.

Fourth, assuming AWU will be allowed and equity percentage equal to its actual book equity and ASU will be allowed a hypothetical capital structure of 50% equity, the two utilities carry more financial risk than what is inherent in the CAPM and DCF cost of equity estimates. Because the CAPM and DCF models use data from capital markets to estimate the return on equity that investors require, the data entered into the calculation are market data – e.g., the total return to investors (changes in stock prices plus dividends) relative to the investment made. The investment is the dollar value of equity and debt, so the market value of equity and debt is what matters, when measuring the capital structure inherent in the CAPM and DCF based estimates of the cost of equity. Over the last five years, the average utility in my water sample has had approximately 64% equity in their capital structure, when measured at market value.[35]

Q14. Please summarize the impact of a large CIAC amount on ASU's risk.

[35] I measure both equity and debt at market value. See, Exhibit BV-03 at Table No. BV-Water-4.

A. Figure 4 summarizes the CIAC among the sample companies as well as for AWU and ASU.

Figure 4: CIAC Relative to Net Plant and LT Debt[36]

Company	CIAC	LT Debt	CIAC / LT Debt	PPE	CIAC / PPE
American States Water	$124	$321	38.5%	$1,205	10.3%
American Water Works	$1,276	$6,812	18.7%	$16,246	7.9%
Aqua America	$571	$2,122	26.9%	$5,400	10.6%
California Water	$187	$532	35.1%	$2,048	9.1%
Connecticut Water Services	$132	$260	50.7%	$698	18.9%
Middlesex Water	$21	$146	14.7%	$557	3.8%
SJW Corporation	$161	$431	37.3%	$1,284	12.5%
The York Water Company	$6	$91	7.0%	$230	2.8%
Average	$310	$1,339	23.1%	$3,458	9.0%
Median	$146	$376	38.9%	$1,245	11.7%
AWU	$207	$219	94.3%	**$553**	**37.4%**
ASU	$167	**$169**	**99.1%**	$410	40.9%

As can be seen from Figure 4 above, both AWU and ASU has substantially more CIAC than the sample companies. For example, the average CIAC to long-term debt average about 23% among the sample companies but 94% and 99~~101~~% for AWU and ASU, respectively. Similarly, as a fraction of net PPE, AWU and ASU's CIAC are at 37~~34~~% and 41%, while the sample's average and median are only about 9% and 12%, respectively.

Because CIAC has been used to finance long-lived assets that are operated by AWU or ASU, but AWU / ASU earn no return on those assets, the magnitude of the CIAC impacts the financial performance. The presence of fixed assets increases operating leverage, because these assets still need maintenance etc., but the revenue associated with the contributed assets does not include a return. Hence, the level of fixed costs to revenue is larger than what it would have been without so much CIAC and therefore operating

[36] Long-Term Debt includes the current portion of long-term debt.

leverage is increased. Operating leverage (like financial leverage) exposes the utility to risk.

Q15. Can you provide an example demonstrating that a high level of CIAC creates risk for utilities?

A. Yes. Just like increased leverage increases the financial risk for a utility, the magnitude of CIAC magnifies the volatility in income or change in net position. The following example illustrates this.

Assume as above that both Companies A and B have a rate base of $1,000 and that the allowed ROE is 10.75% while the cost of debt is 5%. Further assume that operations, maintenance, administrative and general costs are $800. The only difference between the two companies is how their rate base is financed. Specifically, Company A is financed 50-50 with debt and equity, while Company B is financed with 40% debt, 40% equity, and 20% CIAC, which earns a return of zero. The base case is illustrated in Figure 5 below.

Figure 5: The Impact of CIAC on Income Volatility – Base Case

	Company A	Company B
Rate Base	$1,000	$1,000
Debt	$500	$400
Equity	$500	$400
CIAC	$0	$200
O&M and A&G Costs	$800	$800
Debt Cost	$25	$25
Allowed Equity Return	$54	$43
Revenue Requirement	$879	$868
Income	$54	$43

Note that income divided by equity is exactly 10.75%.

Now assume for simplicity that both Companies A and B experience a five percent increase in cost with no impact on revenue. The realized income and return is shown in Figure 6 below.

Figure 6: The Impact of CIAC on Income Volatility – Cost Increase

	Company A	Company B
Revenue	$879	$868
O&M and A&G Costs	$840	$840
Cost of Debt	$25	$25
Income	$14	$3

It is clear from Figure 5 and Figure 6 above that the presence of CIAC makes the utility more vulnerable to fluctuations in cost (or revenues). Hence, an increase in CIAC increases the volatility of a utility's income or change in net position, everything else being equal. Given the large volumes of CIAC that are present on AWU's and ASU's balance sheets, they are exceptionally vulnerable to changes in its operating cost or operating revenues. In other words, AWU's and ASU's significant level of CIAC results in higher business risk relative to the water utility sample.

Q16. Please discuss the impact of ASU and AWU being small in size.

A. Looking to the Duff & Phelps company rankings by book value,[37] AWU and ASU are smaller than their peers with AWU and ASU both falling in Duff & Phelps group 24-25, where groups are ranked from largest to smallest. The average sample company falls in

[37] I use book values of equity for this purpose to be able to compare AWU and ASU to the sample companies.

group 15-16 and the median is in group 21.[38] Empirically, investors have required a higher premium to invest in smaller companies than in larger ones. For example, Duff & Phelps data indicates that companies in group 24 merits a smoothed risk premium of 11.03%, while a company in group 16 would merit a risk premium of 9.22%. Thus, a conservative estimate of the premium for ASU and AWU above that of the average sample company is 181 basis points. The median sample company merits a premium of 10.16% so that ASU's and AWU's premium over the median sample company would be 87 basis points.[39] If I take into account ASU's requested hypothetical capital structure, it would not move higher than group 24, which is what I used in the analysis above.

While the estimated premia are different if size is measured by equity, sales, or net income, the directional effect is similar. ASU and AWU are smaller than the sample companies and thus, both AWU and ASU's smaller size merits a premium over that of the average or median sample company. I use the smaller size of AWU and ASU as one of the facts that merits the ROE of ASU and AWU being above that of the average of the sample. I note that while some studies have found results that differ from Duff & Phelps for electric utilities, others have found similar results when water utilities are included.[40] Additionally, I observe that Duff & Phelps include all companies (including water and other utilities) that trade on the New York Stock Exchange or Nasdaq. I therefore maintain that size is a consideration for AWU and ASU.

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38 Duff & Phelps 2017 SBBI Valuation Handbook, Appendix 4.

39 *Ibid.* The analysis uses the smoothed average risk premium.

40 Annie Wong, "Utility Stocks and the Size Effect: An Empirical Analysis," Journal of the Midwest Finance Association 1993, pp. 95-101 and T.M. Zepp, "Utility Stock and the Size Effect – Revisited," *The Quarterly Review of Economics and Finance*, vol. 43, 2003, pp. 578-582

Q17. Are there other indications that AWU and ASU should be placed in the upper half of the estimation results?

A. Yes. For example, AWU's and ASU's operations are concentrated in Anchorage and the surrounding area, which due to its location creates some unique challenges in, for example, construction due to weather. Further, while AWU's and ASU's service territories are concentrated in one area of one state, larger water and wastewater companies such as American Water Works and Aqua America operate in multiple states. Thus, the sample is much more geographically diverse than are AWU or ASU. This becomes important in a situation like the recent 7.0 earthquake that hit the Anchorage area. The impact of a natural disaster can be more pronounced on utilities like AWU and ASU that are concentrated in one area, like what happened in the earthquake where virtually all of both AWU's and ASU's systems were at significant risk.

Q18. What about AWWU having a higher bond rating than the comparable companies?

A. First, I note that the sample utilities on average have a bond rating of about A. Thus, AWWU and the sample companies all have a bond rating well above the investment grade level. This is important because neither AA, A, nor BBB rated companies have much default risk.[41] Second, bond ratings are measures of default risk and AWU's and ASU's rating being a measure of the default risk of the specific bond that is rated. Thus, the bond rating is the risk of default to the bonded debt only, not all debt. For example, it does not apply to the State of Alaska loan debt or any general debt of the utility to its

[41] According to Standard & Poor, "2017 Annual Global Corporate Default Study and Rating Transitions," April 2018 p 10 the default rate for AA and A rated corporate entities has been zero from 2010 onward while BBB rated entities saw a single year (2011) with a default rate of 0.07%, which is miniscule.

vendors. The bonded debt is akin to secured versus unsecured debt and gets paid before the non-bonded debt, having a claim to the revenue ahead of any subordinated or other unsecured debt. Neither does it apply to equity holders, who are last in line. The risk profile as an equity holder looks much different than it does to a bonded debt holder and the bond rating says little about how the risks look from the bottom of the payment waterfall. A better measure of the risk of a company's equity is its beta measure, not its bond rating.

