BEFORE THE ARIZONA CORPORATION COMMISSION

<u>COMMISSIONERS</u>

MIKE GLEASON, Chairman
JEFF HATCH-MILLER
WILLIAM A. MUNDELL
KRISTIN K. MAYES
GARY PIERCE

IN THE MATTER OF THE APPLICATION OF ARIZONA-AMERICAN WATER COMPANY, AN ARIZONA CORPORATION, FOR A DETERMINATION OF THE CURRENT FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASES IN ITS RATES AND CHARGES BASED THEREON FOR UTILITY SERVICE BY ITS SUN CITY WASTEWATER AND SUN CITY WEST WASTEWATER DISTRICTS	DOCKET NO. WS-01303A-06-0491

REBUTTAL TESTIMONY
OF
BENTE VILLADSEN
ON BEHALF OF
ARIZONA AMERICAN WATER COMPANY
JULY 9, 2007

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TABLE OF CONTENTS

8
9

EXECUTIVE SUMMARY

The rebuttal testimony of Company witness Bente Villadsen addresses the following issues:

- First, I discuss the developments in risks factors and financial parameters that affect the cost of capital for the water industry. Specifically, the industry's risk is increasing as large infrastructure investments are needed, some parts of the country faces drought issues, and environmental requirements are changing

- Second, the financial leverage of Sun City Wastewater and Sun City West Wastewater ("Sun Cities") districts is higher than that of most water utilities. For this reason it is important to take financial leverage into account when determining the cost of equity for Sun Cities.

- Third, I discuss the Direct Testimonies of Mr. Pedro M. Chaves and Mr. William A. Rigsby and why the testimonies underestimate the cost of equity for Sun Cities. Specifically, long-term interest rates are higher now than at the time the witnesses determined their recommendation and back at the level they were when I filed my Direct Testimony. Further, the witnesses rely on growth rates that are quite old which is an issue in a changing industry. I also disagree with Mr. Rigsby's reliance on the historical geometric market risk premium

- Fourth, I conclude the midpoint estimate of the cost of equity for Sun Cities remains at 11¾ percent.

1   **I.   INTRODUCTION**

2   **Q.   PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND TELEPHONE**

3   **NUMBER.**

4   A.   My name is Bente Villadsen. My business address is *The Brattle Group*, 44 Brattle

5   Street, Cambridge, MA 02138 and my business phone is 617-234-5608.

6   **Q.   ARE YOU THE SAME BENTE VILLADSEN WHO PREVIOUSLY SUBMITTED**

7   **TESTIMONY IN THIS CASE?**

8   A.   Yes, I filed Direct Testimony ("Villadsen Direct") on behalf of Arizona-American Water

9   Company ("Arizona-American" or the "Company") in July 2006 regarding the cost of

10   equity its Sun City Wastewater and Sun City West Wastewater Districts (jointly "Sun

11   Cities") should be allowed an opportunity to earn on the rate base. I am attaching an

12   updated version of my resume to this rebuttal testimony.

13   **Q.   WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?**

14   **A.**   I have been asked by Arizona-American to review and comment on the Direct Testimony

15   of Mr. Pedro M. Chaves ("Chaves Direct") for the Arizona Corporation Commission

16   Staff ("Staff") and on the Direct Testimony of Mr. William A. Rigsby ("Rigsby Direct")

17   for the Residential Utility Consumer Office ("RUCO").

18   **Q.   DO YOU HAVE ANY PRELIMINARY COMMENTS BEFORE YOU BEGIN**

19   **YOUR REBUTTAL?**

20   A.   Yes. While cost-of-capital experts may rely on different models or implement the relied-

21   upon models differently, the methods used in the Chaves Direct and in the Rigsby Direct

22   are similar to those relied upon in the Villadsen Direct. Both testimonies recognize the

23   importance of financial risk as well as business risk and adjust the cost-of-equity

24   estimates obtained for proxy groups in recognition of Sun Cities' more leveraged capital

25   structure. The largest source of difference between the Villadsen Direct and the Chaves

26   Direct is that the Villadsen Direct relies on market-value capital structures, while the

27   Chaves Direct relies on book-value capital structures when comparing the sample

1   companies' capital structure to that of Sun Cities. In addition, the Chaves Direct includes

2   two DCF cost-of-equity estimates in its sample that are below the current cost of debt. I

3   do not believe that investors will provide equity capital at a return below the current yield

4   on utility bonds and, therefore, the two low estimates should be excluded from

5   consideration. The impact of deleting these two data points from the Chaves sample is

6   about 40 basis points on his overall recommendation. Further, long-term, risk-free rates

7   have increased since mid-May when the Chaves Direct obtained its data. Everything else

8   equal, the increase of 30-40 basis points in the risk-free rates would lead to a similar

9   increase in the CAPM estimate of the cost of equity and therefore to an increase of 15-20

10   basis points in the overall estimate.

11   There are two key differences between the Rigsby Direct and the Villadsen Direct. First,

12   the Villadsen Direct explicitly calculates the impact of the difference between the proxy

13   groups' market value capital structure and the regulatory capital structure of Sun Cities,

14   while the Rigsby Direct simply adds 50 basis points to the cost of equity obtained by his

15   testimony's preferred method. Second, I disagree with two of the Rigsby Direct's

16   implementation choices. The Rigsby Direct relies on a non-standard adjustment to the

17   sustainable-growth model and uses a geometric average market-risk premium in its

18   CAPM analysis. Neither of these choices is consistent with financial theory. Finally, the

19   Villadsen Direct estimated Sun Cities' cost of equity using data that were available as of

20   May 2006 whereas the Chaves and Rigsby Direct rely on data as of May 2007. I choose

21   not to update my cost-of-capital estimation for two reasons. First, as discussed further

22   below, the underlying data are such that the cost-of-equity estimates would be the same if

23   not higher today than they were when the estimation was undertaken, because interest

24   rates are almost unchanged, betas have increased, and capital structures have changed

25   very little. Growth rates for the water industry have moderated making the DCF results

26   more comparable to those of the CAPM.[1] Second, the gas distribution industry has

27   undergone some changes during the past year, so that today I would select a somewhat

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[1]   The Villadsen Direct gave little weight to the water industry's DCF estimates (Villadsen Direct p. 44), in
part, because the growth rates varied significantly from company to company and across years.

1 different gas LDC sample; in other words, the figures would not (just) be an update.

2 While the Chaves Direct relied solely on a water utility sample, the Rigsby Direct selects

3 a sample of 10 gas LDC companies. I disagree with the inclusion of one company,

4 NICOR, in the Rigsby Direct's sample. However, dropping it from the sample would not

5 change the overall estimate of cost of equity.

6 **Q.** **WHAT TOPICS DO YOU COVER IN THIS REBUTTAL TESTIMONY?**

7 A. I discuss the cost-of-capital recommendations and calculations in the Chaves Direct and

8 in the Rigsby Direct. I also discuss the Chaves Direct and the Rigsby Direct's comments

9 on and discussion of my Direct Testimony, dated July 2006. Specifically, I cover the

10 following topics:

11 • First, I summarize the impact on the cost of equity of key decisions made in the

12 Chaves Direct and the Rigsby Direct.

13 • Second, I discuss the development in risk factors and financial parameters that

14 affects the cost of capital for the water industry.

15 • Third, I discuss the impact of financial leverage and the after-tax weighted-

16 average cost of capital ("ATWACC").

17 • Fourth, I discuss the Chaves Direct's and the Rigsby Direct's selection of sample

18 companies and the implementation of their relied upon methods: the discounted

19 cash flow method ("DCF") and the risk positioning methods (including the

20 capital asset pricing model ("CAPM").

21 • Finally, I attach Schedules BV-R1 to BV-R7 which support my rebuttal

22 testimony.

23 **II.** **SUMMARY**

24 **Q.** **PLEASE SUMMARIZE THE RECOMMENDATIONS MADE BY THE COST-**

25 **OF-CAPITAL WITNESSES.**

26 A. Table R-1 below summarizes the cost-of-capital witnesses' recommendations regarding

27 the cost of equity that Sun Cities should be allowed to earn on the equity portion of its

1   rate base. In the table all figures take into consideration that Sun Cities are more

2   leveraged than the companies that were relied upon to estimate the cost of equity.[2]

	Chaves	Rigsby	Villadsen
Table R-1 **Cost-of-Equity Recommendations**			
Recommendation (Point Estimate)	10.3%	9.99%	11¼ -12¾ (11¾)

3
4   Sources: Chaves Direct Executive Summary, Rigsby Direct p. 6, Villadsen Direct Executive Summary.

5   While Table R-1 shows variation in the recommendations, it is noteworthy that the

6   Chaves Direct obtains raw (before leverage consideration) cost-of-equity estimates in the

7   range of 8.3 to 11.0 percent[3] which when adding the Chaves Direct's recommended

8   leverage adjustment of 70 basis points provides a range of 9.0 to 11.7 percent with the

9   upper end similar to the Company's request. Similarly, the Rigsby Direct obtains

10   estimates ranging from 7.91 percent to 11.37 percent[4] which include the Company's

11   requested 11¾ percent when the 50 basis points leverage adjustment in the Rigsby Direct

12   is considered. In other words, the upper end of the Chaves Direct's and the Rigsby

13   Direct's estimates are comparable to the Company's request.

14   The Chaves Direct relies on the difference between the sample companies' book capital

15   structures and the regulatory capital structure recommended in the Chaves Direct[5] to

16   determine the adjustment for financial risk. Had the Chaves Direct instead used the

17   sample companies' market-value capital structures, the cost-of-equity recommendation

18   would increase by 60-70 basis points, for a return on equity of about 11% (everything

19   else equal).[6] Further, the Chaves Direct relied on risk-free rates as of mid-May 2007

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[2]   The Chaves Direct recommends a capital structure with 38.7 percent equity (Schedule PMC-1) while the Rigsby Direct relies on the Company's requested capital structure of 40 percent equity and 60 percent debt (Rigsby Direct, Schedule WAR-1 p. 1).
[3]   Chaves Direct, Schedule PMC-2.
[4]   Rigsby Direct, Schedule WAR-1 p. 3.
[5]   Chaves Direct, Schedule PMC-1.
[6]   The calculation is based on the capital structure used in Arizona-American's filing.

1 before these rates increased again. If the Chaves Direct were to update its interest rates to

2 today's interest rates, its cost-of-equity recommendation would increase by almost 20

3 basis points.

4 The Rigsby Direct relies on a non-standard adjustment to the sustainable growth model.

5 Specifically, the Rigsby Direct adjusts the observed market-to-book ratio downward in

6 his sustainable growth model resulting in a downward adjustment to the cost-of-equity

7 estimates. Had the Rigsby Direct not used this downward adjustment in the DCF

8 method, the resulting DCF cost-of-equity estimates would have been about 100 basis

9 points higher (everything else equal) for an increase in the calculated cost of equity of

10 about 50 basis points. Further, one of the CAPM methodologies relied upon uses a

11 market risk premium that was determined using geometric average. Standard financial

12 texts disagree with using the geometric average MRP for the purpose of determining cost

13 of capital. Eliminating the estimate that relies on a geometric market risk premium from

14 consideration results in a CAPM cost-of-equity estimate above 11 percent for a cost-of-

15 equity estimate of 11.5% once the 50 basis points for financial risk has been added.

