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Docket #(s): W-02113A-13-0118

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Exhibit #: Part 2 of 5

A11 - A17

EXHIBIT
A-11
ADMITTED

BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

BOB STUMP, Chairman
GARY PIERCE
BRENDA BURNS
SUSAN BITTER SMITH
BOB BURNS

IN THE MATTER OF THE APPLICATION OF CHAPARRAL CITY WATER COMPANY FOR A DETERMINATION OF THE CURRENT FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASE IN ITS RATES AND CHARGES BASED THEREON	DOCKET NO. W-02113A-13-0118

REBUTTAL TESTIMONY

OF

PAULINE M. AHERN, CRRA
PRINCIPAL
AUS CONSULTANTS

ON BEHALF OF

CHAPARRAL CITY WATER COMPANY

JANUARY 21, 2014

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EXECUTIVE SUMMARY
CHAPARRAL CITY WATER COMPANY
DOCKET NO. W-02113A-13-0118

Ms. Ahern's rebuttal testimony responds to certain aspects of the direct testimony of ACC Staff Witness John A. Cassidy and RUCO Witness David C. Parcell on the following issues:

Capital Structure

Ms. Ahern provides evidence that Mr. Cassidy's recommended hypothetical capital structure of 40% debt and 60% equity is inappropriate for ratemaking purposes for Chaparral City Water Company because it is:

1) inconsistent with the capital structure ratios upon which the Company's current rates are based;

2) use of Mr. Cassidy's capital structure ratios and recommended return on common equity of 9.3% results in an insufficient and punitive return on common equity of 0.65%; and,

3) a common equity cost rate of 7.65% implies a financial risk premium of 1.65 basis points, significantly lower than the average downward financial risk adjustments proposed (92 basis points) and / or adopted (46 basis points) in representative Commission decisions since 2006. The implied 7.65% common equity cost rate is derived below.

Description	Weight (%) (1)	Cost (1)	Weighted Cost (1)	Pretax Weighted Cost
Staff Recommended Structure				
Debt	40.0%	5.9%	2.4%	2.4%
Common Equity	60.0	9.3	5.6	9.1 (2)
Weighted Average Cost of Capital			8.0%	11.5%
Company Proposed Structure (Revised)				
Debt	14.45%	5.97%	0.86%	0.86
Common Equity	85.55	7.65 (5)	6.55 (5)	10.5 (3)
Weighted Average Cost of Capital			7.41%	11.5% (4)

Notes:

(1) From Schedule JAC-1.

(2) Assuming a company-provided effective composite Federal and State income tax rate of 38.29%, the pretax weighted cost of common equity based upon Staff Witness Cassidy's recommended 9.3% common equity cost rate and hypothetical capital structure is: 9.1%. 9.1% = 9.3 %/(1 + 0.3829).

(3) Pretax weighted cost rate of common equity equals the pretax overall weighted cost rate (11.5%) based upon Staff Witness Cassidy's recommended 9.3% common equity cost rate and hypothetical capital structure minus the weighted cost rate of debt based upon Chaparral City Water Company's proposed capital structure, 0.86%. 11.5% - 0.86% = 10.5%.

(4) Pretax weighted overall cost of capital based upon Staff Witness Cassidy's proposed overall rate of return.

(5) Weighted cost of common equity calculated as the pretax weighted cost of common equity, 6.55%, divided by Chaparral City Water Company's proposed capital structure ratio, 85.55%. 7.65% = 6.55% / 85.55%.

In addition, Ms. Ahern's rebuttal testimony provides evidence that the Company's proposed capital structure ratios and financial metrics are consistent with Standard & Poor's ("S&P") guidelines for a public utility with bonds rated in the BBB category (Moody's Baa).

Common Equity Cost Rate

Ms. Ahern also provides evidence that both Mr. Cassidy's and Mr. Parcell's Discounted Cash Flow model results, 9.3% and 8.70%, respectively, significantly understate the investors' required return when applied to an original cost less depreciation rate base, i.e., book value. In addition, Ms. Ahern's rebuttal testimony provides evidence in support of the exclusive reliance upon security analysts' forecasts of growth in earnings per share ("EPS") in contrast to the various historical and projected growth rates used by both Mr. Cassidy and Mr. Parcell. As noted in Ms. Ahern's testimony, these forecasts are reasonable indicators of investor expectations and are more accurate than forecasts that rely on historical growth. Mr. Cassidy's and Mr. Parcell's cost of common equity analyses will be discussed in further detail below.

Credit Risk Adjustment

As noted in her rebuttal testimony, Ms. Ahern explains that neither Mr. Cassidy nor Mr. Parcell included an adjustment to reflect the greater credit risk of the Company, as evidenced by its likely bond rating of Moody's Baa1 / S&P BBB+ as indicated by its financial metrics, notwithstanding the level of common equity. An indication of the magnitude of such an adjustment is 0.32 basis points.

Business Risk Adjustment

Ms. Ahern also explains that neither Mr. Cassidy nor Mr. Parcell included an adjustment to reflect the greater business risk of the Company, as evidenced by its smaller size relative to the water utilities upon whose market data their respective recommended common equity cost rates were based. Based on her analysis, Ms. Ahern supports a conservative adjustment of 40 basis points based on the size of the Company.

Mr. Cassidy's Common Equity Cost Rate

Ms. Ahern provides evidence that Mr. Cassidy's exclusive reliance upon the common equity cost rate Discounted Cash Flow Model ("DCF") is inconsistent with the Efficient Market Hypothesis ("EMH") upon which the DCF is predicated. Consistent with the EMH, multiple cost of common equity models should be relied upon.

Thus, Mr. Cassidy's exclusion of the Capital Asset Pricing Model ("CAPM") in this proceeding is not only inconsistent with Staff's previous position but with the EMH upon which his DCF analysis is predicated. Ms. Ahern provides evidence that the rationale Mr. Cassidy used for not relying upon a CAPM analysis in this proceeding is applicable as well to the DCF model when he stated that "forecasted dividend yield [have] fallen to new lows" resulting in abnormally low DCF cost of common equity estimates.

Likewise, Mr. Cassidy's rationale for using a group of sample utilities, that a group of utilities can reduce the sampling error in the estimation of common equity cost rate, can also be applied to the use of multiple models which also reduces the sampling error from the application of a single cost of common equity model, e.g. the DCF.