For these reasons, AWU's and ASU's bond ratings do not indicate that their **equity** is any more or less risky than the sample companies.

Q19. Does the fact that AWU and ASU may have access to state loans affect the ROE?

A. No. To the degree that AWU and ASU have access to loans from the State of Alaska that have lower interest rates than commercial loans, the lower interest rates are reflected in customer rates as borrowing costs are flowed through to customers.

Q20. Does the lower interest rate on state loans affect AWU's and ASU's risk?

A. Minimally, if at all. The state loans have lower interest rates than what is common for investor-owned utilities, but interest payments are not capitalized and therefore not shown as a liability on either the investor-owned or AWU or ASU financial statements. Similarly, the higher interest rate on investor-owned utilities' loans is reflected in the utilities' revenue as is the lower interest on AWU's and ASU's loans – hence the income statement accounts (but not the balance sheet accounts) are smaller due to the state loans, all else equal. Additionally, the state loans are not automatic and needs to be periodically renewed or replaced, which (similar to investor-owned utilities loans) exposes the utilities to refinancing risk.

III. IMPACT OF THE ECONOMY AND MARKETS ON THE COST OF EQUITY

A. INTEREST RATES

Q21. How do interest rates affect the cost of equity?

A. Interest rates and the developments in interest rates are important for the determination of the cost of equity for several reasons. First, current or forecasted interest rates are inputs to some commonly used cost of equity estimation methods such as the Capital Asset Pricing Model and the Risk Premium Model. Second, the developments in interest rates impact parameters or the interpretation of parameters that are often used in cost of equity estimation models. Economists often work with yields, which measures the return an investor realized on a bond – for example, the current yield is the annual interest divided by the current price of the bond. The yield on a bond generally increases if the bond has a longer time to maturity and/or if it has higher default risk, but investor perception also matters. If the difference between the yield on, for example, utility bonds and government bonds increases, it could be because (i) the risk characteristics of one of the bonds has changed or (ii) investors require a higher premium to hold non-government bonds.

Q22. What are the relevant developments regarding interest rates?

A. Interest rates and especially government bond yields have been low in recent years. However, the Federal Reserve has decided to raise the target range for the federal funds rate to a range of 1.75 percent and the primary rate to 2 – 2.25 percent on September 27, 2018 following the increase in June 2018 and is expected to further increase the federal funds rate in December. The most recent Federal Reserve action increases the rates by 25

basis points. Thus, there is plenty of evidence that federal interest rates are increasing.[42] Similarly, actual interest rates have increased and forecasted interest rates are consistent with increasing interest rates as, for example, Blue Chip expects interest rates to increase by 70-80 basis points over the next several years.[43]

Figure 7 below shows the historic and forecasted development in the Government bond yields from 2001 to 2021.[44] It is evident that the yield on long-term government bonds is expected to increase.

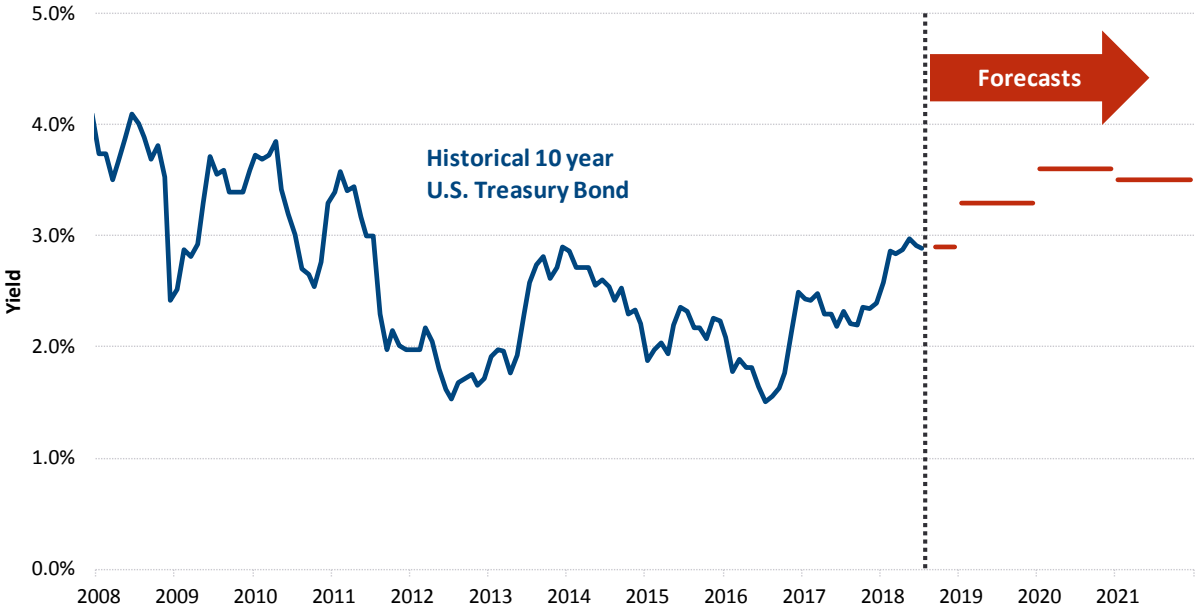
Figure 8 shows the spread between A rated utility bonds and government bond yields along with the average spread prior to the financial crisis. It is evident that the spread is greater than its historical average. Thus, a review of the development in government bond yields and the spread between A rated bonds and U.S. treasury bonds illustrates that (1) yields are expected to increase and (2) the spread between the utility bond yield and government bond yields is elevated.

[42] `See Federal Open Market Committee, Press Release, September 27, 2018 and June 13, 2018.

[43] The current yield on the 10-year government bond is about 2.9% and Blue Chip expects that to increase to 3.6 to 3.7 percent over the next several years. Blue Chip Economic Indicators, October 2018.

[44] For clarity "BBB rated" refer to bonds in the range of BBB- through BBB+ and "A rated" reference bonds in the range of A- through A+. The majority of water utilities are in the A range rating.

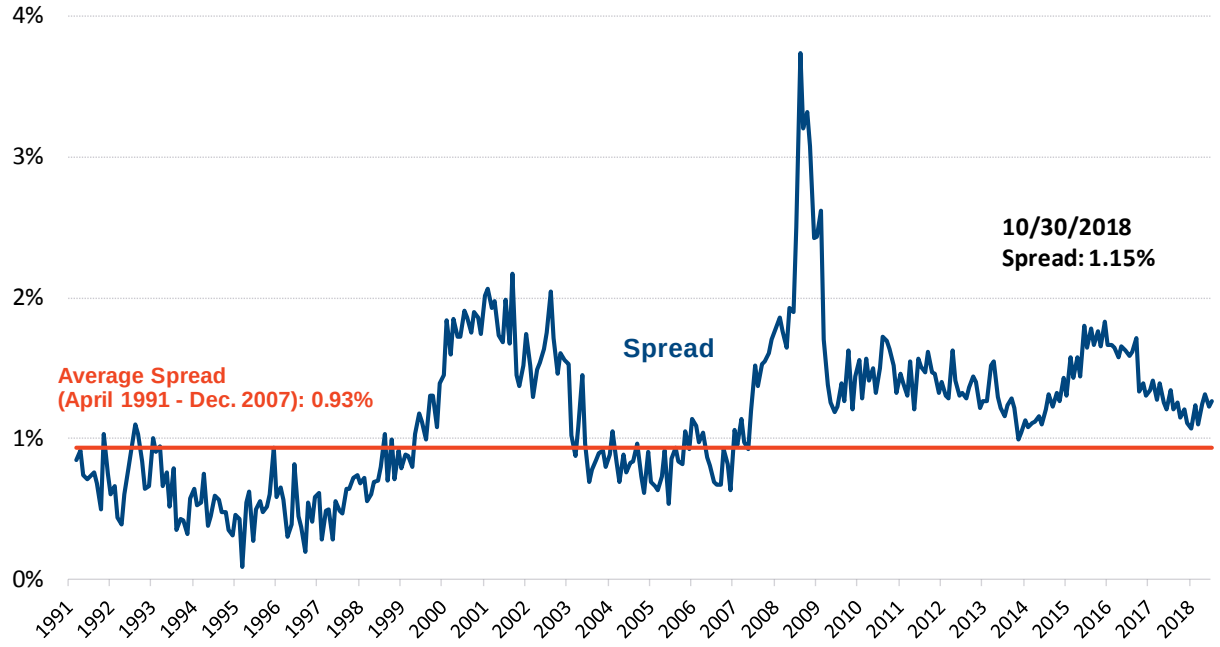
Figure 7: A Utility and Government Bond Yields



Source: Historical data from Bloomberg. Forecasts from Blue Chip Economic Indicators October 2018 issue.