16 The discussion above shows that the Company's request for an allowed return on equity

17 of 11¾ percent is consistent with current estimates of the cost of equity. This is

18 particularly true given the water industry's need for infrastructure investments and

19 increasing risks as illustrated by, for example, increasing beta estimates.

20 **III.   FINANCIAL CONDITIONS AND RISKS FACING THE WATER**

21 **UTILITY INDUSTRY**

22 Q. **WHAT TOPICS DO YOU COVER IN THIS SECTION?**

23 A. I discuss the development in risks in the water industry and in key financial figures and

24 their impact on cost of capital. First, I discuss the development in risks, and second, I

25 address the development in parameters that directly the cost-of-capital estimation.

26 Q. **PLEASE ADDRESS THE DEVELOPMENT IN RISKS FACING THE WATER**

27 **INDUSTRY DURING RECENT YEARS AND MONTHS.**

1   A.   During the last few years and even during the past year, the water utility industry's risk

2   has increased. One corroborating indication is that the beta estimates for the industry

3   have increased significantly. This is shown in Figure R-1 below.

Value Line Betas 1995-2006
Water Utility Companies
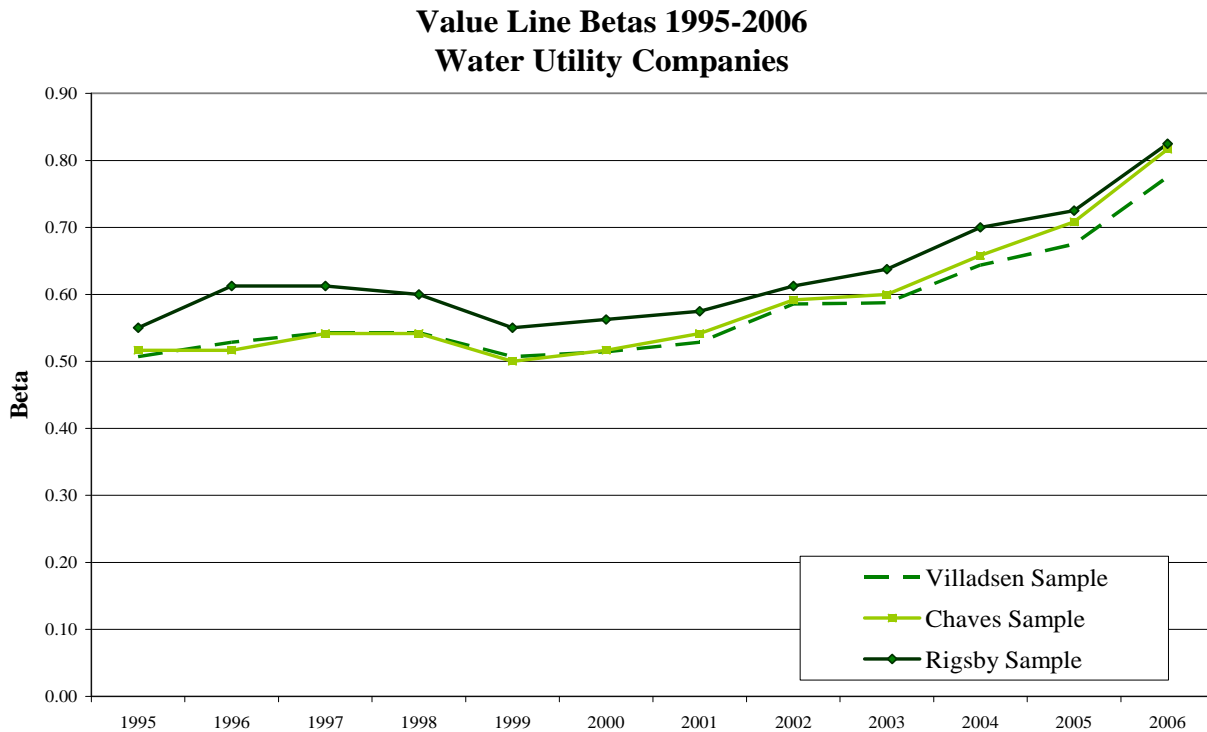
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5   Figure R-1

6   As can be seen from Figure R-1, the betas for the water industry have increased in recent

7   years, and even within the last year. Schedule BV-R1 shows company-specific *Value*

8   *Line*'s estimates for beta during a recent time period and confirms that betas have

9   increased substantially over the last 12-18 months.[7]

10   Additionally, the Environmental Protection Agency ("EPA") has indicated that the water

11   industry needs to invest capital of about $224 billion over the next two decades to meet

1   the nation's need for clean drinking water and for waste water disposal.[8] Indeed, the

2   American Society of Civil Engineers has estimated that drinking water infrastructure

3   needed in Arizona will be $1.6 billion over the next two decades, with an additional $6.2

4   billion for waste water infrastructure.[9] Similarly, *Value Line* notes the need for

5   infrastructure investments and the increasing demands for water safety and water

6   purification.[10] In addition, the need to provide security against acts of terrorism and to

7   replace aging water mains will add to the required investment. This is a substantial

8   investment requirement for a group of companies that *Value Line* estimates to have an

9   annual profit of about $150 million.[11] Additionally, there is a drought in the Western US

10   and in parts of Texas, which impacts a large number of the publicly-traded water

11   utilities.[12] For Arizona-American to remain financially healthy and attract investor

12   capital, it will, like other water utilities, need to be allowed the opportunity to earn a cost

13   of capital that is commensurate with investor expectations. Given the increase in the

14   industry's risk, the necessary return on equity is also increasing.

15   Q.   **EARLIER YOU STATED THAT THE DEVELOPMENTS IN INDIVIDUAL**

16   **PARAMETERS WERE SUCH THAT THE COST-OF-EQUITY ESTIMATES**

17   **WOULD BE UNCHANGED TO SLIGHTLY HIGHER TODAY THAN THEY**

18   **WERE WHEN YOUR DIRECT TESTIMONY WAS WRITTEN.   PLEASE**

19   **EXPLAIN.**

20   A.   As noted above, betas have increased, so everything else being equal, an application of

21   the CAPM would result in a higher raw cost-of-equity estimate. The other parameter that

22   influences the CAPM estimate of the cost of equity, the risk-free rate, is almost the same

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[7]   Table BV-R1 shows that the average beta for water utilities have increased by about .1 in the last year,
      which, everything else equal, would lead to an increase in the raw cost-of-equity estimate of 55 to 75 basis
      points.

[8]   www.epa.gov/waterinfrastructure/infrastructuregap.html

[9]   See, 2005 Report Card for America's Infrastructure, available at www.asce.org.

[10] *Value Line Investment Survey*, Water Utilities, April 27, 2007.

[11] *Value Line Investment Survey,* Water Utilities, April 27, 2007.

[12] American States Water, California Water, SJW Corp, and Southwest Water all have significant operations
      in the Western part of the US and Aqua America has Texas operations. See, for example, Value Line
      Investment Survey, April 27, 2007 and National Oceanic & Atmospheric Administration's, "NOAA
      Reports 2006 Market by Severe Heat Waves, Widespread Drought, Wildfires," NOAA December 14, 2006.

1   today as is was a year ago.   Figure R-2 below shows the movement in selected

2   government bond yields since April, 2006. While there have been fluctuations, the yield

3   on long-term government bonds is back to about 5.2%.[13]

Weekly Treasury Bond Rates, April 2006 to June 2007
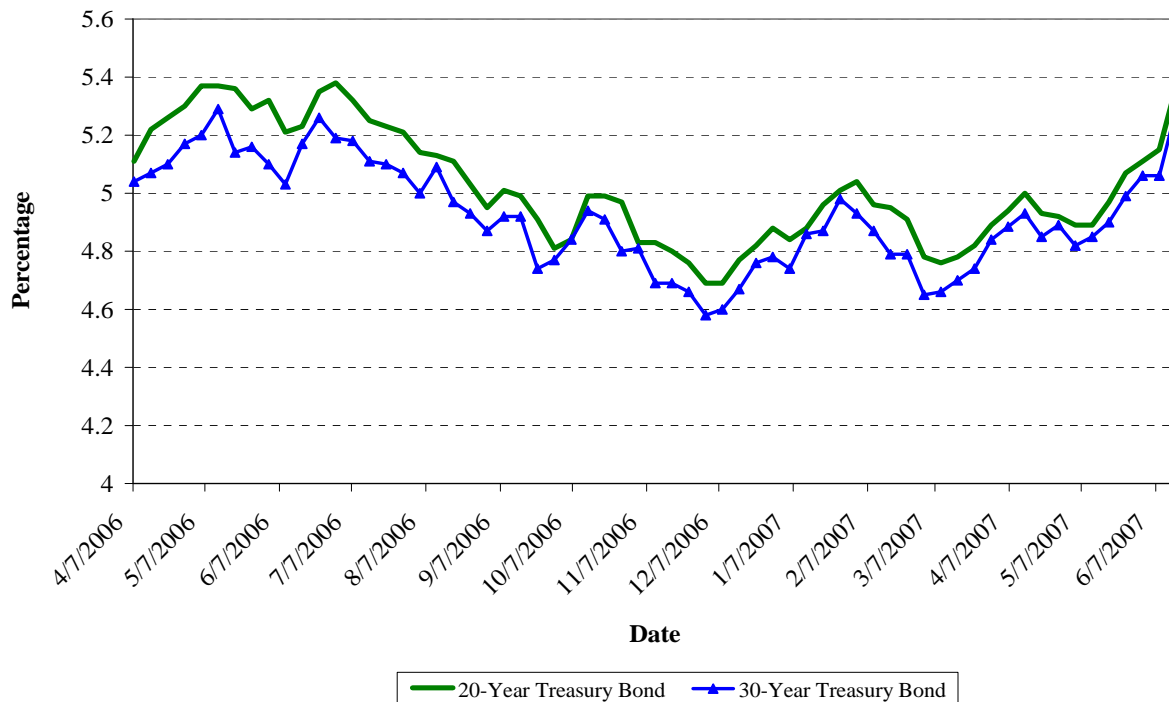
Figure R-2

6   **Q.   HOW DO THESE CHANGES AFFECT THE COST-OF-EQUITY ESTIMATE?**

7   A.   First, because interest rates remain almost the same as a year ago while betas have

8   increased, the raw CAPM cost-of-equity estimate has increased over the past year.

9   Second, during the same time, it appears that the forecasted Value Line growth rates for

10 water utilities have dropped during the past year, so that Value Line now forecasts an

11 average growth in Earnings per Share ("EPS") of 9.1% during the next few years.[14]

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[13]   Schedules BV-R1 and BV-R2 show the change in betas and in the water utilities capital structure, respectively. BV-R3 show current long-term risk-free rates.

[14]   The Chaves Direct, Schedule PMC-4 reports a Value Line growth estimate for EPS of 9.1 while the growth in DPS is 4.6%. The Villadsen Direct relied on an average EPS growth of 8.3% although the Value Line EPS growth was significantly higher (Villadsen Direct, Table No. BV-5).