Ms. Ahern's testimony, both this rebuttal and her direct, provide evidence that upward credit risk and business risk adjustments to the common equity cost rate based upon the market data of the sample utilities is necessary, due to Chaparral's likely bond rating and small size as discussed below. Mr. Cassidy did not include such adjustments.

Properly including these adjustments, coupled with a properly applied CAPM analysis and a properly applied DCF analysis based upon Mr. Cassidy's DCF results in a 10.42% common equity cost rate, only slightly lower than her updated common equity cost rate of 10.50% discussed below.

Mr. Parcell's Common Equity Cost Rate

Ms. Ahern's rebuttal testimony also provides evidence which indicates that Mr. Parcell's application of the Capital Asset Pricing Model ("CAPM") is flawed in several respects and therefore should not be relied upon. Mr. Parcell's CAPM is flawed because:

1) He has incorrectly relied upon an historical risk-free rate despite the fact that both ratemaking and the cost of capital are prospective;

2) He has incorrectly calculated his market equity risk premium by relying upon:

    a. The actually achieved, or non-market based, rates of return on book common equity for a proxy for the market, the S&P 500;

    b. A geometric mean historical market equity risk premium;

    c. The historical total return on U.S. Treasury securities; and,

    d. Not employing a prospective or forward-looking equity risk premium.

3) He has not incorporated an empirical CAPM (ECAPM) analysis despite the fact that empirical evidence indicates that the low-beta securities earn returns higher than the CAPM predicts and high-beta securities earn less.

As stated above, Ms. Ahern's testimony, both this rebuttal and her direct, provide evidence that upward credit risk and business risk adjustments to the common equity cost rate based upon the market data of the sample utilities is necessary, due to Chaparral's likely bond rating and small size as discussed below. Mr. Parcell did not include such adjustments.

Properly including these adjustments, coupled with a properly applied CAPM analysis as well as Mr. Parcell's DCF and Comparable Earnings ("CE") analyses results in a 10.59% common equity cost rate, only slightly higher than her updated common equity cost rate of 10.50% discussed below.

Updated Common Equity Cost Rate

Finally, Ms. Ahern's rebuttal testimony provides an updated common equity cost rate of 10.50% applicable to the Company in the current economic and capital market environment.

CHAPARRAL CITY WATER COMPANY

Rebuttal Testimony of

Pauline M. Ahern

Introduction

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

A. My name is Pauline M. Ahern. I am a Principal of AUS Consultants. My business address is 155 Gaither Drive, Suite A, Mt. Laurel, New Jersey 08054.

Q. Are you the same Pauline M. Ahern who provided direct testimony in this case?

A. Yes.

Purpose

Q. What is the purpose of your testimony?

A. The purpose is to provide testimony on behalf of Chaparral City Water Company ("CCWC" or "the Company") in rebuttal to certain aspects of the direct testimony of John A. Cassidy, Witness for the Staff of the Arizona Corporation Commission (the "ACC" or "the Commission") and the prepared testimony of David C. Parcell, witness for the Residential Utility Consumers Office ("RUCO"). With regard to Mr. Cassidy's testimony, I will address his proposed hypothetical capital structure ratios and his application of the Discounted Cash Flow Model ("DCF"). With regard to Mr. Parcell's testimony, I will address his applications of the DCF, the Capital Asset Pricing Model ("CAPM") and Comparable Earnings Analysis ("CE"). I will also address the failure of both Mr. Cassidy and Mr. Parcell to reflect both the greater credit risk faced by the Company and the greater risk of the

Company's small size relative to their respective proxy utilities. Finally, I will respond to comments on the Company's testimony by both Mr. Cassidy and Mr. Parcell.

Q. Have you prepared an exhibit which supports your rebuttal testimony?

A. Yes. It has been designated as Exhibit PMA-2 and consists of Schedules 1 through 11.

Review of Analysis of ACC Staff Witness John A. Cassidy

Q. Do you agree with Mr. Cassidy's recommended hypothetical capital structure consisting of 40% debt ratio and 60% common equity ratio?

A. No. Mr. Cassidy states on page 9, lines 12 - 13 and 20 – 21 of his direct testimony that he is recommending a hypothetical capital structure "to give recognition to CCWC's reduced exposure to financial risk relative to Staff's proxy group of Companies" and that such a capital structure "encourages CCWC to move towards a more balanced capital structure going forward." Such reasoning is incorrect for four reasons. First, Staff, to the best of my knowledge, has not recently recommended a hypothetical capital structure. Second, also to the best of my knowledge, Chaparral has historically been regulated based upon its actual capital structure. Third, Staff's hypothetical capital structure results in the opportunity to earn an insufficient actual return on common equity based upon the Company's actual balance of financing which is inconsistent with the *Hope*[1] and *Bluefield*[2] cases resulting in an implied downward financial risk adjustment which far exceeds adopted financial risk reductions by the Commission. Fourth,

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[1] Federal Power Commission v. Hope Natural Gas Co., 320 U.S. 591 (1944).

[2] Bluefield Water Works Improvement Co. v. Public Serv. Comm'n, 252 U.S. 679 (1922).

Mr. Cassidy's proposed hypothetical capital structure does not encourage CCWC to move toward what he terms "a more balanced capital structure" going forward.

Q. You mention that Staff, to the best of you knowledge, has not recommended hypothetical capital structures. Please comment.

A. A review of several representative Commission decisions[3] from 2006 through 2013 reveals that Staff has not recently recommended a hypothetical capital structure. Notably, in Decision No. 71308 dated October 21, 2009 relative to CCWC's last rate case, Staff recommended the use of CCWC's actual capital structure which was adopted by the ACC. As was discussed in my direct testimony at page 19, line 19 through page 20, line 9 and will be discussed below, smaller companies need to maintain a higher equity ratio as mitigation, but not elimination, of the added risk due to their small size.