1

Figure 8: Spread between A Rated Utility and 20-Year Government Bond Yield



Source: Bloomberg as of 10/30/2018.

Q23. How does the current spread between utility and government bond yields compare to the historical spread?

A. As shown in Figure 7 and Figure 8 above, the risk-free rate is expected to increase and the spread between A rated utility bond yields and government bond yields is higher than its historical average although the spread has been reduced substantially in recent months. This matters because not only is the current risk-free below the level expected at the time AWU's and ASU's rates will be in place, but there is evidence that the risk-free rate is artificially low or that the current MRP is higher than its historic average (*See Exhibit BV-02 for details*).

Q24. Please explain how interest rates expected to trend going forward.

A. Blue Chip Economic Indicators expects that the yield on 10-year Treasury Notes will increase by about 15 basis points in a year and the publication forecasts additional

increases for 2020.[45] Consensus Forecast expects a slightly larger increase of about 25 basis points in the 10-year yield by mid-2019.[46] These expectations are consistent with the current downward pressure on Government bond yields and enhanced economic activity.

Q25. How do these developments impact the cost of equity analysis?

A. There are several ways in which the current interest rate environment affects the cost of equity analysis. First and most directly, the CAPM utilizes as one of its inputs a measure of the risk-free rate (see Figure 1). I used the yield on a 20-year US government bond as a proxy for the risk-free rate.[47] The CAPM estimated the cost of equity as the risk-free or government bond rate plus a premium. Therefore, if the risk-free rate increases (decreases) by 1%, then the cost of equity increases (decreases), as estimated by the CAPM, by 1%. As a result, to the extent that the government bond rate is driven by monetary policy rather than market factors, so is the CAPM estimate. Importantly, if the government bond rate is downward (upward) biased, then the CAPM estimate will be downward (upward) biased. When that is the case, it is necessary to normalize the relied upon government bond rate, so that the resulting CAPM estimate reflects a non-biased government bond rate. I consider this effect in my CAPM analysis.

Second and as a further indication of a potential bias, if the spread between the yield on utility (or corporate) bonds and government bonds (the "yield spread") widens, it

[45] Blue Chip Economic Indicators, October 2018.

[46] Consensus Forecasts, October 10, 2018.

[47] The main reason I rely on the 20-year bond yield is that the MRP as derived by Ibbotson is measured over bonds with a maturity of about 20 years. To avoid having to consider the impact of a maturity premium, I use the 20-year government bond.

indicates that the premium investors require for holding securities other than government bonds has increased. Thus, there is evidence that the market equity risk premium is elevated. A higher than normal yield spread is one indication of the higher risk premiums currently prevailing in 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. Higher yield spreads reflect the fact that the return on corporate debt is higher relative to government bond yields than is normally the case, even for regulated utilities. Because equity is more risky than debt, this means that the spread between the cost of equity and government bond yields must also be higher; i.e., the premium required to hold equity (the Market Risk Premium or MRP) rather than government bonds has increased. If this fact is not recognized, then the traditional cost of capital estimation models will underestimate the cost of capital prevailing in the capital markets. My analyses recognize this effect and therefore reflect the cost of equity capital more accurately.

Third, in times of economic uncertainty (such as the present) investors seek to reduce their exposure to market risk. This precipitates a so-called "flight to safety," wherein demand for low-risk government bonds rises at the expense of demand for stocks. If yields on bonds are extraordinarily low, however, any investor seeking a higher expected return must choose alternative investments such as stocks, real estate, gold or collectibles. Of course, all of these investments are riskier than government bonds, and investors demand a risk premium (perhaps an especially high one in times of economic uncertainty) for investing in them. But short of accepting meager returns, investors simply have few alternatives to returning to the stock market. Utility stocks may have experienced the "flight to safety" phenomenon to a larger degree than other stock because

they traditionally have paid a substantial portion of their earnings as dividends. Therefore, investors who have sought income from their investments and found government bonds too unattractive may have accepted a higher risk and invested in utility stock with the goal of receiving periodic dividend payments. Importantly, if utility stock prices increase, the dividend yield declines and cost of equity estimates from the Discounted Cash Flow (DCF) model will, everything else equal, be lower. I discuss the potential impact in Section III.B below.

One possible explanation of the current elevated level of the yield spread is that current and near-term expected levels of government bond yields are artificially depressed due to monetary policy.[48] The large holding of mortgage backed securities and treasury bonds by the Federal Reserve is expected to last for several years and only gradually unwind.[49] As a result, U.S. government bond yields are expected to increase substantially over the next several years.

Q26. What are the implications of elevated yield spreads to the cost of equity?

A. The increase in the yield spread indicates that (i) the current long-term government bond yields are depressed relative to their normal levels and / or (ii) investors are demanding a premium higher than the historical premium to hold securities that are not risk free. The latter is an indication that the market equity risk premium may be elevated relative to its historical level. Regardless of the interpretation, the consequence is that if cost of equity

[48] As of July 2018, the Federal Reserve held approximately $1.7 trillion of mortgage-backed securities, whereas the magnitude was less than $0.5 trillion in mid-2009. Sources: Bloomberg, "The Fed Eases Off," September 16, 2015, Federal Reserve Balance Sheet August 2018.

[49] https://www.washingtonpost.com/news/wonk/wp/2017/09/20/in-sign-of-u-s-economys-strength-fed-to-start-reducing-4-5-trillion-balance-sheet/?utm_term=.1fa068334254

is estimated using the current risk-free rate and a market equity risk premium based on historical data will be downward biased. Hence, it is necessary to ensure the relied upon risk-free rate reflects future expectations and that the MRP reflects investor perceptions of the MRP going forward.

B. MARKET UNCERTAINTY AND OTHER MARKET PHENOMENA

Q27. Why is market volatility important?

A. Academic research has found that investors expect a higher risk premium during more volatile periods. The higher the risk premium, the higher the required return on equity. Therefore uncertainty in the market leads investors to demand a higher return for equity investments.

One implication of this finding is that the MRP tends to increase when market volatility is high, even when investors' level of risk aversion remains unchanged.

Q28. What do you mean by the term "risk aversion"?

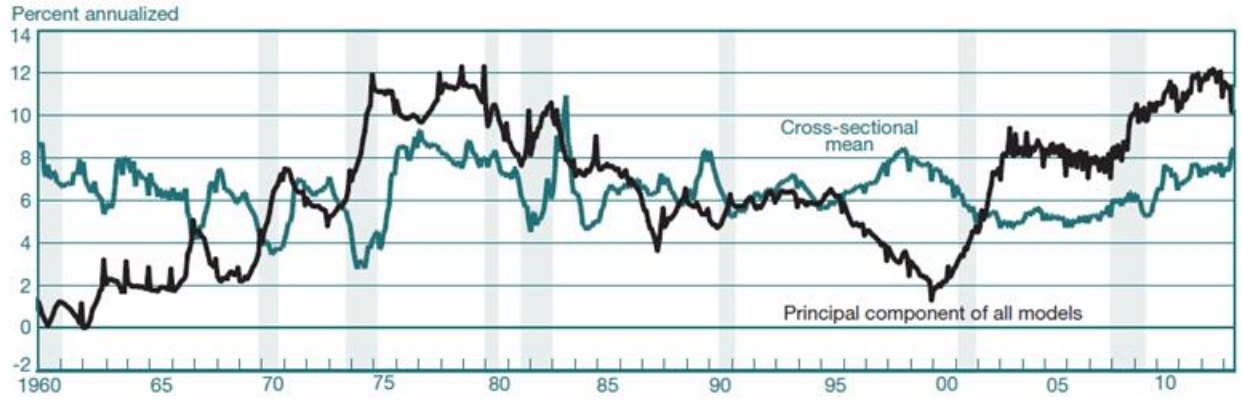
A. Risk aversion is the recognition that investors dislike risk, which means that for any given level of risk, investors must expect to earn an appropriate return to be induced to invest. An increase in risk aversion means that investors now require a higher return for that same level of risk.

Q29. Has the MRP increased since the 2008-09 financial crisis?