1　　　　However, the water industry has had highly volatile growth forecasts (and historical

2　　　　growth rates) during the last few years. This is one reason that the Villadsen Direct gave

3　　　　little weight to the water industry's DCF estimates.[15] Third, the water industry's capital

4　　　　structure has remained virtually unchanged during the past year,[16] so that there would be

5　　　　no change in the financial risk impact.

6　**Q.**　**WHAT DOES THE ABOVE DISCUSSION IMPLY ABOUT SUN CITIES' COST**

7　　　　**OF EQUITY?**

8　A.　I believe the original estimate of 11¼ -12¾ (midpoint of 11¾) remains a valid estimate

9　　　　for Sun Cities' cost of equity, although there are indications that the industry is facing

10　　　increasing risks.

11　　　**IV.**　　**FINANCIAL LEVERAGE AND COST OF CAPITAL**

12　**Q.**　**WHAT TOPICS DO YOU COVER IN THIS SECTION?**

13　A.　I address two topics. First, I address the need for an explicit adjustment for financial

14　　　leverage and second, I discuss the testimonies' comments on the shape of the ATWACC

15　　　curve.

16　**Q.**　**DO THE CHAVES DIRECT AND THE RIGSBY DIRECT INCLUDE AN**

17　　　　**EXPLICIT ADJUSTMENT FOR FINANCIAL LEVERAGE?**

18　A.　Yes. Both the Chaves Direct and the Rigsby Direct explicitly adjust for financial

19　　　leverage. The Chaves Direct relies on Robert S. Hamada (1969)[17] for the adjustment,

20　　　and the Rigsby Direct uses a 50-basis-points upward adjustment.

21　**Q.**　**DO YOU AGREE WITH THE ADJUSTMENTS MADE IN THE CHAVES**

22　　　　**DIRECT AND THE RIGSBY DIRECT?**

23　A.　I certainly agree that an adjustment is merited because the Sun Cities are significantly

24　　　more leveraged than the sample companies used in the estimation process. However, I do

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[15]　　Villadsen Direct p. 44, lines 10-11.
[16]　　See Schedule BV-R2 attached to this rebuttal testimony.
[17]　　Robert S. Hamada (1969), Portfolio Analysis, Market Equilibrium and Corporate Finance, *Journal of Finance* 24, 13-31.

1   not agree with the Chaves Direct's or the Rigsby Direct's implementation methods. First,

2   the Chaves Direct relies on an adjustment based upon a finance paper that actually relies

3   on market-value capital structures, but the Chaves Direct instead uses book values. If the

4   Chaves Direct had properly relied on the market-value capital structure, the leverage

5   adjustment would have been above 135 basis points rather than the 70 basis points

6   recommended in the Chaves Direct, or about 11 percent.[18] Second, the Rigsby Direct

7   does not estimate the magnitude of his adjustment, but uses an arbitrary 50 basis points,

8   which is identical to his recent recommendations for other Arizona-American affiliates in

9   Arizona.

10   **Q.   WHY IS IT IMPORTANT TO USE MARKET VALUES WHEN DETERMINING**

11   **THE SAMPLE COMPANIES' COST OF EQUITY?**

12   A.   As discussed in the Villadsen Direct,[19] the risk of the capital structure's equity depends

13   on the market-value, not on the book-value, and cost of equity is determined in the

14   market place. Hence, investors are concerned about market values not book values.

15   Going through an example, the text of Brealey, Myers and Allen (2006) states

16   The market-value balance sheet shows assets worth $1,250 million. Of
17   course we can't observe this value directly, because the assets themselves
18   are not traded. But we know what they are worth to debt and equity
19   investors … This value is entered on the left of the market-value balance
20   sheet.

21   Why did we show the book balance sheet? Only so you could draw a big
22   X through it. Do so now.

23   *When estimating the weighted-average cost of capital, you are not*
24   *interested in past investments but in current values and expectations for*
25   *the future.* [20]

26   In other words, the cost of equity is determined in the market place and is based upon

27   market values. Thus, the cost-of-equity estimates obtained in the market place pertains to

28   companies with a market-value capital structure whereas a regulated utility such as the

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[18]   See Schedule No. BV-R5.
[19]   Villadsen Direct pp. 10-18.

1   Sun Cities are afforded an allowed cost of equity on a much lower equity percentage.

2   Investors require compensation for the difference.

3   It is also noteworthy that in the 1969 paper where Professor Hamada developed the

4   leverage adjustment relied upon in the Chaves Direct, the author explicitly referred to the

5   "the market value of firm A's equity …" in the derivation for the formula.[21]

6   **Q.   DO YOU HAVE ANY COMMENTS ON THE CHAVES DIRECT'S DISCUSSION**

7   **OF REGULATORY PRACTICE IN THE US?**

8   A.   Yes. First, the Chaves Direct states that

9   The Commission has once again rejected Dr. Villadsen's methodology in
10   Decision No. 69440, dated May 1, 2007.[22]

11   I reviewed the decision which is sourced in both the Chaves Direct and the Rigsby Direct.

12   The section "**Conclusion on Cost of Capital**" does not mention ATWACC at all. It

13   adopted Staff's recommended 10.7% cost of equity for Mohave as "appropriate" and

14   "supported by the evidence in the record."[23] Further, it is noteworthy that the decision

15   included an adjustment for financial risk of 100 basis points <u>and</u> adopted the Company's

16   applied-for capital structure for Mohave consisting of 40% equity.

17   Second, the Chaves Direct states that

18   regulatory agencies in the United States utilize book values when
19   estimating the cost of capital of a public utility. The ATWACC
20   methodology uses ROE as a dependent variable that is derived by
21   inappropriately equating the sample companies' market value capital
22   structure ATWACC to the Applicant's book value capital structure
23   ATWACC.[24]

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[20]   Richard A. Brealey, Stewart C. Myers, and Franklin Allen (2006), *Principles of Corporate Finance*, 8th Edition, McGraw-Hill, pp. 504-505 (emphasis added).

[21]   Hamada (1969), *Op. Cit*., p. 22.

[22]   Chaves Direct, p. 41.

[23]   Decision No. 69440, dated May 1, 2007, p. 19. The decision on p. 19 also acknowledges the Staff's methodology as appropriate and consistent with prior decision. The decision summarizes the methodologies of all cost of capital witnesses including the ATWACC methodology on pp. 16-19.

[24]   Chaves Direct p. 41, lines 18-22.

1   While it is true that regulatory agencies in the U.S. generally use book values for rate

2   making purposes, there are jurisdictions that have accepted the difference between the

3   sample companies market-value capital structures and the regulatory capital structure as

4   key to measuring the regulated entity's financial risk. For example, the Pennsylvania

5   Public Utility Commission has adopted a financial risk adjustment similar to the

6   adjustment I have recommended here to set the allowed rate of return on equity for water

7   companies.[25] Similarly, the Missouri Public Service Commission has in the past

8   accepted a method similar to the one presented here.[26] Also, the United States Surface

9   Transportation Board relies on a market value capital structure to estimate the cost of

10   capital for railroads.[27]

11 **Q.**   **EVEN IF "THE ATWACC METHODOLOGY TO ESTIMATE THE COST-OF-**

12   **EQUITY CAPITAL … IS NOT WIDELY ACCEPTED IN THE REGULATORY**

13   **ENVIRONMENT,"[28] WOULD THIS BE SUFFICIENT JUSTIFICATION FOR**

14   **REJECTING THE RELIANCE ON MARKET VALUE CAPITAL STRUCTURES**

15   **TO ESTIMATE THE COMPANY'S COST OF CAPITAL?**

16 A.   No. From an economic perspective, the rate of return needs to be such that it gives

17   investors a fair opportunity to earn the cost of capital that compensates them for the risk

18   they bear.[29] My recognition of the added financial risk is consistent with financial and

19   economic theory.

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[25]   See, Pennsylvania-American Water, Docket R-00016339 (January 10, 2002); The financial leverage adjustment was appealed to the Commonwealth Court of Pennsylvania and upheld in Pennsylvania-American Water in March 2005 (No. 301 C.D. 2004). A similar methodology was accepted in Pennsylvania Public Utility Commission's Decision DEC-2004-OSA-0298, issued December 2, 2004. For details, see Recommended Decision, Pennsylvania Public Utility Commission in Docket No. R-00049266 re. PPL Electric Utilities Corporation, dated October 21, 2004.

[26]   See the decision in Missouri Public Service Commission, Case No. ER-2004-0570, Tariff File No. YE-2004-1324, for Empire District Electric Company, issued March 10, 2005 ("Missouri Decision").

[27]   Surface Transportation Board, Decision, STB Ex Parte No. 558 (Sub-No. 9). Railroad Cost of Capital – 2005. Decided December 19, 2005.

[28]   Chaves Direct p. 41, lines 12-13.

[29]   This is consistent with the U.S. Supreme Court's opinions in *Bluefield Waterworks & Improvement Co. v. Public Service Commission*, 262 U.S. 679 (1923) and *Federal Power Commission v. Hope Natural Gas*, 320 U.S. 591 (1944).

1 **Q. DO YOU HAVE ANY OTHER COMMENTS ON THE DISCUSSION OF THE**
2 **AFTER-TAX WEIGHTED AVERAGE COST OF CAPITAL IN REGULATORY**
3 **PROCEEDINGS?**

4 A. Yes. Mr. Rigsby comments

5 > While I believe that the ATWACC may have weight in regard to business
6 > entities that operate in a truly competitive environment, the higher rate of
7 > return that she [Villadsen] advocates for the Sun City/Sun City West
8 > Districts is not warranted. While Arizona-American may have a higher
9 > degree of financial risk, as a result of the Company's leveraged capital
10 > structure, it is still a regulated entity that can apply for rate relief when the
11 > need arises.[30]

12 I agree that Sun Cities is a regulated entity and can apply for rate relief when the need

13 arises, as can most, if not all, regulated utilities. However, this is not a reason to provide

14 a rate of return below what investors expect. The cost of capital for Sun Cities is

15 determined in the market as is the cost of capital for firms in competitive industries.

16 There is no difference in the applicability of the ATWACC in these two situations.

17 **V. COST-OF-CAPITAL ESTIMATION**

18 **A. THE SAMPLES: WATER UTILITIES AND GAS LDCS**

19 **Q. PLEASE SUMMARIZE THE SAMPLE SELECTION IN THE CHAVES AND**
20 **RIGSBY DIRECT.**

21 A. The Villadsen Direct and the Rigsby Direct utilize a sample of water utilities and a

22 sample of natural gas distribution companies while the Chaves Direct relies only on a

23 sample of water utilities. For the water sample, the Villadsen Direct included all eight

24 water utilities followed by *Value Line*.[31] The Chaves Direct included the six water

25 utilities followed by *Value Line* that earn most of their revenues from regulated

26 operations and have sufficient data for his analysis. The Rigsby Direct included the

27 water utilities included in *Value Line*'s Standard Edition. While both the Villadsen

28 Direct and the Rigsby Direct selected a group of natural gas distribution utilities from

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[30] Rigsby Direct p. 68.
[31] *Value Line Investment Survey*'s Standard and Small and Mid-cap Editions. (All cost of capital witnesses ignored Sun Hydraulics which is a producer of hydraulic products that Value Line includes in its water industry)

1   *Value Line*, the proxy groups differ. The Villadsen Direct included seven gas distribution

2   companies which, prior to the date of my data collection, had a five-year history of no

3   major (and publicly announced) merger or acquisition activities, no accounting

4   restatements, investment grade bond ratings, and whose revenue was primarily regulated.