In fact, as recently as December 31, 2012, Mr. Cassidy submitted testimony indicating that a hypothetical cap structure should not be used even when the company in the case had proposed the use of such a hypothetical structure:

> **Q. Does Staff consider the use of a hypothetical pro forma capital structure to be appropriate in this proceeding?**
>
> A. No. As discussed below, Staff recommends a financial risk adjustment to the ROE to appropriately address Rio Rico's use of an equity-rich, uneconomical capital structure. Staff's financial risk adjustment is calculated based on financial theory; therefore, it is preferred over use of a subjectively derived hypothetical capital structure.[4]

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[3] Decision No. 73996, Docket No. WS-02676A-12-0196, July 30, 2013; Decision No. 72551, Docket Nos. W-20465A-09-0441, W-20454-09-0413, W-02465A-09-0414, W-02453A-09-0414, and W-20454A-09-0414, April 7, 2011, Decision No. 72059, Docket No. WS-02676A-09-257, January 6, 2011, Decision No. 71865, Docket No. SW-02361A-08-0609, June 1, 2010, Decision No. 71308, Docket No. W-02113A-07-0551, October 21, 2009, Decision No. SW-02519A-06-0015, June 28, 2007, and Decision No. 69164, Docket No. SW-02361A-05-0657, December 5, 2006.

[4] Direct Testimony of John A. Cassidy at 8 (December 31, 2012) (Docket No. WS-02676A-12-0196) (admitted as Exhibit S-1).

Q. What capital structure has been historically adopted in arriving at CCWC's allowed overall rate of return?

A. To the best of my knowledge, CCWC's actual capital structure ratios have been historically adopted for ratemaking purposes. Clearly, CCWC's current authorized rate of return is based upon the Company's actual capital structure ratios as found in Decision No. 71308 in Docket No. W-02113A-07-0551 dated October 21, 2009. In that proceeding, Staff recommended a common equity ratio of 75.6% which was adopted by the ACC. Staff originally recommended a 180 basis point downward financial risk adjustment to its unadjusted recommended common equity cost rate of 11.8%, resulting in a 10.0% recommended common equity cost rate, with David C. Parcell (the RUCO witness in this proceeding) filing surrebuttal testimony adopting Staff's direct testimony. In his surrebuttal testimony, Mr. Parcell also recommended a 10.0% common equity cost rate without regard to a downward financial risk adjustment as he states on page 12, lines 14 – 16 of his surrebuttal testimony. In addition, he also recommended a capital structure comprised of 24.4% debt and 75.6% equity. Ultimately the ACC adopted Staff's recommended capital structure ratios and a 9.9% common equity cost rate implying a financial risk adjustment of 0.1%. There is no compelling reason in this proceeding for the ACC to depart from authorizing CCWC's proposed actual capital structure ratios.

Q. What is the return on common equity on CCWC's proposed capital structure ratios implied in Mr. Cassidy's recommended overall rate of return and hypothetical capital structure?

A. Mr. Cassidy's recommended cost of common equity of 9.3% violates the economic principle of opportunity cost, meaning the return given up or foregone

by investing in one investment as opposed to an alternative investment of comparable risk. Mr. Cassidy's recommended common equity cost rate of 9.3% is applied to a hypothetical capital structure which contains significantly greater financial risk than CCWC's proposed capital structure. When the resultant before-income tax weighted overall rate of return is applied to CCWC's proposed capital structure, the opportunity to earn a return on common equity for CCWC is only 7.65% based upon a company-provided income tax rate of 38.29%, as derived in Schedule 1. A common equity cost rate of 7.65% provides an equity risk premium of but 168 basis points relative to CCWC's embedded cost of debt of 5.97% as requested in this proceeding. Such a low equity risk premium demonstrates how Mr. Cassidy's recommendation violates the economic principle of opportunity cost, when compared with the historical and projected equity risk premiums for the Standard & Poor's ("S&P") equity risk premium relative to Moody's A-rated public utility bonds of 4.16% and 5.24% as well as the beta adjusted equity risk premium of 4.41% shown on pages 19 and 22 of Schedule 11. An equity risk premium of 1.68% is especially egregious when compared with the Predictive Risk Premium Model™ derived equity risk premium for the proxy group of nine water companies of 9.92% as can be derived from page 14 of Schedule 11.

Moreover, an opportunity to earn an implied common equity cost of 7.65% on CCWC's actual mix of capital financing of its rate base results in an effective downward financial risk adjustment of 1.65 basis points from Mr. Cassidy's recommended 9.3% cost rate. A financial risk adjustment of 1.65 basis points is significantly larger than either the average adjustment of 92 basis points

recommended by Staff in the dockets listed in footnote 3 or the average adjustment adopted by the ACC of 46 basis points in those same dockets.

In view of the foregoing, with an effective authorized return on common equity of 7.65%, there is no incentive for an investor to invest in CCWC if he/she would have to forego the risk-adjusted return of 9.3% or more on alternative investments of comparable risk because it provides an inadequate equity risk premium for CCWC and reflects a downward financial risk adjustment far greater than either that proposed by Staff or adopted by the ACC in recent rate cases.

Q. Why do you believe that Mr. Cassidy's proposed capital structure does not encourage CCWC to move toward what he terms "a more balanced capital structure" going forward?

A. Mr. Cassidy's proposed capital structure does not encourage CCWC to move toward what he terms "a more balanced capital structure" going forward precisely because it provides for an implied opportunity for CCWC to earn only 7.65% on its proposed financing mix (capital structure) and hence, its rate base. As discussed immediately above, no incentive for an investor to invest in CCWC results as well as an inadequate return on common equity which will result in slow, if any growth, in retained earnings. When compared with the average expected return on common equity of 9.9% as published by *Value Line Investment Survey ("Value Line")* discussed below, the 7.65% definitely provides no incentive for an investor to invest in CCWC which is clearly more risky based upon its likely bond / credit rating of Baa1/BBB+ as discussed in my prepared testimony at page 19, line 18 through page 20, line 9 and below in this testimony, as well as based upon its smaller size relative to other water utilities as

discussed in my prepared testimony at page 16, line 24 through page 18, line 8 and again on page 44, line 4 through 46, line 7 as well below in this testimony.