A. Yes. A recently updated analysis by Duarte and Rosa of the Federal Reserve of New York aggregates the results of many models of the required MRP in the U.S. and tracks them over time. This analysis finds a very high MRP in recent years.

The analysis estimates the MRP that results from a range of models each year from 1960 through the present.[50] The analysis then reports the average as well as the first principal component of results.[51] The analysis then finds that the models used to determine the risk premium are converging to provide more comparable estimates and that the average annual estimate of the MRP was at an all-time high in 2013. These estimates are reasonably consistent with those obtained from Bloomberg and the consistent elevation of the MRP over the historical figure indicates that the elevated level is persistent. Figure 9 below shows Duarte and Rosa's summary results.

Figure 9
Duarte and Rosa's Chart 3
One-Year Ahead MERP and Cross-Sectional Mean of Models



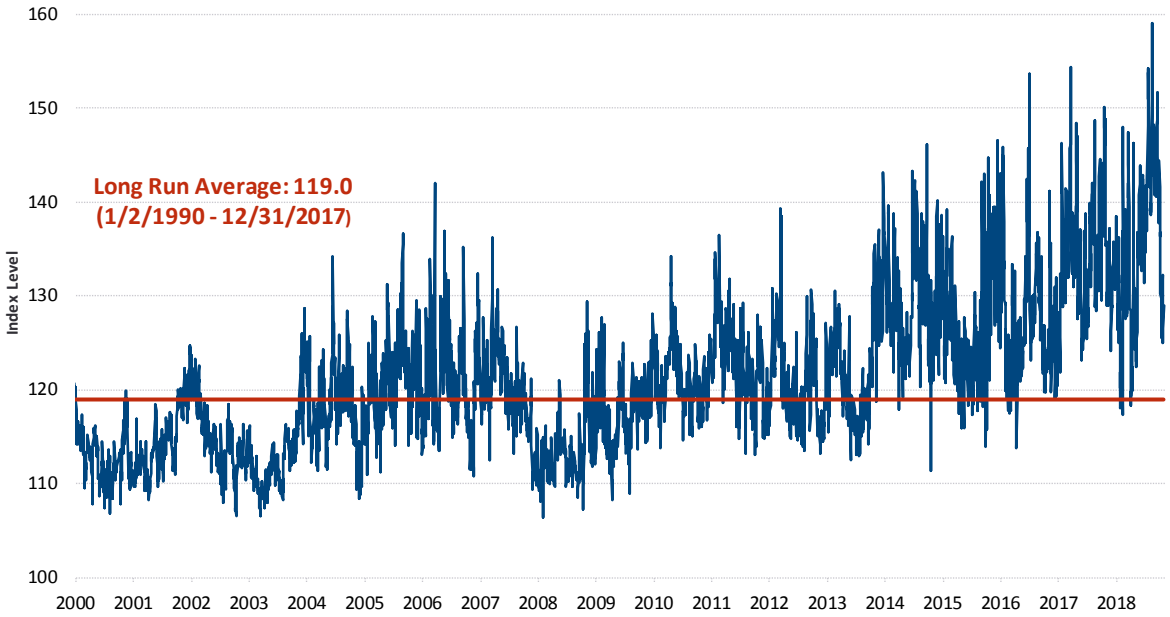
Q30. What other financial measures do you have that indicate a high degree of investor uncertainty?

[50] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Review of Models," *Federal Reserve Bank of New York*, December 2015 (Duarte & Rosa 2015).

[51] Duarte & Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the most variability among the 20 models over time.

A. The SKEW index, which measures the market's willingness to pay for protection against negative "black swan" stock market events (i.e., sudden substantial downturns) is high by historical standards. This indicates that even if the short-term volatility is low, investors are exhibiting signs of elevated risk aversion as concerns downside tail risk.[52]

Figure 10: SKEW Index



Source: Bloomberg as of 10/25/2018

As can be seen from Figure 10 above, the SKEW indicates a high level of investor fear of serious economic events.

Q31. What is the relevance of these observations in this case?

[52] The SKEW index is traded on the Chicago Board Option Exchange. Short-term volatility can be measured by, for example, the VIX index. The VIX measures the one month ahead market volatility expectations and is calculated from options traded on the Chicago Board Options Exchange.

A. Evidence that MRP has increased since the financial crisis and indications are that it remains at that higher level are important because much research in the early 2000s went into analyzing whether the MRP was below the long-term historical average. This research pertained to a period prior to the financial crisis and therefore may not have a bearing on the MRP that is required today.

Q32. Are there other economic features that currently are unusual?

A. Yes. The most recently experienced GDP growth (Q3, 2018) is estimated to have seen a real GDP growth of 3.5% (nominal about 5.5%),[53] while Q2, 2018 was even higher at about 4.2% (nominal about 7.6%).[54] This is materially higher than in the recent past and higher than the forecasted GDP growth from, for example, Blue Chip. Because the GDP growth rate is used as an input to the multi-stage DCF model, an increase in this parameter will increase the DCF-based cost of equity estimates. Going forward, GDP growth was estimated at 4.1% (nominal) by Blue Chip Economic Indicators in October 2018 (the most recent long-term estimate) may be substantially affected by the growth currently being experienced.

Q33. Are there other features of financial markets that are currently unusual?

A. Yes. There are several. First, the ongoing implementation of tariffs on certain products, the ongoing crisis in the Middle East, Brexit implementations, and the changes in the U.S. Congress and Senate put financial markets at risk for large fluctuations. Second, the full impact of the 2017 Tax Cut and Jobs Act has yet to materialize and may not have

[53] CNBC, "The US Economy Grew at a 3.5% Pace in the Third Quarter, Faster than Expected," October 26, 2018.

[54] U.S. Bureau of Economic Analysis: https://www.bea.gov/data/gdp/gross-domestic-product

been fully incorporated in all forecasts. These policy initiatives and crises impact economic performance and could substantially affect financial markets. Third, the current level of many companies', including water utilities', Price-to-Earnings (P/E) ratio is higher than what has been experienced historically. Empirically, the P/E ratio increases when interest rates decline. This effect indicates that the dividend yield (dividends divided by price) is currently lower than it historically has been. As interest rates increase, the P/E level has historically declined, so that the dividend yield is likely to increase going forward.

Q34. What do you conclude from this information?

A. The forecasted increase in the risk-free rate, the Federal Reserve signaling continuing monetary tightening, the elevated spread between the yield on utility and government bonds, and risks in financial markets as illustrated by, for example, the SKEW index, indicates that the premium investors require to hold assets that are not risk-free is higher than before the financial crisis.

These factors point to a relatively high degree of investor risk aversion and the premium that investors require to hold assets that are not risk-free is elevated. Similarly, the fact that the Q2 and Q3, 2018 GDP growth is higher than the forecasted GDP growth as of October may indicate that an increase in GDP growth is coming.

C. IMPACT ON ROE ESTIMATION

Q35. Please summarize how the economic developments discussed above have affected the return on equity and debt that investors require.

A. Utilities rely on investors in capital markets to provide funding to support their capital expenditure program and efficient business operations. Investors consider the risk return

tradeoff in choosing how to allocate their capital among different investment opportunities. It is therefore important to consider how investors view the current economic conditions; including the plausible development in the risk-free rate and the growth in GDP.

These investors have been dramatically affected by the credit crisis and ongoing market volatility, so there are reasons to believe that their risk aversion remains elevated relative to pre-crisis periods.

As AWU and ASU are expected to be compensated as a utility on the equity component of its rate base, the same factors would affect AWU and ASU's equity.[55]

Q36. Does your analysis consider the current economic conditions?

A. Yes. In implementing the CAPM and risk premium models, I considered the forecasted interest rate and consider the current multi-stage DCF to be downward biased as the forecasted GDP growth is lower than the recently experienced GDP growth. Specifically, I rely on Blue Chip's 2019 government bond yield forecast for the risk-free rate and consider the long-term GDP growth rate to be downward biased for which reason substantial weight needs to be afforded the single-stage DCF model.

IV. ANALYZING THE COST OF EQUITY

A. APPROACH

Q37. Please outline your approach for determining the cost of equity for AWU and ASU.

[55] AWU's and ASU's ability to raise debt capital may differ from that of an investor-owned utility in that the utility has access to government loans. However, the availability of such loans and the interest rate hereon will change over time.

A. As described above in Section II.A, the standard for establishing a fair rate of return on equity requires that a regulated utility be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for AWU and ASU focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by AWU and ASU. Because the models I rely upon most heavily require market data, my consideration of comparable companies is restricted to those that have publicly traded stock.

To this end, I have selected a sample of publicly-traded companies that primarily provide regulated water and wastewater services.