5   The Rigsby Direct also selected its gas distribution sample from *Value Line*, but excluded

6   two of my proxy companies: Cascade Natural Gas and Peoples Energy. These two

7   companies announced merger activities in July of 2006, after my Direct Testimony was

8   filed. If I undertook the analysis today, I would also exclude these companies. The

9   Rigsby Direct also included AGL Resources, Atmos Energy, New Jersey Resources,

10   NICOR Inc., and Piedmont Natural Gas in his sample for a sample of ten companies.[32]

11   **Q.   PLEASE COMMENT ON THE CHAVES DIRECT AND THE RIGSBY**

12   **DIRECT'S PROXY GROUPS.**

13   A.   I will address the Rigsby Direct first. As noted in the Rigsby Direct, *Value Line*'s

14   Standard Edition currently follows only four water utilities: American States Water, Aqua

15   America, California Water, and Southwest Water. These are the four water utilities

16   include in the Rigsby Direct's water-company sample. Several of the companies are

17   engaged in acquisition activities. I therefore agree with the Rigsby Direct that a second

18   sample is a useful check. As for the Rigsby Direct's gas LDC sample, I would not have

19   included NICOR Inc. because the company in 2002 restated its earnings and its stock

20   price has yet to recover from the dramatic drop it suffered then. However, the inclusion

21   of NICOR does not impact the Rigsby Direct's final cost-of-equity estimate and thus will

22   not be discussed further.[33] The Rigsby Direct relies on three estimation methods applied

23   to his two comparable groups, water utilities and gas LDCs. The testimony averages the

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[32]   AGL Resources, Atmos Energy and Piedmont Natural Gas were not part of the Villadsen Direct because of merger and acquisition activities within the past five years (as of the date the Direct was filed). New Jersey Resources and NICOR were excluded because of a low percentage of regulated revenues and accounting restatements, respectively.

[33]   Removing NICOR would result in an increase in the DCF estimate of cost of equity of about 40 basis points and a decrease in the CAPM estimate of cost of equity of about 40 basis points, so that the overall impact is negligible.

1   results for the two proxy groups and then averages the DCF result and the CAPM result

2   which is based on two methodologies.

3   The Chaves Direct also relies on a Value Line water sample but does not include

4   Southwest Water whose revenue is not concentrated in the water industry. The testimony

5   adds Connecticut Water, Middlesex Water, and SJW Water from Value Line's Small and

6   Mid-Cap Edition, as I do.[34] The final cost-of-equity recommendation in the Chaves

7   Direct relies on an average of four estimation methods applied to the sample of water

8   companies. However, three of the six water utilities in the Chaves Direct do not have

9   earnings or dividend projections from Value Line so that some of the estimation methods

10   in the Chaves Direct are based on data from only three companies.[35] In my judgment,

11   three companies are not enough to provide reliable data.

12   **B.   THE DCF METHOD**

13   **Q.   PLEASE SUMMARIZE THE DCF METHODS RELIED UPON IN THE CHAVES**

14   **AND RIGSBY DIRECT TESTIMONIES.**

15   A.   The Chaves Direct relies on a constant growth rate DCF and on a multi-stage DCF

16   model. In the constant growth rate model, the growth rate is estimated as the average of

17   6 growth rates: historical and predicted dividend growth, historical and predicted earnings

18   growth, and historical and predicted sustainable growth.[36] The Chaves Direct relies on

19   10 years of dividend and earnings-per-share data for the historical dividend and earnings

20   growth rate. It relies on Value Line forecasts for the 2006 to 2010-12 period for three of

21   the six companies to estimate the forecasted dividend and earnings growth rate.[37] The

22   sustainable growth rate consists of an internal growth rate, the (earnings) retention ratio

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[34]   I also consider York Water and a subsample of companies without Southwest Water.
[35]   *See*, Chaves Direct, Schedules PMC-4 and PMC-5.
[36]   The sustainable growth rate consists of an internal growth rate, the (earnings) retention ratio multiplied
         with return on equity, plus an external growth ratio, growth financed through the issuance of new shares.
[37]   Chaves Direct, Schedule PMC-4.

1 multiplied with the return on equity, plus an external growth rate financed through the

2 issuance of new shares.[38] The standard sustainable growth model states that

3 $$g = b \times r + s \times v \qquad \textbf{(1)}$$

4 where   b   is the earnings retention ratio

5   r   is the return on common equity

6   s   is the growth in shares

7 $$v = [(\text{Market Value per Share}) / (\text{Book Value per Share}) - 1] \qquad \textbf{(2-a)}$$

8 The Chaves Direct calculates the historical internal growth rate over the period 1997-

9 2006, while the historical external growth is calculated using a mixture of data for the

10 1997-2006 period and current data.[39] The Chaves Direct calculated the dividend yield as

11 of a specific date, May 11, 2007.[40] In the multi-stage DCF model, the Chaves Direct

12 relied on *Value Line* projected dividend growth for the first four years and historical GDP

13 growth for the long term ("Stage-2 growth").

14 The Rigsby Direct relies on a constant growth DCF model with a sustainable growth rate.

15 Rigsby calculates the five-year historical and forecasted retention ratio, book return on

16 equity, book value per share, and growth in shares. Based on five-year historical

17 averages and forecasted growth rates, Rigsby decides on an internal growth rate.[41] He

18 also estimates the share growth. However, the Rigsby Direct relies on a model where v is

19 replaced by[42]

20 $$v^* = \{[(\text{Market Value per Share}) / (\text{Book Value per Share}) + 1] / 2 - 1\} \qquad \textbf{(2-b)}$$

21 As v* is less than v whenever the stock price per share is higher than the book value per

22 share, the formula in (2-b) results in a lower growth rate than the standard formula for

23 companies with a market-to-book (or price to book value per share) above one.

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[38] The Chaves Direct does not rely on the number of shares issued in the calculation but determines the funds raised from issuing common stock. See, Chaves Direct workpapers.

[39] See Chaves Direct, Schedule PMC-5 and workpapers supporting this schedule.

[40] Chaves Direct p. 16, lines 14-16.

[41] *See* Rigsby Direct p. 27 and Schedules WAR-4, WAR-5, and WAR-6.

[42] Rigsby Direct, Schedule WAR-4, page 2.

1   **Q.**   **DO YOU HAVE ANY COMMENTS ON THE CHAVES DIRECT OR THE**

2   **RIGSBY DIRECT'S IMPLEMENTATION OF THE DCF MODEL?**

3   **A.**   Yes. The Chaves Direct presented four estimates of the sample's cost of equity. The

4   constant growth DCF is based on an average of six growth rates.[43] Unfortunately, the

5   projected growth estimates are based on only three companies which is a <u>very</u> small

6   sample. Additionally, the 10-year historical growth estimate may be somewhat

7   downward biased because it relies on historical information and the industry is changing.

8   Further, 2006 was an unusual year for several of the companies in the sample due to

9   water shortages in the western part of the U.S.[44] Finally, several of the companies operate

10   in a regulatory environment that has changed dramatically in recent years.[45] Specifically,

11   had the Chaves Direct relied on either forward-looking information or information that

12   gives rise to cost-of-equity estimates above the cost of debt, the DCF cost-of-equity

13   estimate would increase by more than 100 basis points.[46]

14 **Q.**   **ABOVE YOU MENTIONED THAT THE RIGSBY DIRECT ADJUSTED THE**

15   **TYPICAL SUSTAINABLE GROWTH MODEL. WHAT ARE THE**

16   **CONSEQUENCES?**

17 **A.**   In essence, the adjustment lowers (increases) the sustainable growth rate when the

18   market-to-book ratio is higher (lower) than one. Table R-2 below reports the results from

19   using the data in the Rigsby Direct's Schedules WAR-2 and WAR-4 page 2 but removing

20   the adjustment factor. For the water companies the cost-of-equity estimate increases by

21   about 170 basis points while the cost-of-equity estimate for the gas LDC sample

22   increases by about 55 basis points for an average increase of more than 100 basis points

23   in the DCF cost-of-equity estimate.

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[43]   Chaves Direct, Schedule PMC-7.
[44]   See Value Line Investment Survey, April 27, 2006.
[45]   See Value Line Investment Survey, April 27, 2007.
[46]   See Schedule BV-R6.

Table R-2
The Impact on the Cost of Equity of the Rigsby
Direct's Adjustment to the Sustainable Growth Model

	Water Utility	Natural Gas LDC
Rigsby-based DCF without Adjustment	9.64%	9.60%
Rigsby DCF (with Adjustment)	7.91%	9.03%
Difference	1.73%	0.57%

Source: Rigsby Direct, Schedule WAR-1 and Schedule BV-R4.

As can be seen from Table R-2 above, the impact of this one adjustment is significant and biases the DCF estimates obtained in the Rigsby Direct downward.

Q. WHY DID YOU MODIFY THE CALCULATION OF THE EXTERNAL GROWTH RATE?

A. The adjustment made in the Rigsby Direct is founded on the notion that "[t]he market price of a utility's common stock will tend to move toward book value, or a market-to-book ratio of 1.0, if regulators allow a rate of return that is equal to the cost of capital."[47] Thus, it appears that the Rigsby Direct relies on the so-called market-to-book test, which is based on the assumption that the value of a utility's stock equals the present value of the returns of and on a rate base equal to the net book value of the utility's equity. To illustrate the consequences of a strict belief in the market-to-book test,[48] I will discuss a hypothetical example.

Assume the market-to-book test worked, and that all parties agreed that at a cost of equity of 11 percent is appropriate for Utility A.[49] For simplicity, assume that Utility A has an actual and ratemaking capital structure consisting of 40 percent equity. Assume that Utility A's market-to-book ratio is 2, which if the market-to-book test were valid would signal that 11 percent is above the cost of equity at the regulatory equity ratio. Suppose

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[47] Rigsby Direct p. 17.
[48] Neither the Chaves Direct nor the Rigsby Direct appear to argue that regulators should seek a market-to-book ratio of one.
[49] The 11 percent is used for illustrative purposes only.

1   also that the book value of the utility is expected to grow at a long-term annual rate of 5

2   percent. Lastly, suppose that investors expected an extreme form of regulatory lag:

3   regulators will leave allowed rates of return at the current 11 percent level for X years.

4   On the last day of the Xth year, regulators will readjust the allowed rate of return down to

5   the cost of equity, so that the market-to-book ratio falls to 1.0 on that day. In short, the

6   assumptions are that (1) investors put up $2 now for every $1 of book equity rate base,

7   (2) earn an allowed rate of return of 11 percent (which by hypothesis is above the cost of

8   capital) on the book value of the equity rate base (which grows at 5 percent per year) for

9   X years, and (3) then end up with a stock value equal to only the book-value rate base,

10   i.e., they lose 50 percent of their original investment after X years. If the market-to-book

11   test were valid, the discount rate that makes the present value of these hypothesized

12   returns equal to twice the book value of the stock is the utility's true cost of equity.

13   Figure R-3 plots the implied true cost of equity associated with values of "X" running out

14   to 20 years. As benchmarks, it adds the assumed 11 percent allowed rate of return on

15   equity and the associated long-term bond rate, 5 percent.