Q. Why are CCWC's proposed common equity ratios appropriate for ratemaking purposes?

A. CCWC's proposed common equity ratios are appropriate because, in my opinion, they are consistent with S&P's financial metrics for a public utility with a BBB (equivalent to a Moody's Baa) bond rating. Although S&P states that its metrics are not intended to be precise indications or guarantees of ratings opinions, they can be used to provide insight into the likely bond rating of CCWC. To that end, in my opinion, CCWC's financial metrics are consistent with S&P's financial metrics for a public utility assigned a "Modest" financial risk profile. As shown on Schedule 2, CCWC's Funds From Operations ("FFO") relative to total debt averaged 44.00% for the five years ended 2012, which is consistent with a "Intermediate" S&P financial risk profile which is from 30% - 45% as shown in Table 2 on page 4 of Schedule 3 of Exhibit PMA-1. Both CCWC's total debt / Earnings Before Interest, Taxes, Depreciation and Amortization ("EBITDA") of 1.20 times and total debt / total capital ratio of 21.40% for the five years ended 2012 are consistent with a "Minimal" S&P financial risk profile for which S&P indicates total debt / EBITDA of less than 1.5 times and total debt / total capital less than 25%, also on Table 2 on page 4 of Schedule 3 of Exhibit PMA-1. Table 1 on page 2, presents S&P's Business and Financial Risk Profile Matrix which can provide insight into a likely bond rating for a public utility, given its financial risk profile. In my opinion, given CCWC's small size discussed above and later in this testimony, coupled with its inability to earn its authorized return on common equity, its business profile would be "Satisfactory", at best. Table 1 on

page 2 of Schedule 3 of Exhibit PMA-1 indicates that the likely bond rating for a public utility with a "Satisfactory" business profile and an "Intermediate" financial risk profile is BBB, the equivalent of Moody's Baa2. If CCWC were assigned a financial risk profile of "Modest" by S&P, a BBB+ bond rating (or Moody's Baa1) is indicated in Table 1.

In view of the foregoing, my opinion expressed in my direct testimony at page 19, line 19 through page 20, line 8 is that CCWC's likely bond rating would be in the BBB (S&P) / Baa (Moody's) rating categories. However, because S&P links a subsidiary's bond / credit ratings to the credit quality of the parent as discussed on page 43, line 6 – 16, it is my opinion that CCWC's likely bond rating would specifically be Baa1 by Moody's and BBB+ by S&P. In addition, it is also my opinion that an upward credit risk adjustment is necessary to reflect the lower credit risk, *i.e.*, Baa1, of CCWC relative to the A1 / A2 average Moody's bond rating of the proxy group of nine water companies as shown on page 16 of Schedule 11, my updated common equity cost rate analysis. This credit risk adjustment will be discussed subsequently.

Common Equity Cost Rate

Q. Do you agree with Mr. Cassidy's recommended common equity cost rate of 9.3%?

A. No. Mr. Cassidy's common equity cost rate of 9.3% is based upon exclusive reliance upon the results of his DCF analyses. Mr. Cassidy chose to not use the CAPM in this proceeding. Mr. Cassidy discusses his reasons for not using a CAPM analysis on page 3, line 24 through page 4, line 15, concluding that because the "low interest rate environment engineered by the Fed has compelled investors to seek out higher yields on investment wherever they may be found,

resulting in the equity markets having recently achieved new all-time highs"[4] (footnote omitted) and "forecasted dividend yields falling to new lows.[5] (footnote omitted)", the CAPM provides abnormally low cost of common equity estimates and should not be relied upon. However, because forecasted dividend yields have fallen to new lows due to high market valuations, the same can be said for the DCF, namely that it should not be relied upon exclusively in today's capital market and economic environment. However, using informed expert judgment relative to the CAPM's components, it is possible to use a properly applied CAPM analysis which reflects more normal economic and capital market conditions as I have done in both my prepared testimony and updated common equity cost rate analysis discussed at the end of this testimony.

In addition, as stated in my prepared testimony at page 8, lines 19 – 23, "[j]ust as the use of the of the market data for the proxy group adds reliability to the informed expert judgment used in arriving at a recommended common equity cost rate, the use of multiple common equity cost rate models also adds reliability when arriving at a recommended common equity cost rate." This is another way of saying that sampling error from the application of a single cost of common equity model, *e.g.*, the DCF, can be reduced through the use of multiple models. Mr. Cassidy agrees that the use of a proxy or sample group reduces "the sample error resulting from random fluctuations in the market at the time the information is gathered", yet he did not apply this concept when relying exclusively upon the DCF model, albeit, two versions of the DCF.

Moreover, by placing exclusive weight on the results of the application of the DCF, Mr. Cassidy's methodology is inconsistent with the Efficient Market Hypothesis ("EMH") upon which the DCF is predicated. Giving exclusive weight

to a DCF derived cost rate also exacerbates the DCF's tendency to understate the investors' true required return in the current market environment where market-to-book ratios significantly exceed one. . In addition, such a cost rate does not adequately reflect the additional risk experienced by CCWC due to its greater credit risk and small size relative to the companies in its proxy group.

Q. Why is placing exclusive weight on the DCF inconsistent with the EMH?

A. The DCF model utilized by Mr. Cassidy is market-based and therefore based upon the EMH since market prices are employed in its application. As discussed on page 23, line 10 through page 25, line 7 of my prepared testimony, the CAPM and Risk Premium Model ("RPM") are also based on the EMH, pioneered by Eugene F. Fama[5] in 1970 and the foundation of modern investment theory. According to the EMH, an efficient market is one in which security prices reflect all relevant information all the time. This implies that prices adjust instantaneously to new information, thus reflecting the intrinsic fundamental economic value of a security.[6]

The "semistrong" form of the EMH is generally held to be true because the use of insider information often enables investors to "outperform the market" and earn excessive returns in the short-run. The generally-accepted "semistrong" form of the EMH means that all perceived risks, based upon publicly available information, are taken into account by investors in the prices they pay for

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[5] Fama, Eugene F., "Efficient Capital Markets: A Review of Theory and Empirical Work" (Journal of Finance, May 1970) 383-417.

[6] Brigham, Eugene F., Financial Management – Theory and Practice, 5th Ed. (The Dryden Press, 1985) 225.

securities. In addition, investors are aware of such information, including bond ratings, discussions about companies by bond rating agencies and investment analysts, as well as the various cost of common equity methodologies (models) discussed in the financial literature and utilized in ratemaking. This means that no single common equity cost rate model should be relied upon exclusively in determining a common equity cost rate and that the results of multiple cost of common equity cost rate models should be taken into account.

In addition, the academic literature indicates the need to rely upon multiple, independent cost of common equity models in arriving at a recommended common equity cost rate.