For this sample, I derive estimates of the representative cost of equity according to standard financial models including two versions of the CAPM and two versions of the DCF model. I further review summary analysis of allowed ROEs for water utilities. The latter analysis is conducted using allowed returns on equity and associated allowed equity ratios rather than market data; the results of these analyses are used as a test on the reasonableness of my market-based results.[56] A recent development regarding methodology is that the FERC in an October 2018 decision[57] determined that the CAPM, DCF, risk premium, and expected earnings (a forward-looking version of the comparable earnings test) are appropriate for ROE estimation, finding that

[56] I note that I only have data on the allowed ROE for water utilities back to 2004, whereas I have data back to 1990 for electric and gas utilities. Due to the more limited data availability I am more cautious in interpreting the water risk premium results.

[57] Federal Energy Regulatory Commission, 165 FERC ¶ 61,030; Docket No. EL11-66-001, et al., Issued October 16, 2018.

> [i]n light of current investor behavior and capital market conditions, relying on the DCF methodology alone will not produce a just and reasonable ROE. Instead, we propose to rely upon the results of all four financial models in the records for these proceedings …[58]

As the cost of equity for the CAPM and DCF based models are derived from market data that reflect the capital that investors hold in the sample companies, I consider the impact of any difference between the financial risk inherent in the cost of equity estimates and the capital structure to which it is assigned using several methods to avoid any one method biasing the results.

B. SAMPLE SELECTION

Q38. How do you identify sample companies?

A. AWU and ASU are regulated water and wastewater utilities, so I start with the universe of publicly traded utilities classified as water utilities in Value Line. I require that the companies have an investment grade credit rating, no recent dividend cuts, and generally have data available for estimation.[59]

Q39. What are the characteristics of the Water Utility sample?

A. The water utility sample comprises water utilities whose primary source of revenues and majority of assets are subject to regulation. The final sample consists of the water utilities listed in Figure 9 below. These companies own regulated water and wastewater utility

[58] *Ibid*., ¶32.

[59] Commonly, I also eliminate companies with merger and acquisition activity as well as smaller entities with limited trading activity. In this case I consider the impact of eliminating two companies that have recently engaged in merger talks.

subsidiaries in many states. Therefore, the sample is broadly representative of the regulated water and wastewater industry from a business risk perspective.

Figure 11 reports the sample companies' annual revenues for the most recent four quarters as of Q3, 2018 and also reports the market capitalization, credit rating, beta and growth rate. I note that compared to the sample companies included in Order 10, American Water Works has been added because it now has data available for analysis. At the time the data that led to Order 10 was obtained, American Water had just started trading and therefore had very limited market data available for analysis.[60] Compared to my prior testimony, I consider both a core sample and an expanded sample. The core sample eliminates CT Water and SJW, which have announced intents to merge. The expanded sample includes these two companies for consistency with prior testimony and to have access to a larger sample.[61]

The sample consists of companies that Value Line classifies as water utilities except (i) Consolidated Water, which is a developer and operator of desalination plants rather than a utility, (ii) Global Water Resources, which does not have sufficient data available for analysis, and (iii) Artesian Water, which was excluded due to its concentrated ownership.

[60] I note that Pennichuck was acquired by the City of Nashua in 2011 and therefore is no longer part of Value Line's group of Water Utilities.

[61] I note that Aqua America has announced plans to acquire Peoples Gas. However, as my data predates the announcement, I include Aqua America.

Figure 11: Characteristics of Water Utility Sample

Company	Annual Revenues (USD million)	Regulated Assets	Market Cap. 2018 Q3 (USD million)	Betas	S&P Credit Rating (2016)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	$430	R	$2,204	0.75	A+	10.9%
Amer. Water Works	$3,411	R	$15,928	0.60	A	8.1%
Aqua America	$836	R	$6,623	0.70	A-	8.6%
California Water	$686	R	$2,000	0.75	A+	10.0%
Conn. Water Services	$111	R	$828	0.60	A	15.1%
Middlesex Water	$136	R	$780	0.75	A	5.9%
SJW Corp.	$393	R	$1,222	0.65	A-	10.1%
York Water Co. (The)	$49	R	$389	0.80	A-	9.8%
Average	$756		$3,747	0.70		9.8%

Sources and Notes:
[1]: Bloomberg as of October 31, 2018. Most recent four quarters available at the time of access to Bloomberg.
[2]: See Table No. BV-WATER-2. Key:
R - Regulated (More than 80% of assets regulated).
[3]: See Table No. BV-WATER-3 Panels A through H.
[4]: See Supporting Schedule # 1 to Table No. BV-WATER-10.
[5]: S&P Credit Ratings from Research Insight as of 2018 Q3.
[6]: See Table No. BV-WATER-5.

Q40. How does the water utility sample compare to AWU and ASU?

A. The sample consists of eight (8) companies with operations concentrated in the regulated water and wastewater industry. I also create a subsample (or core sample) of six utilities that have not recently engaged in merger activity, excluding CT Water and SJW, which have announced plans to combine. To ensure that the impact hereof does not impact my estimates I create the subsample and look at both subsample and full sample numbers. Specifically, I look to the full sample as a confirmation that even with a larger sample, my subsample estimates are within a reasonable range.

As for a comparison to AWU and ASU the sample companies are larger than AWU and ASU. AWU and ASU currently have a slightly higher bond rating than the average sample company. However (1) AWU / ASU and the sample companies are all highly rated and (2) bond rating measures bond default risk rather than the cost of equity. Therefore, the impact of a slightly higher bond rating is simply that AWU and ASU have slightly lower bond default risk than the average sample company,[62] which may be reflected in lower interest rates, which benefits customers. It does not, however, affect the cost of equity.

Finally, while the sample companies are investor-owned and publicly traded companies, AWU and ASU are each part of AWWU, a municipally-owned entity that does not have publicly traded stock.[63]

Q41. Does the availability of the PRISM affect AWU's or ASU's risk relative to the sample companies?

A. No. As shown in Figure 12 below, it is clear that American Water Works, Aqua America, Middlesex Water, and York Water have PRISM-like mechanisms in the majority of their jurisdictions as does CT Water. The only companies that do not have a PRISM-like mechanism are American States, California Water, and SJW Corp. Thus, the majority of the sample companies have a PRISM-like mechanism. In addition, while California does not have a PRISM-like mechanism, it does have a different type of utility plant recovery

[62] See footnote 28 and Figure 11.

[63] As a result of being a municipally-owned entity, AWU and ASU follows GAAP and GASB while the sample companies follow GAAP; additionally AWU and ASU has access to low interest loans from the State of Alaska, which are reflected in rates through lower cost of debt.

mechanism and several other rider mechanisms.[64] Therefore, mechanisms similar to the PRISM are available to the majority of the sample companies and not a distinguishing factor.

Figure 12: Prevalence of Infrastructure Recovery Mechanisms Among Sample Companies[65]

Sample Company	% of Revenue/Rate Base With Infrastructure Recovery Mechanism
American States Water	0%
American Water Works	>= 80%
Aqua America	90%
California Water	0%
Connecticut Water Service	100%
Middlesex Water	100%
SJW Group	0%
The York Water Company	100%

Source: The Brattle Group, Alternative Regulation and Ratemaking Approaches for Water Companies, pg 50.
American Water Description and Investment Thesis, August 2018, pg 9.
Notes: American Water number is calculated as % of 2017 regulated revenues.

Q42. Are there any differences in the regulatory environment in which the comparable companies and AWU /ASU operate?

A. While all jurisdictions to a degree are unique, I note that while Anchorage is more urbanized and faces less extreme weather than much of Alaska, the state of Alaska is unique in that it is much more thinly populated, faces difficulties engaging in construction for a substantial part of the year and thus makes some main and pipe

[64] American Water, "Investor Presentation," August 2018, p. 12.

[65] For details, see Exhibit BV-5.

replacements challenging. Alaska, unlike many states in the West, does not face water supply difficulties.

As for the specific risks that face AWU and ASU, I noted above the very high level of CIAC and a much higher than average debt level.

I also note that at least one of ASU's wastewater treatment facilities currently operates under an administrative extension of a permit that has expired. ASU's largest wastewater treatment plant, Asplund, is permitted under a provision of the Clean Water Act, Section 301(h). Operation of the plant as a primary treatment facility is dependent on continuation of the ability to operate under the Section 301(h) permit modification. If the modification is not renewed, secondary or possibly tertiary treatment of the wastewater may be required and will require significant upgrades to the Asplund treatment facility. This is further discussed in the pre-filed direct testimony of Mr. David Persinger.