Market-to-Book Test Implies an Unrealistic True Cost of Equity (CoE)
(Allowed RoR on Book Equity = Estimated Cost of Equity = 11%. M/B
Ratio Falls from 2.0 to 1.0 at the End of the Year Indicated on the X-Axis.)
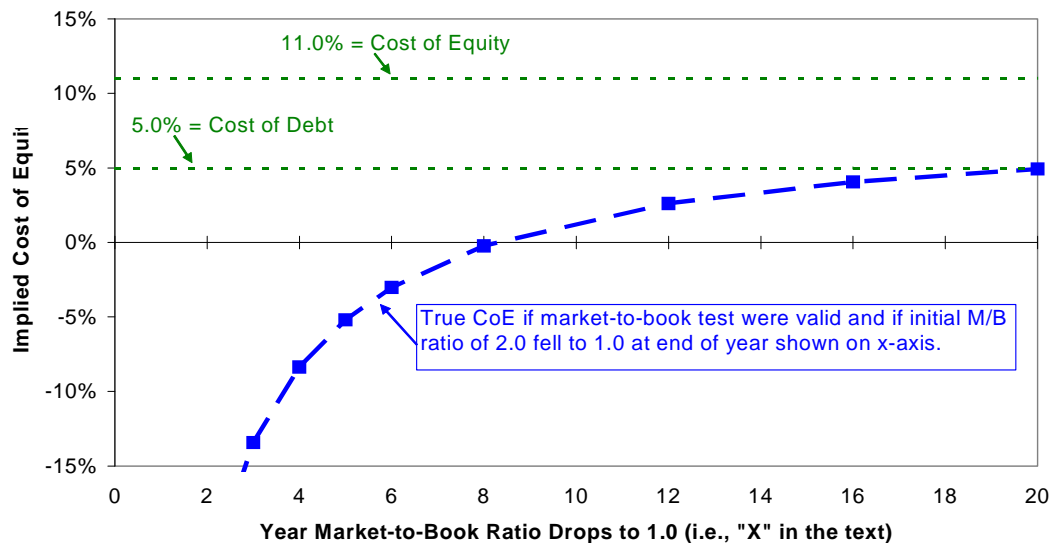
16

17   **Figure R-3**

1   The curved line (blue in color copies) depicts the true cost of capital as the length of the

2   regulatory lag (X) grows from three years to 20 years. With a loss of 50 percent of the

3   original investment due at the end of the regulatory lag, X must exceed 8 years for the

4   true cost of equity to become positive, and during the 20-year period considered it never

5   exceeds the cost of debt (or risk-free rate). As investors clearly expect a return in excess

6   of the risk-free rate, trying to regulate to obtain a market-to-book ratio of one is not

7   viable. The example illustrates that it is unlikely that the simple market-to-book test

8   works. Because the test does not work, I firmly believe the regulators should not attempt

9   to maintain, increase, or decrease a utility's market-to-book ratio.[50]

10   **Q.   DO YOU HAVE ANY GENERAL COMMENTS REGARDING CHOICE OF**

11   **GROWTH RATES IN THE CHAVES DIRECT AND RIGSBY DIRECT?**

12   A.   Yes, both testimonies rely on historical growth rates as well as projected growth rates.

13   The Chaves Direct also argues that analyst forecasts are overly optimistic.[51] Because, as

14   discussed below, the water industry currently is in transition, historical growth rates are

15   likely not representative of future growth. As noted above, the water utility industry is

16   expected to make significant infrastructure investments, the industry is facing a number

17   of mergers and acquisitions, and the water utility companies' risk appears to be

18   increasing.[52]   Additionally, the water utility industry's risk is clearly increasing as

19   indicated by, for example, increasing beta estimates. This was shown in Figure R-1

20   above. Because of the rapid changes in the water utility industry the heavy reliance on

21   historical growth rates likely bias the cost-of-capital estimate which, as the Chaves Direct

22   points out,[53] is a forward looking or expected measure. There is a large academic

23   literature that indicates that analysts' forecasts are statistically more accurate than growth

24   forecasts solely based on historical earnings, dividends, book value and equity growth

25   rates.[54] For example, a paper by Gordon, Gordon and Gould (1989)[55] demonstrates that

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[50]   There may be circumstances where an extremely low market-to-book ratio indicates a fundamental problem
        in which case the regulator may need to address the underlying problem - - not the market-to-book ratio.
[51]   Chaves Direct pp. 42-43.
[52]   *Section V* discusses this issue further.
[53]   See Chaves Direct p. 3.
[54]   This literature is summarized in the Villadsen Direct, Appendix C pp. 5-8.

1   for utilities, forecasted earnings growth outperform past growth in earnings, past growth

2   in dividends, and past growth in earnings retention in explaining utilities expected return.

3   (Note that one of the authors, Myron J. Gordon, developed the Gordon Growth Model, or

4   DCF model, relied upon in the Rigsby Direct).

5   **Q.   DO YOU HAVE ANY COMMENTS ON THE CHAVES DIRECT AND THE**

6   **RIGSBY DIRECT'S DISCUSSIONS OF OPTIMISM BIAS IN ANALYSTS'**

7   **FORECASTS?**

8   A.   Yes. I will first address the Chaves Direct's discussion of optimism bias, and then I will

9   address the Rigsby Direct's comments on *Value Line*'s projected and actual rates of

10   return on equity.

11   **Q.   PLEASE ADDRESS THE CHAVES DIRECT'S DISCUSSION OF OPTIMISM**

12   **BIAS IN ANALYSTS' FORECASTS.**

13   A.   The Chaves Direct argues that "it is reasonable to assume that investors also rely on past

14   growth."[56] The Chaves Direct also cites studies that found that analysts' forecasts of

15   future earnings are optimistic.[57] The Villadsen Direct[58] discussed the optimism bias in

16   analysts' forecast which, I agree, the academic literature has documented. As noted in

17   the Villadsen Direct, Chan, Karceski, and Lakonishok (2000)[59] found that for companies

18   in the lowest quintile when sorted by size, there was no obvious bias. Because utilities

19   and especially water utilities tend to be small in size, the results indicate that analysts'

20   optimism bias may be much less in the water industry than in many other industries.

21   Among the text cites in the Chaves Direct, it appears that only Professor Malkiel

22   explicitly includes utilities.[60] Professor Malkiel[61] discusses the findings, the utility

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[55]   David A. Gordon, Myron J. Gordon, and Lawrence I. Gould (1989), Choice Among Methods of Estimating Share Yield, *The Journal of Portfolio Management*, 50-55.

[56]   Chaves Direct p. 42.

[57]   Chaves Direct p. 42-43 references David Dreman (1998), *Contrarian Investment Strategies: The Next Generation*, Simon & Schuster ("Dreman"), Jeremy J. Siegel (2002), *Stocks for the Long Run*, McGraw-Hill ("Siegel"), and Burton G. Malkiel (2003), *A Random Walk Down Wall Street*, W.W. Norton & Co.

[58]   Villadsen Direct, Appendix C, pp. 6-8.

[59]   L. K.C. Chan, J. Karceski, and J. Lakonishok (2003), "The Level and Persistence of Growth Rates," *Journal of Finance* 58(2):643-684.

[60]   Dreman p. 95-97 discuss 15 industries none of which appear to be dominated by utilities.

1   industry and the "unpredictable events" in the industry that presumably cause analysts'

2   forecasts to over or underestimate earnings. He cites, among other factors, the fuel costs

3   of the 1970s, the 1979 Three Mile Island accident, unexpected unfavorable rulings of

4   public utility commissions, and, in the 1990s, the impact of deregulation and competition.

5   These factors pertain primarily to a segment of the electric utility industry, so it is not

6   obvious to which utilities Professor Malkiel refers in the statement quoted in the Chaves

7   Direct.   Without knowing exactly which utilities and companies are included in the

8   studies cited, it is difficult, if not impossible, to determine the study's impact on the

9   choice between analysts' forecasts and other growth rates. After all, there is ample

10 evidence in the academic literature that analysts' forecasts outperform historical growth

11 rates.[62] Further, according to a recent joint report by NASD and the NYSE,

12 … the SRO Rules have been effective in helping restore integrity to
13 research by minimizing the influences of investment banking and
14 promoting transparency of other potential conflicts of interest. Evidence
15 also suggests that investors are benefiting from more balanced and
16 accurate research to aid their investment decisions.[63]

17 Lastly, analysts have ample access to historical information on companies they follow

18 and presumably use whatever information is available to them in projecting future

19 earnings or other factors for a company. Therefore, I believe that historical data are

20 incorporated in analysts' forecasts and that to implement a truly forward looking DCF

21 model, only forward looking growth rates should be included.

22 **Q.   DO YOU HAVE ANY OTHER COMMENTS ON GROWTH RATES?**

23 A.   Yes. In commenting on my Direct Testimony and optimism bias, the Rigsby Direct

24 states on p. 59

25 This tendency, referred to as optimism bias by Dr. Villadsen, is addressed
26 in Appendix C of her testimony and, according to Dr. Villadsen, is
27 eliminated by the use of a long-term growth rate estimate for gross
28 domestic product ("GDP") in her multi-stage model.

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[61]   Malkiel (2003), *Op. Cit.*, p. 177.
[62]   See footnote 1 p. 5 in Appendix C to the Villadsen Direct.
[63]   Joint Report by NASD and NYSE on the Operation and Effectiveness of the Research Analyst Conflict of Interest Rules, December 2005, p. 44.

1   First, as argued above and in Appendix C of my Direct Testimony, optimism bias is less

2   of an issue for smaller companies and utilities than for the average industry. Second, my

3   multi-stage model serves several purposes. It takes into account that no publicly

4   available analysts' forecasts, to the best of my knowledge, provide information beyond at

5   most five years. Consequently, assumptions have to be made regarding the growth rate

6   of companies beyond that horizon. If a company were to grow significantly faster

7   (slower) than the economy as a whole for a very long time, it would become an

8   increasingly larger (smaller) portion of the economy which appears illogical as water

9   companies and utilities in general serve the public. Third, the multi-stage model does

10   adjust for overly optimistic or pessimistic company-specific forecasts.

11   **C.   THE RISK POSITIONING METHOD**

12   **Q.   PLEASE SUMMARIZE THE RISK POSITIONING MODEL RELIED UPON IN**

13   **THE CHAVES AND RIGSBY DIRECT TESTIMONIES.**

14   A.   Both the Chaves Direct and the Rigsby Direct report results from risk positioning models

15   and both witnesses rely on the standard Capital Asset Pricing Model ("CAPM") using

16   betas from *Value Line* Investment Survey. The Chaves Direct reports results from two

17   models. The first model uses a market risk premium ("MRP") equal to the average

18   historical arithmetic difference between the S&P 500 and the intermediate-term

19   government bond income return and a risk-free rate of 4.6%. The second model uses a

20   projected market risk premium where the projection is based on *Value Line*'s expected

21   dividend yields and the current yield on 30-year Treasury notes.[64] The Rigsby Direct

22   also reports results from two risk positioning models. In one model, the Rigsby Direct

23   relies on the difference between the arithmetic, historical average return on the S&P 500

24   and the current yield (of 4.9%) on 91-day treasury bills for the MRP. In a second model,

25   the Rigsby Direct relies on the difference between the historical, geometric average

26   return on the S&P 500 and the current yield on 91-day treasury bills for the MRP. The

---

[64]   See Chaves Direct, Schedule PMC-2.