Q. Please describe this academic literature.

A. Representative academic literature states the following. For example, Morin[7] states:

> Each methodology requires the exercise of considerable judgment on the reasonableness of the assumptions underlying the methodology and on the reasonableness of the proxies used to validate a theory. *The inability of the DCF model to account for changes in relative market valuation, discussed below, is a vivid example of the potential shortcomings of the DCF model when applied to a given company.* Similarly, the inability of the CAPM to account for variables that affect security returns other than beta tarnishes its use. (Italics added)
>
> No one individual method provides the necessary level of precision for determining a fair return, but each method provides useful evidence to facilitate the exercise of an informed judgment. Reliance on any single method or preset formula is inappropriate when dealing with investor expectations because of possible measurement difficulties and vagaries in individual companies' market data.

* * *

[7] Roger A. Morin, New Regulatory Finance (Public Utility Reports, Inc., 2006) 428-431.

The financial literature supports the use of multiple methods. Professor Eugene Brigham, a widely respected scholar and finance academician, asserts:[1(footnote omitted)]

> Three methods typically are used: (1) the Capital Asset Pricing Model (CAPM), (2) the discounted cash flow (DCF) method, and (3) the bond-yield-plus-risk-premium approach. These methods are not mutually exclusive – no method dominates the others, and all are subject to error when used in practice. Therefore, when faced with the task of estimating a company's cost of equity, we generally use all three methods and then choose among them on the basis of our confidence in the data used for each in the specific case at hand.

Another prominent finance scholar, Professor Stewart Myers, in an early pioneering article on regulatory finance, stated:[2(footnote omitted)]

> Use more than one model when you can. Because estimating the opportunity cost of capital is difficult, only a fool throws away useful information. That means you should not use any one model or measure mechanically and exclusively. Beta is helpful as one tool in a kit, to be used in parallel with DCF models or other techniques for interpreting capital market data.

Reliance on multiple tests recognizes that no single methodology produces a precise definitive estimate of the cost of equity. As stated in Bonbright, Danielsen, and Kamerschen (1988), '*no single or group test or technique is conclusive*.' Only a fool discards relevant evidence. (Italics in original) (Morin, p. 430)

* * *

While it is certainly appropriate to use the DCF methodology to estimate the cost of equity, there is no proof that the DCF produces a more accurate estimate of the cost of equity than other methodologies. Sole reliance on the DCF model ignores the capital market evidence and financial theory formalized in the CAPM and other risk premium methods. The DCF model is one of many tools to be employed in conjunction with other methods to estimate the cost of equity. *It is not a superior methodology that supplants other financial theory and market evidence. The broad usage of the DCF methodology in regulatory proceedings in contrast to its virtual disappearance in academic textbooks does not make it superior to other methods. The same is true of the Risk Premium and CAPM methodologies.* (Italics added)

Brigham and Gapenski[8] state:

> In *practical* work, *it is often best to use all three methods* – CAPM, bond yield plus risk premium, and DCF – and then apply judgment when the methods produce different results. People experienced in estimating equity capital costs recognize that both careful analysis and some very fine judgments are required. It would be nice to pretend that these judgments are unnecessary and to specify an easy, precise way of determining the exact cost of equity capital. Unfortunately, this is not possible. Finance is in large part a matter of judgment, and we simply must face this fact. (Italics in original)

Finally, Brigham and Daves[9] reiterate Brigham and Gapenski's comments when they state:

> Recent surveys found that the CAPM approach is by far the most widely used method. Although most firms use more than one method, almost 74 percent of respondents in one survey, and 85 percent in the other, used the CAPM.[12 (footnote omitted)]
>
> * * *
>
> Approximately 16 percent now use the DCF approach, down from 31 percent in 1982. The bond-yield-plus-risk-premium is used primarily by companies that are not publicly traded.
>
> People experienced in estimating the cost of equity recognize that both careful analysis and sound judgment are required. It would be nice to pretend that judgment is unnecessary and to specify an easy, precise way of determining the exact cost of equity capital. Unfortunately, this is not possible – finance is in large part a matter of judgment, and we simply must face this fact.

In view of all of the foregoing, it is clear that investors are or should be aware of all of the models available for use in determining a common equity cost rate. Thus, implicit in the EMH is the assumption that, collectively, investors consider them all. Hence, Mr. Cassidy's exclusive reliance upon the DCF model

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8 Brigham, Eugene F. and Gapenski, Louis C., Financial Management – Theory and Practice 4th Edition, (The Dryden Press, 1985) 256.

9 Brigham, Eugene F. and Daves, Phillip R., Intermediate Financial Management, (Thomson-Southwestern, 2007) 332-333.

is at odds with the very foundation, *i.e.*, the EMH, upon which the DCF is predicated. In addition, absent empirical evidence to the contrary, there is no evidence, under the EMH, that investors place exclusive weight upon the DCF to the exclusion of other models such as the CAPM and RPM.

Q. You previously mentioned the DCF's tendency to understate the investors' true required return in a market environment where market-to-book ratios significantly exceed one. Why does the DCF model mis-specify investors' required return rates when the market value of common stock differs significantly from its book value?

A. Market prices form the basis of investment decisions and investors' expected rates of return. Nonetheless, in most jurisdictions, including Arizona[10], a regulated utility is limited to earning a return on its net book value (depreciated original cost) rate base. When the market value of assets diverges significantly from their book value, a market-based DCF cost rate applied to the book value of common equity, *i.e.*, rate base, will not produce investors' expected returns.[11] In this regard, I agree with Dr. Morin's explanation in New Regulatory Finance, (2006):[12]

> The third reason and perhaps most important for caution and skepticism is that application of the DCF model produces estimates of common equity cost that are consistent with investors' expected return only when stock price and book value are reasonably similar, that is when the M/B is close to unity. As shown below, application of the standard DCF model to utility stocks understates the investor's expected return when the market-to-book (M/B) ratio of a given stock exceeds unity. This was particularly relevant in the

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[10] Although Arizona is a fair-value rate base state, in this proceeding CCWC is maintaining that its book value rate base is equal to its fair value rate base. Therefore, the authorized return on common equity will be applied to CCWC's book value rate base.

[11] Market values can diverge from book values for a myriad of reasons including, but not limited to, EPS and DPS expectations, merger / acquisition expectations, interest rates, etc.

[12] Roger A. Morin, New Regulatory Finance (Public Utility Reports, Inc., 2006) 434.

> capital market environment of the 1990s and 2000s where utility stocks were trading at M/B ratios well above unity and have been for nearly two decades. The converse is also true, that is, the DCF model overstates that investor's return when the stock's M/B ratio is less than unity. The reason for the distortion is that the DCF market return is applied to a book value rate base by the regulator, that is, a utility's earnings are limited to earnings on a book value rate base.