Lastly, I note that the area around Anchorage recently experienced a 7.0 earth quake, which may impact certain infrastructure in the area and hence the day-to-day operations of ASU and AWU and / or their need for replacement capital. Because AWU and ASU have a concentrated service territory the impact is larger than for a company with a geographically disperse service territory.

C. THE CAPM BASED COST OF EQUITY ESTIMATES

Q43. Please briefly explain the CAPM.

A. In the CAPM, the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security

Market Line (see Figure 1 in Section II), in which the required expected return on an asset is proportional to that asset's relative risk as measured by that asset's so-called "beta".

More precisely, the CAPM states that the cost of capital for an investment, S (e.g., a particular common stock), is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \qquad (1)$$

where $\boldsymbol{r_S}$ is the cost of capital for investment S;

$\boldsymbol{r_f}$ is the risk-free interest rate;

$\boldsymbol{\beta_S}$ is the beta risk measure for the investment S; and

$\boldsymbol{MRP}$ is the market equity risk premium.

The CAPM is a "risk-positioning model" that relies on the empirical fact that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment whose returns do not vary relative to market returns should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 1). 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 Market Risk Premium: the risk premium on a value-weighted portfolio of all investments, which by definition has average risk.

1. Inputs to the CAPM

Q44. What inputs does your implementation of the CAPM require?

A. As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the market equity risk premium

(MRP), as well as a measurement of the stock's beta. There are many methodological choices and sources of data that inform the selection of these inputs. I discuss these issues, along with the finance theory underlying the CAPM, in Exhibit BV-02 to this written testimony. I performed multiple CAPM calculations corresponding to distinct "scenarios" reflecting different values of the inputs. This allowed me to derive a range of reasonable estimates for the cost of equity capital implied by each of my samples.

Q45. What values did you use for the risk-free rate of interest?

A. I used the yield on a 20-year Government Bond as the risk-free asset for purposes of my analysis. Recognizing the fact that the cost of capital set in this proceeding will be in effect through at least 2019 and perhaps longer, I rely on a forecast of what Government bond yields will be one year out. Specifically, Blue Chip predicts that the yield on a 10-year Government Bond will be 3.3% by 2019.[66] I adjust this value upward by 50 basis points to reflect the historical maturity premium for the 20-year over the 10-year Government Bond.[67] This gives me a risk-free rate of 3.8%.

Q46. What values did you use for the market equity risk premium (MRP)?

A. Like the cost of capital itself, the market equity risk premium is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can *expect* to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable, and must be inferred or forecasted based

[66] Blue Chip Economic Indicators, Consensus Forecasts, October 2018. The October 2018 forecast the 10-year government bond yield at 3.4% for 2019.

[67] This maturity premium is estimated by comparing the average excess yield on 20-year versus 10-year Government Bonds over the period 1990 - 2017, using data from Bloomberg.

on known market information. One commonly used method for estimating the MRP is to measure the historical average premium of market returns over the income returns on government bonds over some long historical period. *Duff and Phelps* performs such a calculation of the MRP. The average market risk premium from 1926 to the present (March 2018) is 7.07%.[68] I used 7.07% as the value of the MRP in my CAPM scenarios.

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 explained in Section III, there is evidence that investors' level of risk aversion remains elevated relative to the time before the global financial crisis and ensuing recession that commenced in 2008. In the past I have also examined the impact of using a forecasted MRP based on Bloomberg data. However, the Bloomberg forecast is currently consistent with the long-term arithmetic average, so I present only one MRP in this case.[69]

Q47. What is the basis for stating that the current MRP is higher than before the financial crisis?

A. Academic articles that were written in the late 1990s or early 2000s often found that the U.S. MRP at the time was lower than its historical average based on various forward-looking models, such as market-wide versions of the DCF model. A recent article by Duarte and Rosa of the Federal Reserve of New York summarizes many of these models and also estimates the MRP from the models each year from 1960 through the present.[70]

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[68] See *Duff and Phelps 2018 Valuation Handbook*, p. 3-33.

[69] Bloomberg currently forecast the U.S. MRP at 7.15% over a 10-year Government bond, which is broadly consistent with the MRP I rely on.

[70] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Consensus of Models," *Federal Reserve Bank of New York*, December 2015 (Duarte & Rosa 2015).

The authors find that the models are converging to provide more consensus around the estimate and that the average annual estimate of the MRP is consistent with the academic literature and with forward-looking estimates such as Bloomberg's. Their analysis shows that the U.S. MRP was lower than its long-term historical average in the early 2000s, but is currently at an all-time high. Chart 3 from Duarte & Rosa 2015 was re-produced in Figure 9, which shows the average estimated MRP (over 30-day T-bills) for 20 models.

To my knowledge these studies have not been updated but are consistent with investors' required risk premium being higher than before the financial crisis. As the Bloomberg forecasted MRP is consistent with the long-term arithmetic average MRP per the Ibbotson methodology, I rely on the historical MRP of 7.07%.[71]

Q48. What betas did you use for the companies in your sample?

A. I used Value Line betas, which are estimated using five years of weekly data, which is consistent with approach taken in Order 10.[72]

2. The Empirical CAPM

Q49. Did you use any other CAPM-based model?

A. Yes. Empirical research has 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

[71] Following the evidence in standard finance textbooks, I rely on the arithmetic average for the historic market risk premium. See, for example, Brealey, Myers and Allen, "Principles of Corporate Finance," 11th Edition, 2014 pp. 162-163 and Ross, Westerfield and Jaffe, "Corporate Finance," 10th Edition, 2013 pp. 322-323. Reliance on an arithmetic historic average is also consistent with Order 10.

[72] Order 10 at 40.

premiums than predicted.[73] 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.

The second variation on the CAPM that I employed makes use of these empirical findings. It estimated the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see equation (2) above).

I call 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, 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.

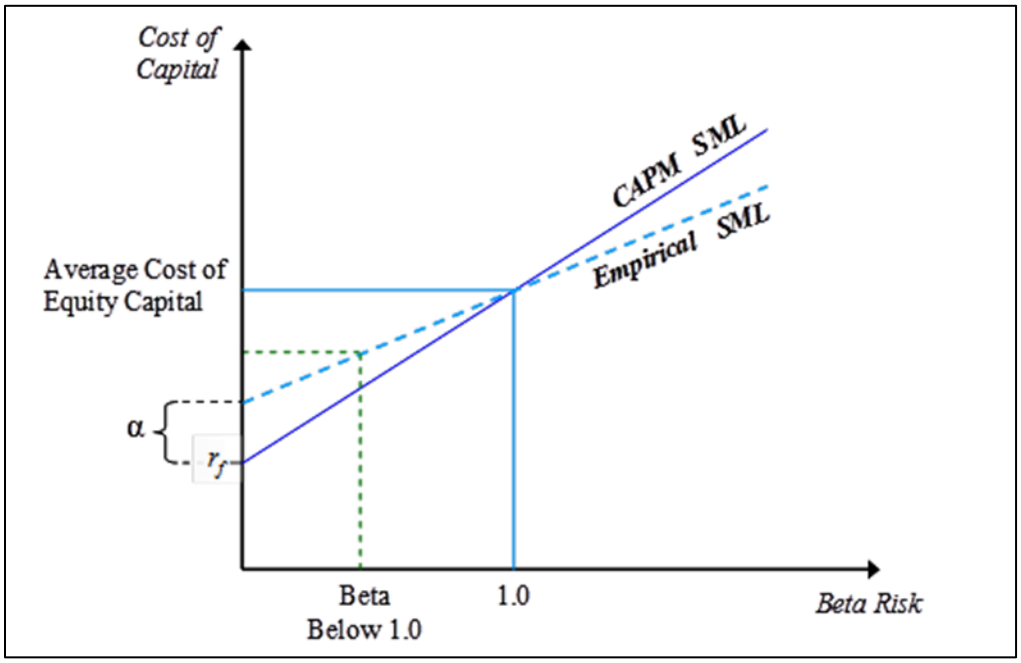
Q50. Why do you use the ECAPM?

A. Research shows that the analysis performs better empirically, when paired with the ECAPM, which recognizes the consistent empirical observation that the CAPM underestimates the cost of capital for low 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

[73] See Exhibit BV-02 for references to relevant academic articles.

adjusts for this fact, which has been established by repeated empirical tests of the CAPM. Exhibit BV-02 discusses the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, (α).

Figure 13: The Empirical Security Market Line



3. Results from the CAPM Based Models

Q51. Please summarize the parameters you considered in your CAPM and ECAPM analyses.