1   Rigsby Direct uses the average yield on the 91-day Treasury bills over the six week

2   period ending May 25, 2007.[65]

3   **Q.   DO YOU HAVE ANY COMMENTS ON THE IMPLEMENTATION OF THE**

4   **RISK POSITIONING MODEL IN THE CHAVES OR RIGSBY DIRECT**

5   **TESTIMONIES?**

6   A.   Yes.   The Rigsby Direct reports results that rely on a geometric estimate of the market

7   risk premium.   Current finance theory and practice has ruled out the reliance on the

8   geometric MRP for cost-of-capital estimation.

9   **Q.   PLEASE ADDRESS THE ISSUE OF GEOMETRIC VERSUS ARITHMETIC**

10 **MARKET RISK PREMIA.**

11 A.   While the magnitude of the market risk premium currently is the subject of scrutiny in the

12 academic literature,[66] there is no doubt among academics that the geometric market risk

13 premium does not apply to cost-of-capital estimation.   For example, Ibbotson Associates

14 state

15   The equity risk premium data presented in this book are arithmetic
16   average risk premia as opposed to geometric average risk premia.   The
17   arithmetic average equity risk premium can be demonstrated to be most
18   appropriate when discounting future cash flows.   For use as the expected
19   equity risk premium in either the CAPM or the building block approach,
20   the arithmetic mean or the simple difference of the arithmetic means of
21   stock market returns and riskless rates is the relevant number.   This is
22   because both the CAPM and the building block approach are additive
23   models, in which the cost of capital is the sum of its parts. The geometric
24   average is more appropriate for the reporting past performance, since it
25   represents the compound average return.[67]

26 Similarly, the *New Regulatory Finance* text by Roger A. Morin (2006) argues that

27   Only arithmetic means are correct for forecasting purposes and for
28   estimating the cost of capital.   There is no theoretical or empirical
29   justification for the use of geometric mean rates of returns as a measure of
30   the appropriate discount rate in computing the cost of capital or in

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[65]   See Rigsby Direct, Schedule WAR-7.
[66]   See Villadsen Direct, Appendix B pp. 3-10 for a discussion.
[67]   Ibbotson Associates, *Stock, Bonds, Bills and Inflation, Valuation Edition*, 2006 Yearbook, p. 77.

1   computing present values. There is no dispute in academic circles as to
2   whether the arithmetic or geometric average should be used for purposes
3   of computing the cost of capital.[68]

4   Finally, the text by Bode, Kane, and Marcus (2005) states,

5   [I]f our focus is on future performance, then the arithmetic average is the
6   statistic of interest because it is an unbiased estimate of the portfolio's
7   expected return (assuming, of course, that the expected return does not
8   change over time). In contrast, because the geometric return over a
9   sample period is always less than the arithmetic mean, it constitutes a
10   downward-biased estimator of the stock's expected return in any future
11   year.[69,70]

12   Based on the academic and other literature, the geometric average based MRP is invalid.

13   It leads to downward biased cost of capital estimates and should be ignored. Table R-3

14   below shows the difference between the Rigsby Direct's cost-of-equity estimates using

15   the arithmetic and geometric MRP.

Table R-3
Arithmetic versus Geometric CAPM Cost-of-equity Estimates in the Rigsby Direct

	Water Companies	Natural Gas LDC
Arithmetic MRP	11.37%	11.30%
Geometric MRP	9.71%	9.66%
Difference	1.66%	1.64%

16   Source: Rigsby Direct Schedule WAR–7. Difference calculated.

17   As can be seen from the table, the Rigsby Direct's CAPM cost-of-equity estimates are

18   about 165 basis points lower when relying on the geometric MRP than when relying on

19   the arithmetic MRP. Using the arithmetic CAPM, the Rigsby Direct estimates an average

20   cost of equity of 11.33 percent before any adjustments for Sun Cities' higher leverage.

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[68]   Roger A. Morin (2006), *New Regulatory Finance*, Public Utilities Reports, Inc., pp. 116-117.
[69]   Zvi Bode, Alex Kane, and Alan J. Marcus (2005), *Investments*, 6'th Edition, McGraw-Hill, p. 865.
[70]   See also Richard A. Brealey, Stewart C. Myers, and Franklin Allen (2006), *Principles of Corporate Finance*, 8th Edition, McGraw-Hill, p. 150-151.

1   Considering the 50 basis points upward adjustment for financial leverage that the Rigsby

2   Direct relies upon, the CAPM with an arithmetic MRP results in a cost of equity of about

3   11.8%, which is higher than the Company's requested return on equity.

4 **Q.   DO YOU HAVE ANY COMMENTS ON THE CHAVES DIRECT'S**

5 **IMPLEMENTATION OF THE CAPM?**

6 A.   Yes. The Chaves Direct based its risk-free rate on the May 11, 200, spot rate when the

7   longer term rates were lower than both prior rates and current rates. Because any

8   increase in the risk-free rate is reflected in the CAPM cost-of-equity estimate, current

9   estimates would be higher by about 40 basis points as the average of the current 5-year,

10   7-year, and 10-year constant yield to maturity Treasury series is a bit above 5.0%. The

11   yield on the 30-year Treasury has increased to about 5.1% .[71] An increase in the risk-free

12   rate leads, everything else equal, to the same increase in the CAPM estimate of the cost

13   of equity.[72]

14 **Q.   ARE THERE OTHER DIFFERENCES IN THE IMPLEMENTATION OF THE**

15 **RISK POSITIONING MODELS?**

16 A.   Yes Both the Chaves Direct and the Rigsby Direct relied on *Value Line* betas as did the

17   Villadsen Direct. However, both the Chaves Direct and the Rigsby Direct relied on

18   adjusted betas as reported by *Value Line,* while, in the Villadsen Direct, I unadjusted the

19   *Value Line*'s betas. The Villadsen Direct choose to unadjust *Value Line*'s betas as a

20   conservative estimate, although current 52-week estimates of betas indicate that the

21   companies' betas are of the magnitude reported by *Value Line*.[73]

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[71]   See Chavies Direct p. 29, lines 8-12 and Schedule BV-R3 attached to this rebuttal testimony.

[72]   The yield on the 91-day T-bill used in the Rigsby Direct has declined by 15-20 basis points, but this would
        have no material effect on the cost-of-equity estimate using the model in the Rigsby Direct.

[73]   Schedule BV-R7 attached to this rebuttal shows so-called 52-week rolling betas for the water utilities relied
        upon in the Villadsen Direct.

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               D.   CONSEQUENCES OF THE ESTIMATION METHODS RELIED

               UPON IN THE CHAVES DIRECT AND THE RIGSBY DIRECT

3 **Q.** **DO YOU HAVE ANY COMMENTS ON THE IMPACT OF THE CHAVES**

4 **DIRECT'S IMPLEMENTATION CHOICES FOR THE DCF AND CAPM**

5 **METHODS?**

6 A.   Yes. As noted above, the Chaves Direct presented four estimates of the sample's cost of

7   equity. The constant growth DCF is based on an average of six growth rates.[74] Two of

8   these growth rates are so low that it would result in a cost-of-equity estimate that is lower

9   than the current yield on a BBB-rated utility bond.[75] As discussed above, investors do

10   not want to undertake risky investments unless they expect to receive adequate

11   compensation. Additionally, the growth rates in question are based on a 10-year history

12   of companies that are changing significantly as described above. Table R-4 below

13   summarizes the Chaves Direct's estimates and provides a modified estimate. First, the

14   Constant Growth DCF ignores the growth rates that would give rise to a cost of equity

15   estimated less than the current yield on low risk bonds. Second, the CAPM method uses

16   the current yield on Treasury bonds.[76] Second, the risk-free rate in the historical MRP

17   CAPM is increased by 40 basis points and the risk-free rate used in the current MRP

18   CAPM is increased by 30 basis points. These figures correspond to the average yield on

19   the 5-year, 7-year, and 10-year Treasury bonds and the yield on the 30-year Treasury

20   bond, respectively.

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[74]   Chaves Direct, Schedule PMC-7.

[75]   See Schedule BV-R5.

[76]   The Chaves Direct uses risk-free rates of 4.6 and 4.8% in the Historic and Current model, respectively. Schedule BV-R3 shows that the yield on 5-year, 7-year, and 10-year treasury bonds (used in the Historic CAPM) have increased to about 5% while the yield on the 30-year treasury bond (used in the Current CAPM) has increased to about 5.1%.. This increase of 40 and 30 basis points leads to an increase of 40 and 30 basis points in the CAPM estimate of cost of equity, everything else equal.

Table R-4
Summary of the Chaves Direct's Results and Modifications

	Chaves Direct	Modified
Constant Growth DCF	8.3%	9.6%
Multi-Stage DCF	9.5%	9.5%
Average DCF	**8.9%**	**9.6%**
CAPM with Historic MRP	11.0%	11.4%
CAPM with Current MRP	9.5%	9.8%
Average CAPM	**10.3%**	**10.6%**
Average (*)	**9.6%**	**10.1%**
Average plus 70 basis points	*10.3%*	*10.8%*

(*) The average of the DCF and CAPM results is calculated using all decimals from the underlying figures. Source: Chaves Direct, Schedule PMC-2, Schedule BV-R3 and BV-R5.

As can be seen from Table R-4, if we use growth rates that give rise to a cost of equity below the current market cost of debt and the current risk-free interest rates, then the resulting cost-of-equity estimate increases from 10.3 percent to about 10.8 percent. In other words, the figure is close to the figure recently allowed in Decision No. 69440.[77]

Q.   PLEASE COMMENT ON IMPACT OF THE RIGSBY DIRECT'S IMPLEMENTATION CHOICES FOR THE DCF AND CAPM METHODS.

A.   I have two key comments. First, the low DCF cost-of-equity estimate was obtained using a non-standard downward adjustment for the market-to-book ratio when calculating the sustainable growth rate. Second, the Rigsby Direct relies on a version of the CAPM that uses a geometric market risk premium, which for reasons discussed above should be avoided. Table R-5 below presents the results of the analysis in the Rigsby Direct with those two modifications. The non-standard external growth in the sustainable growth model is replaced by a standard version of the model and CAPM with the geometric market risk premium is dropped from the analysis.

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[77]   Decision No. 69440 allowed 10.7% return on equity for Mohave Water and Mohave Wastewater district. See p. 19 of the order.

Table R-5
Summary of the Rigsby Direct's Results and Modifications

	Rigsby Direct	Modified
Sustainable Growth - Water	7.91%	9.64%
Sustainable Growth – Gas LDC	9.03%	9.60%
Average DCF	**8.47%**	**9.62%**
Arithmetic-CAPM, Water	11.37%	11.37%
Arithmetic-CAPM, Gas LDC	11.30%	11.30%
Geometric-CAPM, Water	9.71%	n/a
Geometric-CAPM, Gas LDC	9.66%	n/a
Average CAPM	**10.51%**	**11.33%**
Average	9.49%	10.5%
Average plus 50 basis points	***9.99%***	***11.0%***

1   Source: Rigsby Direct, Schedule WAR-1, Schedule BV-R4.

2   The Rigsby Direct's cost-of-equity estimate rises by approximately 100 basis points, just

3   by replacing the non-standard external growth estimate with a textbook version and

4   dropping the geometric based CAPM.