Despite the turmoil in capital markets over the last several years, utility stocks continue to trade at market-to-book ratios well above unity. Indeed, as shown on page 2 of Schedule 8 of Exhibit___ (DCP-1), *i.e.,* the average market-to-book ratios of water utilities ranged from 141% to 276% from 1992 - 2012.

Mathematically, the DCF model understates investors' required return rate when market value exceeds book value and overstates them when market value is less than book value because, in many instances, market prices reflect investors' assessments of long-range market price growth potentials (consistent with the infinite investment horizon implicit in the standard regulatory version of the DCF model) not fully reflected in analysts' shorter range forecasts of future growth for earnings per share (EPS) and dividends per share (DPS) and other accounting proxies. This indicates the need to better match market prices with investors' longer range growth expectations which are embedded in those prices. The understatement/overstatement of investors' required return rate associated with the application of the market price-based DCF model to the book value of common equity clearly illustrates why reliance upon a single common equity cost rate model should be avoided.

Thus, a mismatch results in the application of the DCF model as market prices reflect long range expectations of growth in market prices (consistent with the presumed infinite investment horizon of the standard DCF model), while the

short range forecasts of growth in accounting proxies, *i.e.,* EPS and DPS, do not reflect the full measure of growth (market price appreciation) expected in per share market value.

Therefore, in an attempt to emulate investor behavior, neither the DCF nor any single common equity cost rate model should be relied upon exclusively in determining a cost rate of common equity and the results of multiple costs of common equity models should be evaluated. Moreover, as previously discussed, the use of multiple cost of common equity models adds reliability to the estimation of the investor-required cost of common equity by moderating potentially abnormal results from any single model.

Q. Can the understatement of Mr. Cassidy's single-stage DCF results of 8.10% be demonstrated mathematically when applied to a depreciated original cost rate base or book value?

A. Yes. Mr. Cassidy's single-stage DCF result of 8.10% equity cost rate is based upon an average dividend yield for his sample water utilities of 2.9% plus a growth rate of 5.2%. However, as demonstrated on Schedule 3, CCWC would have no realistic opportunity to actually earn Mr. Cassidy's market-based rate of return. In this example, the average market price per share is $25.49 and the average book value per share is $11.58. Under these circumstances, Mr. Cassidy's 8.10%, market-based cost rate implies an annual return of $2.065 consisting of $0.739 in dividends and $1.326 in growth (market-price appreciation). However, application of the 8.10% return rate to book value ($11.58), produces an opportunity to earn a total annual return of just $0.938. With annual dividends of $0.739, the utility could reasonably expect market-price appreciation of $0.199, or only 0.78%. In other words, there is no possible way

to achieve the expected growth of $1.326 (5.2%) related to an average market price of $25.49 absent a huge cut in annual cash dividends. Of course, if the converse situation exists (market prices substantially below their book values), a market-based DCF cost rate applied to the book value of common equity would overstate the cost rate.

Consideration of multiple cost of common equity models is always appropriate, but especially when, in view of all of the foregoing, at this time the traditional application of the DCF mis-specifies investors' required return. The DCF mis-specifies, specifically understating investors' required return, because of the confluence of recently rising market prices, the use of accounting measures as proxies for capital appreciation in the DCF, the recent dramatic rise in actual and forecasted interest rates discussed below. The magnitude of this understatement can be found in the difference between the 5.20% growth in market values, *i.e.,* growth in EPS, shown in column 1 on Schedule 3 and the growth in market value of 0.78%, shown in column 2, when the 8.1% single-stage DCF cost rate is applied to book value, or up to approximately 442 basis points. Coupled with the added reliability and accuracy that the use of multiple cost of common equity models provides in the estimation of the cost of common equity, it is more imperative than ever to not give exclusive, primary or even simply greater reliance to the DCF analysis at this time

Q. Do you have any comments upon Mr. Cassidy's applications of the single-stage and multi-stage DCF?

A. Yes. My comments relate specifically to his development of the growth rate for his single-stage DCF and the first stage of his multi-stage DCF.

Although I do not agree with the need to apply a multi-stage DCF for reasons given in my prepared direct testimony at page 25, line 21 through page 26, line 24, given my updated common equity cost rate analysis presented in Schedule 11, Mr. Cassidy's multi-stage DCF result of 9.3% is a reasonable DCF result at this time. It is slightly greater than my average DCF result shown on page 2 and within the range of the results of my cost of common equity models. Although reasonable relative to my DCF analysis, a DCF cost rate of 9.3% still mis-specifies the investor required return as discussed above. Consistent with the *Hope* decision, it is not the methodology, but rather the end result which must not be unjust or unreasonable. As *Hope* states:

> Nor is it important to this case to determine the various permissible ways in which any rate base on which the return is computed might be arrived at. For we are of the view that the end result in this case cannot be condemned under the Act as unjust and unreasonable from the investor or company viewpoint.

Therefore, although I do not agree with the application of a multi-stage DCF model, at this time, Mr. Cassidy's multi-stage DCF results cannot be said to be unreasonable based upon *Hope* and the range of the results of my updated common equity cost rate analysis.

Q. Please comment on Mr. Cassidy's development of his single-stage DCF growth rate.

A. On Schedule JAC-5, Mr. Cassidy presents 10-year historical growth rates in dividends per share ("DPS") and earnings per share ("EPS") as well as projected growth in DPS and EPS, all sourced as coming from *Value Line*, while Schedule JAC-6 presents Mr. Cassidy's derivation of his sustainable growth. Ultimately, Mr. Cassidy relied upon an average of historical and projected DPS growth, historical and projected EPS growth, and historical and projected sustainable

growth. More correctly, Mr. Cassidy should have relied exclusively upon projected EPS growth.

Q. Please comment on Mr. Cassidy's use of DPS and sustainable growth.

A. DCF theory indicates that an investor buys a stock for an expected total return rate composed of cash flows received in the form of dividends plus appreciation in market price, or as Morin[13] states: "dividends, rather than earnings, constitute the source of value." Nevertheless, as noted on page 24, line 6 - 12 of my direct testimony:

> Over the long run, there can be no growth in DPS without growth in EPS. Security analysts' earnings expectations have a more significant, but not sole, influence on market prices than dividend expectations. Thus, the use of earnings growth rates in a DCF analysis provides a better matching between investors' market appreciation expectations and the growth rate component of the DCF. Earnings expectations have a significant influence on market prices and their appreciation or the "growth" experienced by investors.[12] (footnote omitted)

Morin corroborates this concept when he states[14]:

> This does not mean that earnings are unimportant for they provide the basis for paying dividends.