A. I use the forecasted risk-free rate of 3.8% for 2019 and the historical arithmetic average MRP of 7.07%.[74]

[74] In past testimony, I have relied on scenarios that took the elevation in the spread between A-rated utility bond and 20-year treasury bond into account. As the yield spread is lower and the current Bloomberg forecasted MRP is consistent with the historical average, I use only one set of parameters.

Q52. Please explain the difference between the data relied upon to estimate the cost of equity and the regulatory rate base to which the cost of equity is applied.

A. Both the CAPM and the DCF models rely on market data to estimate the cost of equity for the sample companies, so the results reflect the value of the capital that investors hold during the estimation period (market values). The allowed return on equity is applied to the fair value rate base, which could be financed differently than the sample companies.

Q53. Why is this difference important to the estimation of the cost of equity?

A. Taking differences in financial leverage into consideration does not change the value of the rate base, but it does consider the fact that the more debt a company has, the higher the financial risk associated with an equity investment is.[75] To see this I constructed a simple example below, where only the financial leverage of a company varies. I assumed the return on equity is 11% at a 50% equity capital structure and determined the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 36%.

[75] See Exhibit BV-02 for a description of common practice and underlying finance principles related to the impact of financial risk on the cost of equity.

Figure 14
Illustration of Impact of Financial Risk on Allowed ROE

	Company A (50% Equity)	Company B (36% Equity)
Rate Base	$1,000	$1,000
Equity	$500	$360
Debt	$500	$640
Cost of Debt (5%)	$25	$32
Return on Equity	$55	$48
Total Cost of Capital (7.5%)	**$80**	**$80**
ROE / Implied ROE	11%	13.3%

The table above illustrates how financial risk affects returns and also the allowed ROE: the overall return does not change, but the allowed ROE required to produce the same return goes up in recognition of the increased risk to equity investors caused by the higher degree of financial leverage.

The principle illustrated in

Figure 14 is an example of the adjustments I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to a water or wastewater utility with 50 percent equity. I considered financial risk using several commonly used methods including the method commonly referred to as the Hamada method in textbooks[76] to avoid undue influence from any one set of assumptions.[77] The Hamada method looks to the equity beta that is estimated from market data and derives an equivalent asset beta that assumes the assets are financed 100% by equity. The method then re-levers the beta to be consistent with the capital structure relied upon by the target company. There are multiple versions of the Hamada method that are differentiated by the assumptions they make about the systematic risk of debt (e.g., debt betas) and the impact of taxes. To avoid unduly biasing the estimation by the specific assumptions, I estimate the cost of equity using three different methods: (1) as in

[76] See, for example, Berk & DeMarzo 2014, Chapter 14. A detailed explanation is also included in Exhibit BV-02.

[77] These methods include calculating the ROE implied by the overall cost of capital as illustrated in Figure 12, as well as two versions of the so-called Hamada method for levering and unlevering betas in the CAPM and ECAPM. See Exhibit BV-02 for further discussion and detail.

Figure 14 above, I assume the overall cost of capital remains constant regardless of capital structure, (2) I use the Hamada method assuming taxes are irrelevant, and (3) I use the Hamada method assuming taxes are relevant. As there is no consensus in the academic literature about which method is the most accurate in general, I present all three methodologies.

Q54. Can you summarize the results from applying the CAPM-based methodologies?

A. Yes. The results using a hypothetical capital structure of 50% equity presented in Figure 15 below.[78]

Figure 15: Water Utility Sample CAPM-Based Results

Estimated Return on Equity	Full Sample [1]	Core Sample [2]
Financial Risk Adjusted Method		
CAPM	11.0%	11.4%
ECAPM (α = 1.5%)	11.6%	12.0%
Hamada Adjustment Without Taxes		
CAPM	10.6%	11.0%
ECAPM (α = 1.5%)	10.7%	11.0%
Hamada Adjustment With Taxes		
CAPM	10.2%	10.5%
ECAPM (α = 1.5%)	10.3%	10.6%

Sources and Notes:
Long-Term Risk Free Rate of 3.80%.
Long-Term Market Risk Premium of 7.07%.

[78] Tables and supporting schedules detailing my cost of capital calculations for Water Utility sample are contained in Exhibit BV-03.

From Figure 15 the water and wastewater utility sample's CAPM-based results range from 10.2% to 12% with the core sample showing higher results than the full sample, which include companies that have announced merger intentions. As AWU and ASU do not pay federal income taxes like the comparable companies, but the utilities pay a Municipal Utility Service Assessment ("MUSA"), which is a payment in lieu of taxes. To ensure my range encompasses all possible aspects, I present the estimates with and without taxes, where "with taxes" scenario is a lower bound in that I assume statutory taxes. Consequently, the estimated cost of equity for a water / wastewater utility with 50% equity is presented using all three methods is fairly wide and range from 10.2% to 12%. However, if I focus on the CAPM that in the past has been preferred by the Commission and on the Hamada-based financial risk considerations, I find that the CAPM supports an ROE of 10¼% to 11% at 50% equity with the core sample supporting a slightly higher range.[79]

Using ASU's 2017 year-end capital structure including 36% equity, the CAPM supports and ROE of 12 to 13 percent and using AWU's 2017 year-end capital structure including 39% equity, the CAPM supports and ROE of 11¾ to 12¾ percent.

D. THE DCF BASED ESTIMATES

1. Single- and Multi-Stage DCF Models

Q55. Can you describe the DCF approach to estimating the cost of equity?

A. The DCF model attempts to estimate the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. The DCF method

[79] The Commission has in the past relied on the CAPM and the historical arithmetic MRP; Order 10, p. 41.

simply 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—literally a stream of expected "cash flows" discounted at a risk-appropriate discount rate. When the cash flows are dividends, that discount rate is the cost of equity capital:

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

Where $\boldsymbol{P_0}$ is the current market price of the stock;

$\boldsymbol{D_t}$ is the dividend cash flow expected at the end of period $\boldsymbol{t}$;

$\boldsymbol{T}$ is the last period in which a dividend cash flow is to be received; and

$\boldsymbol{r}$ is the cost of equity capital.

Importantly, this formula implies that if the current market price and the pattern of expected dividends are known, it is possible to "solve for" the discount rate, r that makes the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

Many DCF applications assume the growth rate lasts forever, so the formula can be rearranged to estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$\boldsymbol{r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g} \quad (4)$$

where $\boldsymbol{D_0}$ is the current dividend, which investors expect to increase at rate $\boldsymbol{g}$ by the end of the next period, and over all subsequent periods into perpetuity.

Equation (4) says that if equation (3) 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 single-stage DCF model; it is also known as the Gordon Growth model. I note that this is the DCF model relied upon by the Commission in Order 10.[80]

Q56. Are there different versions of the DCF model?

A. Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[81] One such alternative expands the Gordon Growth model to three stages. In the multistage model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period. [82]

A common implementation of the multi-stage DCF is to assume that companies grow their dividend for 5 years at the forecasted company-specific rate of earnings growth, the growth then tapering over the next 5 years toward the growth rate of the overall economy (i.e., the long-term GDP growth rate forecasted to be in effect 10 years or more into the future). Variations of this model have historically been used by me and others in a large number of jurisdictions and although I have utilized them, I consider many of the model's features problematic in the current environment. The model may combine two

[80] Order 10, pp. 34-38.

[81] The Surface Transportation Board uses a cash flow based model with three stages. See, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009.

[82] See Exhibit BV-02 for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

conservative elements: (1) The current dividend yield may be lower than expected going forward and (2) the current GDP forecast is much lower than both its historical average and that recently experienced. Thus, the combination of these two elements may lead to unusually low DCF estimates of the cost of equity. As a result, I believe the result merits less weight than the Gordon growth model discussed above.[83] However, the model has the advantage of allowing for different growth rates at different future points.

Q57. What are the relative strengths and weaknesses of the DCF versus CAPM based methodologies for estimating the cost of equity capital?

A. Current market conditions affect all cost of capital estimation models to some degree, but the DCF model has at least one advantage over the CAPM-based models as it includes contemporaneous stock prices and forward-looking growth, whereas the CAPM relies on historical data to estimate systematic risk and (in some cases) the market risk premium.

2. DCF Inputs and Results

Q58. What growth rate information did you use?

A. I looked to a sample of investment analysts' forecasted earnings growth rates for companies in my samples. I used investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters *IBES*, which is consistent with Order 10's reliance on analysts' forecasts from several public sources.[84] For the multi-stage version, I also use Blue Chip growth forecasts.