5   **Q.   YOU DO NOT ADDRESS ALL ISSUES OR FINDINGS DISCUSSED IN THE**

6   **CHAVES DIRECT OR RIGSBY DIRECT. DOES THAT IMPLY THAT YOU**

7   **ACCEPT THEIR POSITIONS OR FINDINGS?**

8   A.   No, not necessarily.

9   **Q.   DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?**

10 A.   Yes.

APPENDIX A: RESUME OF BENTE VILLADSEN

Bente Villadsen is a principal at The Brattle Group. Her work concentrates in the areas of regulatory finance and accounting. Her work has included analyses of the cost of capital, credit issues, valuation, accounting disclosure and principles including mark-to-market accounting, accounting for hybrid securities, and accounting for investments. Recent topics include rate-regulated companies' allowed rates of return, the valuation of and accounting for power contracts, the impact of imputed debt, and accounting issues pertaining to contract disputes in the petroleum, energy, and materials industries.

Dr. Villadsen holds a Ph.D. from Yale University's School of Management. She has a joint degree in mathematics and economics (BS and MS) from University of Aarhus in Denmark. Prior to joining The Brattle Group, she was a Professor of Accounting at the University of Iowa, University of Michigan, and at Washington University in St. Louis. Dr. Villadsen also worked as a consultant for Risoe National Laboratories in Denmark.

REPRESENTATIVE EXPERIENCE

Energy and Public Utility Finance

- Dr. Villadsen has filed several cost of capital testimonies and appeared at hearing for water and wastewater utilities in connection with rate hearings before state regulatory commissions.

- She has considerable experience in estimating the cost of capital for major U.S. and Canadian utilities and pipelines. The work has been used in connection with the companies' rate hearings before the Federal Energy Regulatory Commission, the Canadian National Energy Board, and state and provincial regulatory bodies. The work has been performed for pipelines, integrated electric utilities, non-integrated electric utilities, gas distribution companies and water utilities.

- In connection with rate hearings for electric utilities, Dr. Villadsen has estimated the impact of power purchase agreements on the company's credit ratings and calculated appropriate compensation for utilities that sign such agreements to fulfill, for example, renewable energy requirements.

- For a large integrated utility in the U.S., Dr. Villadsen participated in all aspects of the company's rate filing, including the company's cost of capital, incentive based rates, and certain regulatory accounting issues.

- She was part of a team evaluating the capital structure and cost of capital for a Canadian crown corporation.

- Dr. Villadsen has been involved in several projects evaluating the impact of credit ratings on electric utilities. She was part of a team evaluated the impact of accounting fraud on an energy company's credit rating and assessing the company's credit rating but-for the accounting fraud.

- For a large electric utility, Dr. Villadsen modeled cash flows and analyzed its financing decisions to determine the degree to which the company was in financial distress as a consequence of long-term energy contracts.

- For a large electric utility without generation assets, Dr. Villadsen assisted in the assessment of the risk added from offering its customers a price protection plan and being the provider of last resort (POLR).

- Dr. Villadsen is evaluating the impact of energy efficiency initiatives on electric utilities' financial statements, credit ratings, and electric rates.

Accounting and Corporate Finance

- Dr. Villadsen has provided expert reports on specific accounting issues. She has testified on the equity method of accounting, the classification of debt versus equity and the distinction between categories of liabilities in a contract dispute between two major oil companies. Dr. Villadsen also has wrote an expert report involving the categorization of leases, impairment of long-lived assets, and the determination of shareholders equity in an international arbitration.

- She has worked extensively on two litigation matters involving the proper application of mark-to-market and derivative accounting in the energy industry. The work relates to the proper valuation of energy contracts, the application of accounting principles, and disclosure requirements regarding derivatives.

- Dr. Villadsen has worked on accounting issues in connection with several tax shelter cases. The focus of her work has been the application of accounting principles to evaluate intra-company transactions, the accounting treatment of security sales, and the classification of debt and equity instruments.

- She evaluated the accounting practices of a mortgage lender and the mortgage industry to assess the information available to the market and ESOP plan administrators prior to the company's filing for bankruptcy. A large part of the work consisted of comparing the company's and the industry's implementation of gain-of-sale accounting.

- Dr. Villadsen has modeled the cash flows of several companies to estimate the impact of specific (energy) contracts or to determine the impact of specific loans.

- For a company in the energy sector, she modeled cash flows to evaluate the company's need for additional funds over time and to assess its viability.

- She assisted in the estimation of net worth of individual segments for firms in the consumer product industry. Further, she built a model to analyze the segment's vulnerability to additional fixed costs and its risk of bankruptcy.

- For a large integrated oil company, Dr. Villadsen estimated the company's cost of capital and assisted in the analysis of the company's accounting and market performance.

- In connection with commercial litigation, Dr. Villadsen estimated the cost of capital for companies in the chemical industry and for companies in the cement industry.

PUBLICATIONS

"Understanding Debt Imputation Issues," (with Michael J. Vilbert and Joe B. Wharton) Edison Electric Institute, forthcoming.

"Measuring Return on Equity Correctly: Why current estimation models set allowed ROE too low," Public Utilities Fortnightly, August 2005 (with A. Lawrence Kolbe and Michael J. Vilbert).

"The Effect of Debt on the Cost of Equity in a Regulatory Setting," (with A. Lawrence Kolbe and Michael J. Vilbert, and with "The Brattle Group" listed as author), Edison Electric Institute, April 2005.

"Communication and Delegation in Collusive Agencies," Journal of Accounting and Economics, Vol. 19, 1995.

"Beta Distributed Market Shares in a Spatial Model With an Application to the Market for Audit Services" (with M. Hviid), Review of Industrial Organization, Vol. 10, 1995.

PRESENTATIONS

"Current Issues in Cost of Capital," (with M.J. Vilbert). EEI Electric Rates Advanced Course, Madison, 2005.

"Issues for Cost of Capital Estimation," (with M.J. Vilbert). EEI Cost of Capital Conference, Chicago, 2004.

"Discussion of 'Are Performance Measures Other Than Price Important to CEO Incentives?'" Annual Meeting of the American Accounting Association, 2000.

 "Contracting and Income Smoothing in an Infinite Agency Model: A Computational Approach," (with R.T. Boylan) Business and Management Assurance Services Conference, Austin 2000.

"Computational Methods and Theoretical Accounting Research," Big 10 Doctoral Consortium, Urbana-Champaign, 1999.

TESTIMONY

Expert Report on investing activities, impairment of assets, and shareholder' equity under U.S. GAAP in an international arbitration. International Chamber of Commerce (ICC), Case No. 14144/CCO, May 2007. (joint with Carlos Lapuerta, Confidential)

Direct Testimony on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0491, July 2006.

Direct Testimony, Rebuttal Testimony, Rejoinder Testimony, Supplemental Rejoinder Testimony and Hearing Appearance on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0403, June 2006, April 2007, May 2007.

Direct Testimony, Rebuttal Testimony, Rejoinder Testimony, and Hearing Appearance on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0014, January 2006, October 2006, November 2006.

Expert report, rebuttal expert report, and deposition in an arbitration proceeding on behalf of a major oil company regarding the equity method of accounting and classification of debt and equity, August and November, 2004. (Confidential)

SCHEDULES BV-R1 to BV-R7

Schedule BV-R1

Summary of Historical and Current Value Line Betas

Companies in Value Line			Beta as of 1/27/2006	Beta as of 4/27/07
[1]	[2]	[3]	[4]	[5]
American States Water	*	*	0.75	0.80
Aqua America	*	*	0.80	0.90
California Water	*	*	0.75	0.90
Connecticut Water Services	*		0.75	0.90
Middlesex Water	*		0.75	0.85
SJW Corp	*		0.65	0.75
Southwest Water		*	0.70	0.90
York Water			0.50	0.55
Average			0.71	0.82
Chaves Sample Average			0.74	0.85
Rigsby Sample Average			0.75	0.88

Sources and Notes:

[1]: Companies in the Value Line Plus Edition Water Utility Universe.

[2]: * if in the Chaves Sample.

[3]: * if in the Rigsby Sample.

[4]: Value Line Beta as of January 27, 2006.

[5]: Value Line Beta as of April 27, 2007.

Schedule BV-R2
15-Day Treasury Bond Yields

Date	5-year Treasury Bond	7-year Treasury Bond	10-year Treasury Bond	30-year Treasury Bond
5/31/2007	4.86	4.87	4.9	5.01
6/1/2007	4.92	4.92	4.95	5.06
6/4/2007	4.91	4.91	4.93	5.02
6/5/2007	4.96	4.96	4.98	5.07
6/6/2007	4.94	4.94	4.97	5.08
6/7/2007	5.05	5.07	5.11	5.2
6/8/2007	5.06	5.08	5.12	5.22
6/11/2007	5.07	5.1	5.14	5.24
6/12/2007	5.18	5.21	5.26	5.35
6/13/2007	5.13	5.16	5.2	5.28
6/14/2007	5.16	5.19	5.23	5.3
6/15/2007	5.1	5.12	5.16	5.26
6/18/2007	5.07	5.1	5.15	5.26
6/19/2007	5	5.03	5.09	5.2
6/20/2007	5.05	5.09	5.14	5.24
Average	5.03	5.05	5.09	5.19
Average*		5.06		

Source: Bloomberg as of June 21, 2007.

* Average of the 5-year, 7-year, and 10-year Treasury Bond.

Schedule BV-R3

Capital Structure Summary and Comparison

Company	5-Year Average Capital Structure as of Year End, 2005			5-Year Average Capital Structure as of Year End, 2006		
	Common Equity - Value Ratio [4]	Preferred Equity - Value Ratio [5]	Debt - Value Ratio [6]	Common Equity - Value Ratio [4]	Preferred Equity - Value Ratio [5]	Debt - Value Ratio [6]
American States Water Co	0.58	0.00	0.42	0.59	-	0.41
California Water Service Gp	0.65	0.00	0.35	0.65	0.00	0.35
Connecticut Water Svc Inc	0.75	0.00	0.25	0.73	0.00	0.26
Middlesex Water Co	0.63	0.01	0.36	0.63	0.01	0.36
Aqua America Inc	0.71	0.00	0.29	0.71	0.00	0.29
SJW Corp	0.70	-	0.30	0.70	-	0.30
Southwest Water Co	0.67	0.00	0.33	0.68	0.00	0.32
York Water Co	0.74	-	0.26	0.72	-	0.28
Average	0.68	0.00	0.32	0.68	0.00	0.32

Sources and Notes:

All data compiled from Bloomberg and Compustat.