In fact, Morin states the following as well[15]:

> Because of the dominance of institutional investors and their influence on individual investors, analysts' forecasts of long-run growth rates provide a sound basis for estimating required returns. Financial analysts exert a strong influence on the expectations of many investors who do not possess the resources to make their own forecasts, that is, they are a cause of g. The accuracy of these forecasts in the sense of whether they turn out to be correct is not at issue here, as long as they reflect widely held expectations. As long as the forecasts are typical and/or influential in that they are consistent with current stock price levels, they are relevant. The use of analysts' forecasts in the DCF model is sometimes

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[13] Morin 252.
[14] Morin 252
[15] Morin 298

> denounced on the grounds that it is difficult to forecast earnings and dividends for only one year, let alone for longer time periods. This objection is unfounded, however, because it is present investor expectations that are being priced; it is the consensus forecast that is embedded in price and therefore in required return, and not the future as it will turn out to be.
>
> * * *
>
> Published studies in the academic literature demonstrate that growth forecasts made by security analysts represent an appropriate source of DCF growth rates, are reasonable indicators of investor expectations and are more accurate than forecasts based on historical growth. These studies show that investors rely on analysts' forecasts to a greater extent than on historic data only.

Dr. Myron Gordon, the "father" of the standard regulatory version of the DCF model widely utilized throughout the U. S. in rate base / rate of return regulation, who has recognized the significance of analysts" forecasts of growth in EPS. In addition, studies performed by Cragg and Malkiel[16] demonstrate that analysts' forecasts are superior to historical growth rate extrapolations.

Finally, notwithstanding Mr. Cassidy's citation on page 35, lines 20 – 27 of his direct testimony from Jeremy Siegel's book "Stocks For the Long Run", Dr. Siegel actually supports the use of earnings growth forecasts when valuing stocks when he states[17]:

> For the equity holder, the source of future cash flows is the earnings of firms.
>
> * * *
>
> Some people argue that shareholders most value stocks' cash dividends. But this is not necessarily true.
>
> * * *
>
> Since the price of a stock depends primarily on the present discounted value of all expected future dividends, it appears that

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[16] John G. Cragg and Burton G. Malkiel, Expectations and the Structure of Share Prices (University of Chicago Press, 1982) Chapter 4.

[17] Jeremy J. Siegel. Stocks for the Long Run, (McGraw-Hill 2002) 90 – 94.

> dividend policy is crucial to determining the value of the stock. However this is not generally true.
>
> * * *
>
> Since stock prices are the present value of future dividends, it would seem natural to assume that economic growth would be an important factor influencing future dividends and hence stock prices. However, this is not necessarily so. The determinants of stock prices are earnings and dividends on a *per-share* basis. Although economic growth may influence *aggregate* earnings and dividends favorably, economic growth does not necessarily increase the growth of per-share earnings of dividends. It is earnings per share (EPS) that is important to Wall Street because per-share data, not aggregate earnings or dividends, are the basis of investor returns. (Italics in original)

Mr. Cassidy's citation from Dr. Siegel on page 35 of his direct testimony is relative to the use of dividends as the cash flows which are discounted to present value at the discount rate to determine stock prices and not the use of earnings. The paragraph cited by Mr. Cassidy is silent about what growth rate should be used in determining that discount rate (cost of common equity). Thus, Mr. Cassidy's use of Dr. Siegel's citation as support for the use of DPS growth in a DCF analysis is invalid.

In view of all of the foregoing, Mr. Cassidy should more correctly have relied upon earnings per share growth projections in his DCF analyses.

Q. Do you agree with Mr. Cassidy's inclusion of sustainable growth in determining the growth rate component of his DCF analysis?

A. No. Mr. Cassidy's partial reliance upon the sustainable growth methodology for determining the growth rate component for his DCF analyses is based upon historical and expected retention of earnings as well as the historical and projected increase in common share balances as discussed on page 20, line 17 through page 21, line 17 of his direct testimony and derived in Schedule JAC-6.

The sustainable growth methodology is inherently circular because it relies upon either a historical or an expected return on book common equity which is then used in a DCF analysis to establish a common equity cost rate related to the market value of the common stock which, if authorized as the allowed return in a regulatory proceeding, will become the expected return on book common equity. Thus, the resultant allowed DCF derived return on book common equity, Mr. Cassidy's recommended 9.3%, if authorized, is lower than the expected average *Value Line* ROE of 9.9% for his sample water utilities (as derived from his electronic workpapers), used to derive that cost rate based upon sample water utilities' market data. I again agree with Morin[18] who states the following:

> There are three problems in the practical application of the sustainable growth method. The first is that it may be even more difficult to estimate what b, r, s and v investors have in mind than it is to estimate what g is they envisage. It would appear far more economical and expeditious to use available growth forecasts and obtain g directly instead of relying on four individual forecasts of the determinants of such growth. *It seems only logical that the measurement and forecasting errors inherent in using four different variables to predict growth far exceed the forecasting error inherent in the direct forecast of growth itself.*
>
> *Second,* there *is a potential element of circularity in estimating g by a forecast of b and ROE for the utility being regulated, since ROE is determined in large part by regulation. To estimate what ROE resides in the minds of investors is equivalent to estimating the market's assessment of the outcome of regulatory hearings.* Expected ROE is exactly what regulatory commissions set in determining an allowed rate of return. In other words, the method requires an estimate of return on equity before it can even be implemented. *Common sense would dictate the inconsistency of a return on equity recommendation that is different than the expected ROE that the method assumes the utility will earn forever.* For example, using an expected return on equity of 11% to determine the growth rate and using the growth rate to recommend a return

[18] Morin 306 - 307

> on equity of 9% is inconsistent. *It is not reasonable to assume that this regulatory utility company is expected to earn 11% forever, but recommend a 9% return on equity. The only way this utility can earn 11% is that rates be set by the regulator so that the utility will, in fact, earn 11%....*
>
> Third, the *empirical* finance literature discussed earlier demonstrates that the sustainable growth method of determining growth is not as significantly correlated to measures of value, such as stock price and price/earnings ratios, as other historical measures or analysts' growth forecasts. *Other proxies for growth such as historical growth rates and analysts' growth forecasts outperform retention growth estimates.* (Italics added)

In view of the foregoing, it is clear that Mr. Cassidy's use of sustainable growth in his application of the DCF is circular and ignores the basic principle of rate base / rate of return regulation, namely, that the cost of equity which will be authorized in this proceeding will be applied to the jurisdictional book value rate base of CCWC and become the allowed future earned return on book common equity, *i.e.*, the expected return on equity component of the sustainable growth method.