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[83] I include the estimation results to be consistent with my prior filing in e.g., U-18-002 and U-18-003.

[84] Order 10, p. 37 cites growth forecasts from Value Line, First Call, Zacks, and Reuters. I note that First Call / Reuter is now part of Thomson Financial and that Zacks obtain many of its forecasts from IBES.

Additionally, I relied on the dividend yield of the companies, which I estimate using the most recently available dividend information (currently) and the average of the last 15 days of stock prices ending October 31, 2018.[85] As the single largest advantage of the DCF model is that it uses current market information, I find it is important to use a relatively short time period to determine the dividend yield – yet to avoid the bias caused by any one day. I believe a 15-day average accomplishes that goal. Because the stock price of utilities currently is higher than they historically have been and because some companies engage in share buybacks, the dividend yield underestimates the yield on cash distributions to investors.

Q59. Please address the input data in the DCF model.

A. The Gordon Growth/single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over a sufficiently long horizon, but estimates are typically only available for 3-5 years.

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies in my samples use share repurchases, the DCF model using dividend yields will underestimate the cost of equity for these companies. While there are companies in my sample that have engaged in share buybacks in the past, the magnitude is currently not large.

[85] The Commission in Order 10 (p. 35) used a six month average – because it was the most current.

A second issue is that the flight to quality has resulted in higher than usual stock prices for water utilities and hence lower than usual dividend yields. As a result, the dividend yield may be downward biased. The multi-stage DCF model additionally requires a measure of the long-term GDP growth.

Q60. What are the DCF based cost of equity estimates for the samples?

A. The results are presented in Figure 16 below.[86] I note that the growth rates in the model (shown in Figure 11) range from 5.9% to 10.9% for the subsample (with a higher upper bound for the full sample). The average is about 8.9%.

Figure 16: DCF Results for Water Utility Sample

	Cost of Equity Estimates
Full Sample	
Single-Stage DCF	16.1%
Multi-Stage DCF	8.7%
Subsample	
Single-Stage DCF	14.9%
Multi-Stage DCF	8.8%

In Order 10, the Commission emphasized the simple Gordon Growth model and I believe that it is a more reasonable estimate at the current time than the multi-stage DCF, which is impacted by both the very low dividend yield and a forecasted GDP growth rate that is

[86] Tables and supporting schedules detailing my cost of capital calculations are included in Exhibit BV-03.

lower than what has recently been experienced. As a result, I believe the multi-stage DCF is downward biased.

Q61. How do you interpret the results of your DCF analyses?

A. The DCF model estimates range from 8.8% to 14.9% using the core sample, but I believe it is reasonable to limit the range to 9½% to 13%, which is the result of eliminating the highest and lowest estimates. The midpoint of this range is 11¼%, which is consistent with the upper end of my CAPM results. It is also consistent with the average obtained from the DCF model prior to any financial risk consideration, where the average is 11.1% (using the subsample).[87]

E. RISK PREMIUM MODEL ESTIMATES

Q62. Did you estimate the cost of equity that results from an analysis of risk premiums implied by allowed ROEs in past utility rate cases?

A. Yes. In this type of analysis, sometimes called the "risk premium model", the cost of equity capital for utilities is estimated based on the historical relationship between allowed ROEs in utility rate cases and the risk-free rate of interest at the time the ROEs were granted. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecasted) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium$$

Q63. What are the merits of this approach?

[87] See Exhibit BV-03.

A. First, it estimates the cost of equity from regulated entities as opposed to holding companies, so that the relied upon figure is directly applicable to a rate base. Second, the allowed returns are clearly observable to market participants, who will use this one data input to making investment decisions, so that the information is at the very least a good check on whether the return is comparable to that of other investments. Third, I analyze spread between the allowed ROE at a given time and the then prevailing interest rate to ensure that I properly consider the interest rate regime at the time the ROE was awarded. This implementation ensures that I can compare allowed ROE granted at different times and under different interest rate regimes.

Q64. How did you use rate case data to estimate the risk premiums for your analysis?

A. The data comes from RRA's Water Advisory and cover the period 2007-2018, Q2.[88] Using this data I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in water utility rate cases to the average 20-year Treasury bond yield that prevailed in each quarter.[89] I calculated the allowed utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares (OLS) regression to estimate the parameters of the linear equation:

$$Risk\ Premium = A_0 + A_1 \times (Treausury\ Bond\ Yield) \qquad (5)$$

[88] The data source varies from what I have used in the past as RRA Water Advisory now has published a consistent series of data.

[89] I rely on the 20-year government bond to be consistent with the analysis using the CAPM and to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and find that the regression has a high degree of explanatory power in a statistical sense (R^2=0.95) and the parameter estimates, A_0=0.0915 and A_1= -0.776, are statistically significant.[90] The negative slope coefficient reflects the empirical fact that regulators grant smaller risk premiums when risk-free interest rates (as measured by Treasury bond yields) are higher. This is consistent with past observations that the premium investors require to hold equity over government bonds increases as government bond yields decline. In the regression described above, the allowed ROE on average declined by less than 100 basis point when the government bond yield declined by 100 basis points. Based on this analysis, I find that the current market conditions are consistent with an ROE of 10.0 – 10.2%.

It is important to recognize that the allowed ROE is granted on the equity portion of water utilities' rate base. The rate base is commonly measured using book value and the average allowed equity percentage is about 50%, so there is no need to consider financial leverage if an equity percentage of 50% is used.

Q65. What conclusions did you draw from your risk premium analysis?

A. While the Commission did not rely on the risk premium models in Order 10 and the risk premium models based on historical allowed returns are not underpinned by fundamental finance principles in the manner of the CAPM or DCF models, I believe they can provide useful benchmarks for evaluating whether the estimated ROE is consistent with recent

[90] My implementation of the risk premium model is similar to that recently relied upon by the FERC, where the FERC expanded its approach to cost of equity estimation to include four methods. See Footnote 57.

practice. My risk premium model cost of equity estimates demonstrate that the results of my DCF and CAPM analyses are in line with the actions of utility regulators. Because the risk premium analysis as implemented takes into account the interest rate prevailing during the quarter the decision was issued, it provides a useful benchmark for the cost of equity in any interest environment.

V. RISK CHARACTERISTICS AND THE COST OF EQUITY

Q66. Please summarize your ROE evidence assuming a hypothetical capital structure with 50% equity.

A. Assuming a hypothetical capital structure that includes 50% equity for ASU and using AWU's actual capital structure, I find the range of ROE results displayed in Figure 17 below.

Figure 17: Range of ROE Estimates at 50% Equity

	Reasonable Range	Midpoint Estimate
CAPM-Based*	10.25% - 11.0%	10.6%
DCF**	9.5% - 13.0%	11.3%
Risk Premium	10.0% - 10.2%	10.1%
Average		10.7%

I note that if I assign 40% weight to the CAPM and 60% weight to the DCF as did Order 10, then the ROE is approximately 11% and higher if only the single-stage DCF results

are relied upon.[91] This figure is higher than what is supported by the risk premium analysis.

I agree that the multi-stage DCF deserves less weight than does the Gordon growth model. Further, as ASU and AWU both face unique risks in the form of (i) their smaller size, (ii) a very high level of CIAC relative to other balance sheet items, and (iii) challenges earning their allowed ROEs, I believe that ASU placing ASU at the midpoint is conservative.

Q67. Please summarize your findings regarding ASU's and AWU's capital structure and costs of equity.

A. Based on the analysis discussed above and supported by my workpapers, I find that a hypothetical capital structure including 50% equity, which is similar to that of other water and wastewater utilities on a book value basis along with a ROE 10.75 is reasonable for ASU. As shown in Figure 14 above, if ASU was to use its actual 2017 year-end capital structure, the ROE needs to be substantially higher for ASU. To obtain the equivalent dollar amount it needs to be increased by more than 200 basis points.

For AWU, I recommend using its actual capital structure as of year-end 2017 along with a return on equity of 10.75%. I note that this recommendation is conservative as it is derived assuming an equity percentage of 50%, while AWU has only about 39% equity at year-end.

I also note my recommendations are consistent with my empirical analysis using the DCF model and CAPM and also with the risk premium model. I also note that the primary

[91] Note that if I (contrary to best practices) ignore the financial risk and rely on the subsample, then the 60-40 weighting result in an ROE of 60% ×14.5% + 40%×9.23 = 12.3%.

methods relied upon such as the CAPM and DCF are similar to those used in Order 10 and result in a lower recommended ROE than would have been the case under the methodology used in Order 10.

Q68. Does this conclude your pre-filed direct testimony?

A. Yes.