Schedule BV - R4

DCF Cost of Equity Estimates Without Adjustment Using Rigsby Direct Data

Stock Symbol	Company	Dividend Yield [1]	Internal Growth (br) [2]	Share Growth [3]	Market to Book [4]	External Growth (sv) [5]	Sustainable Growth [6]	Estimated Cost of Equity Capital [7]
AWR	AMERICAN STATES WATER CO.	2.55%	4.00%	5.00%	2.07	5.35%	9.35%	11.90%
CWT	CALIFORNIA WATER SERVICE GROUP	2.98%	4.25%	2.00%	2.04	2.08%	6.33%	9.32%
SWWC	SOUTHWEST WATER COMPANY	1.68%	3.25%	4.50%	1.82	3.67%	6.92%	8.61%
WTR	AQUA AMERICA, INC.	2.04%	4.00%	1.25%	3.16	2.70%	6.70%	8.74%
WATER COMPANY AVERAGE								9.64%
ATG	AGL RESOURCES, INC.	3.78%	5.75%	0.50%	2.07	0.54%	6.29%	10.07%
ATO	ATMOS ENERGY CORP.	3.99%	4.50%	5.00%	1.43	2.14%	6.64%	10.63%
LG	LACLEDE GROUP, INC.	4.62%	3.00%	2.75%	1.53	1.45%	4.45%	9.07%
NJR	NEW JERSEY RESOURCES CORPORATION	2.89%	5.50%	1.25%	2.18	1.47%	6.97%	9.87%
GAS	NICOR, INC	3.67%	3.65%	0.10%	2.47	0.15%	3.80%	7.47%
NWN	NORTHWEST NATURAL GAS CO.	2.92%	4.75%	0.75%	2.14	0.85%	5.60%	8.53%
PNY	PIEDMONT NATURAL GAS COMPANY	3.58%	3.25%	0.75%	2.24	0.93%	4.18%	7.75%
SJI	SOUTH JERSEY INDUSTRIES, INC.	2.48%	10.50%	1.15%	2.42	1.63%	12.13%	14.60%
SWX	SOUTHWEST GAS CORPORATION	2.22%	6.25%	2.65%	1.75	2.00%	8.25%	10.47%
WGL	WGL HOLDINGS, INC.	4.07%	3.25%	0.25%	1.77	0.19%	3.44%	7.51%
NATURAL GAS LDC AVERAGE								9.60%
AVERAGE OF WATER COMPANY AND GAS LDC								9.62%

Sources and Notes:
[1]: Rigsby Direct Schedule WAR - 3, column (A).
[2]: Rigsby Direct Schedule WAR - 4 page 1, column (A).
[3]: Rigsby Direct Schedule WAR - 4 page 2, column (A).
[4]: Rigsby Direct Schedule WAR - 4 page 2, column (B).
[5]: [3] x ([4] - 1)
[6]: [2] + [5].
[7]: [1] + [6].

Schedule BV-R5

Calculation of Hamada Adjustment

	Risk-Free Rate [1]	Value Line Beta [2]	Market Risk Premium [3]	CAPM RoE [4]
Chaves Direct CAPM				
Historical Market Risk Premium	4.62%	0.84	7.60%	11.01% [a]
Current Market Risk Premium	4.83%	0.84	5.55%	9.50% [b]
Average				10.26% [c]
Using Market Values and 61/39 Capital Structure				
Historical Market Risk Premium	4.62%	1.09	7.60%	12.88% [d]
Current Market Risk Premium	4.83%	1.09	5.55%	10.86% [e]
Average				11.87% [f]
Difference				1.62% [g]
Using Market Values and 59/41 Capital Structure				
Historical Market Risk Premium	4.62%	1.05	7.60%	12.62% [h]
Current Market Risk Premium	4.83%	1.05	5.55%	10.67% [i]
Average				11.65% [j]
Difference				1.39% [k]

Sources and Notes:
[1]: Chaves Workpapers.
[2][a], [b]: Chaves Workpapers.
[2][d], [e], [h], [i]: Workpaper 1 to Schedule BV-R5.
[3]: Chaves Workpapers.
[4]: [1] + [2] x [3].
[c]: Average of [4][a] and [b].
[f]: Average of [4][d] and [e].
[g]: [f] - [c].
[j]: Average of [4][h] and [i].
[k]: [j] - [c].

Workpaper 1 to Schedule BV-R5

Adjusted Relevered Beta Calculation

Company [1]	Unadjusted Beta [2]	Tax Rate [3]	Debt to Market Value Ratio [4]	Equity to Market Value Ratio [5]	Unlevered Beta [6]
American States Water	0.67	40.5%	0.41	0.59	0.48
California Water	0.82	39.7%	0.35	0.65	0.62
Aqua America	0.82	39.6%	0.29	0.71	0.66
Connecticut Water	0.82	23.5%	0.27	0.73	0.64
Middlesex Water	0.75	33.4%	0.37	0.63	0.54
SJW Corp	0.52	40.8%	0.30	0.70	0.42
Average					0.56

	Unlevered Beta [7]	Tax Rate [8]	Book Value of Debt [9]	Book Value of Equity [10]	Relevered Beta [11]	Adjusted Relevered Beta [12]
Sun City's Capital Structure at 61/39	0.56	38.60%	0.61	0.39	1.10	1.09 [a]
Sun City's Capital Structure at 58.9/41.1	0.56	38.60%	0.589	0.411	1.05	1.05 [b]

Sources and Notes:
[1] - [3]: Chaves Workpapers.
[4]: 1 - [5].
[5]: Workpaper 2 to Schedule BV-R5.
[6]: [2] / (1 + ([4] / [5]) x (1 - [3])).
[7]: Average of [6].
[8]: Chaves Workpapers.
[9] - [10][a]: Chaves Workpapers.
[9] - [10][b]: Proposed Capital Structure.
[11]: [7] x (1 + ([9] / [10]) x (1 - [8])).
[12]: [11] x 0.67 + 0.35.

Workpaper 2 to Schedule BV-R5

Capital Structure Summary

Company	5-Year Average Capital Structure (2002- 2006)		
	Common Equity - Value Ratio [1]	Preferred Equity - Value Ratio [2]	Debt - Value Ratio [3]
American States Water Co	0.59	-	0.41
Aqua America Inc	0.71	0.00	0.29
California Water Service Group	0.65	0.00	0.35
Connecticut Water Service Inc	0.73	0.00	0.26
Middlesex Water Co	0.63	0.01	0.36
SJW Corp	0.70	-	0.30
Southwest Water Co	0.68	0.00	0.32
York Water Co	0.72	-	0.28

Sources and Notes:

Data from Compustat and Bloomberg.

Schedule BV-R6

DCF Cost of Equity Estimate Using Chaves Data without
Growth Rates that Yield a Cost of Equity below the Cost of Debt

| Description [1]	g [2]	
DPS Growth - Historical[1]	2.8%	
* DPS Growth - Projected[1]	4.6%	
EPS Growth - Historical[1]	2.9%	
* EPS Growth - Projected[1]	9.1%	
* Sustainable Growth - Historical[2]	5.7%	
* Sustainable Growth - Projected[2]	8.1%	
Average	**5.5%**	
Average*	**6.9%**	[a]
Chaves Dividend Yield	**2.8%**	[b]
Modified DCF Cost of Equity	**9.7%**	[c]

Sources and Notes:

[1] - [2]: Chaves Direct, Schedule PMC-7 and PMC-2.

[a]: Average of [2] with * (Cost of Equity >= Cost of Debt).

[b]: Chaves Direct, Schedule PMC-2 and workpapers.

[c]: [a] + [b].

Schedule BV-R7
52-Week Rolling Betas for the Water Sample*
from July 2002 through June 2007
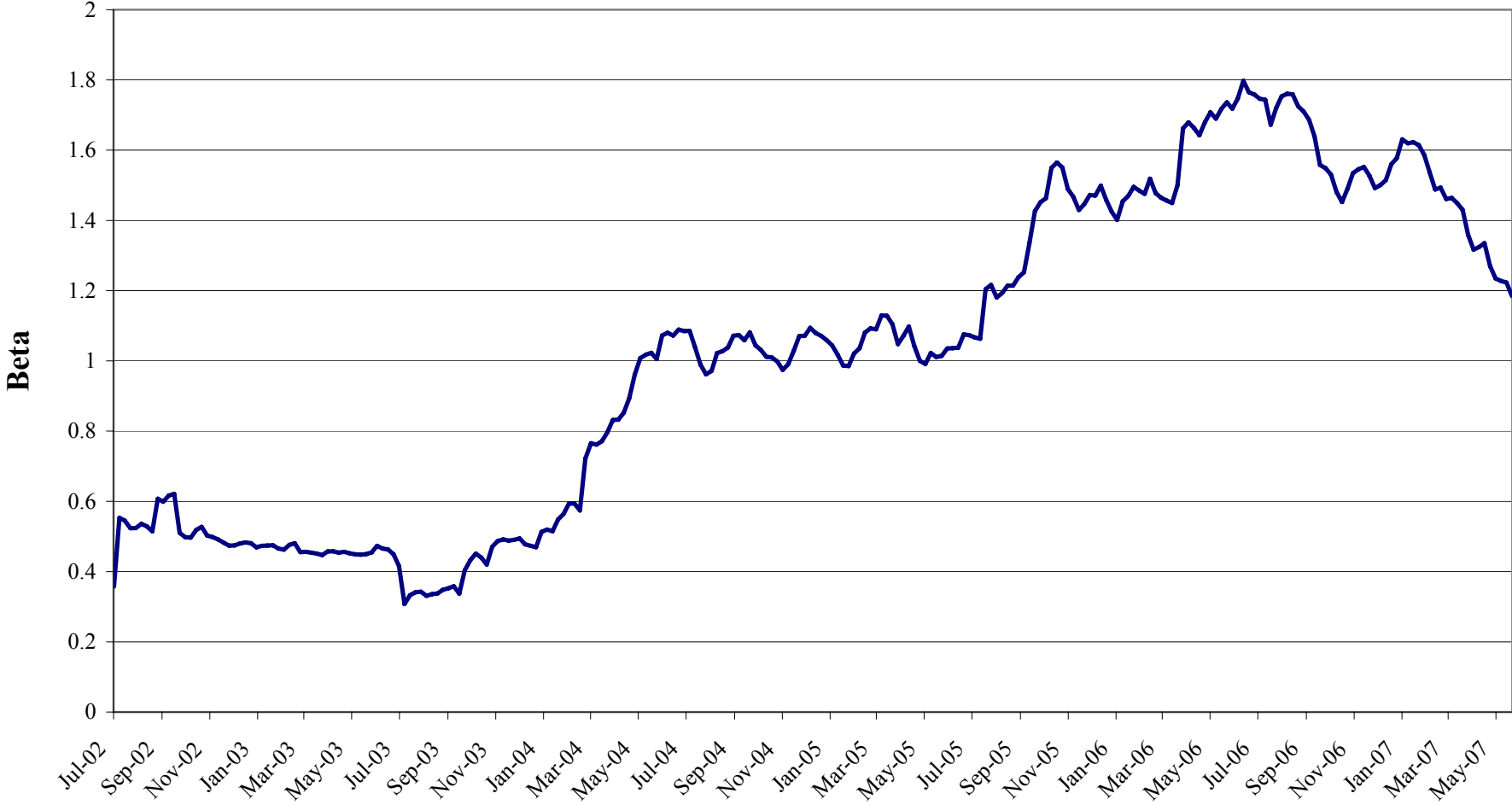
* Excludes York Water due to low trading volume.