Q. Do you have any further comments regarding Mr. Cassidy's derivation of growth for his DCF analysis?

A. Yes. A review of his electronic workpapers reveals that Mr. Cassidy calculated his DPS, EPS and sustainable growth rates, rather than using the comparable DPS and EPS growth rates or components for sustainable growth published by *Value Line* in each water company's *Ratings & Report.* It is unnecessary for Mr. Cassidy to calculate such growth rates since they are readily available from *Value Line* which is investor influencing and publicly available online or print subscription or free in public libraries throughout the U.S. Moreover, *Value Line* calculates its growth rates from one 3-year base period to another 3-year base period in order

to mitigate possible aberrations in the accounting data it relies upon in any single year. *Value Line*[19] states:

> In an attempt to eliminate short-term fluctuations that may distort results, Value Line uses a three-year base period and an ending period when calculating growth rates. Investors often try to calculate a growth rate from one starting year to one ending year, and then can't understand why the number they get is not the same as the one published by Value Line. If they used a three-year base period (2099-2011) and three-year ending period, (2015-2017), they would get the same results we do.

In view of all of the foregoing, Mr. Cassidy should more correctly have relied upon the projected 5-year EPS growth rates as published in *Value Line*'s *Ratings & Reports* for each of his sample water utilities.

Q. What would Mr. Cassidy's DCF (single-stage and multi-stage) results be had he correctly relied exclusively upon *Value Line*'s published 5-year projected growth in EPS for his sample water utilities.

A. As shown on page 1 of Schedule 4, in his single, or constant, growth DCF result would have been 8.8% and his multi-stage growth DCF result would remain 9.3%, for an average DCF result of 9.1%. When Mr. Cassidy's "economic assessment adjustment" of 60 basis points is added, a common equity cost rate of 9.7% results. However, this 9.7% common equity cost rate is still understated because it does not reflect any additional risk of the Company due to its greater credit risk and smaller relative size as will be discussed below.

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[19] *Complete Overview – The Value Line Investment Survey*, Value Line Inc., 2013 12.

Credit Risk

Q. Does your correction to Mr. Cassidy's common equity cost rate analysis adequately reflect the greater credit risk of the Company relative to the water utilities?

A. No. As discussed previously in this testimony and in my prepared testimony at page 43, lines 6-26, if CCWC's bonds were rated, it is my opinion that they would be rated Baa1 by Moody's. Since the water utilities have been assigned an A1/A2 bond rating by Moody's as shown on page 16 of Schedule 11. Therefore, an indication of the magnitude of such an adjustment is one-third of a recent spread of 0.48% shown on page 17 of Schedule 11 (0.32% = 0.48% * (5/6)).

Business Risk Adjustment

Q. Does your correction to Mr. Cassidy's common equity cost rate analysis adequately reflect the risk implications of the Company's small size relative to the water utilities?

A. No. As discussed previously, company size is a significant element of business risk for which investors expect to be compensated through greater returns. Smaller companies are simply less able to cope with significant events which affect sales, revenues and earnings. For example, smaller companies face more risk exposure to business cycles and economic conditions, both nationally and locally. Additionally, the loss of revenues from a few larger customers would have a greater effect on a small company than on a much larger company with a larger, more diverse, customer base. Moreover, smaller companies are generally less diverse in their operations and have less financial flexibility. In addition, extreme weather conditions, i.e., prolonged droughts or extremely wet

weather, will have a greater affect upon a small operating water utility than upon the much larger, more geographically diverse holding companies.

Further evidence of the risk effects of size include the fact that investors demand greater returns to compensate for the lack of marketability and liquidity of the securities of smaller firms. It is a generally-accepted financial principle that the risk of any investment is directly related to the assets in which the capital is invested. The Commission should focus on the risk and return on the common equity investment in the Company's jurisdictional rate base because it is the Company's rates which will be set in this proceeding. The fair rate of return must relate to where capital is invested. In other words, that it is the use of funds invested and not the source of those funds which gives rise to the risk of any investment. Therefore, the relevant risk reflected in the cost of capital must be that of the Company, including the impact of its small size on common equity cost rate. As noted above, the Company is significantly smaller than the average water group company based upon total capitalization.

Consistent with the financial principle of risk and return discussed above, such increased risk due to small size must be taken into account in the allowed rate of return on common equity.

Q. Does the financial literature support the basic financial principle that it is the use of the funds invested which gives rise to the risk of the investment, not the source of the funds?

A. Yes. As Richard A. Brealey and Stewart C. Myers state in Principles of Corporate Finance[20]:

> *But the company cost of capital rule can also get a firm into trouble if the new* projects *are more or less risky than its existing business. Each project should be evaluated at its own opportunity cost of capital.* This is a clear implication of the value-additivity principle introduced in Chapter 7. For a firm composed of assets A and B, the firm value is
>
> Firm Value = PV (AB) = PV (A) + PV(B) = sum of separate asset values
>
> Here PV(A) and PV(B) are valued just as if they were mini-firms in which stockholders could invest directly ...If the firm considers investing in a third project C, it should also value C as if C were a mini-firm. *That* is, the firm should discount the cash flows of C at the expected rate of return that investors would demand to make a separate investment in C. *The true cost of capital depends on the use to which the capital is put.* (Italics added to first paragraph, italics in original text in last paragraph)

In addition, Haim Levy and Marshall Sarnat[21] state:

> The cost of capital and the discount rate are two concepts which are used throughout the book interchangeably. However, there is a distinction between the *firm's* cost of capital and specific *project's* cost of capital. (Italics contained in original text.)
>
> In any case where the risk profile of the individual projects differ from that of the firm, an adjustment should be made in the required discount rate, to reflect this deviation in the risk profile.

It is fundamental that individual investors expect a return commensurate with the risk associated with where their capital is invested. Hence, the Company must be viewed on its own merits. As *Bluefield* so clearly states:

> A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the

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[20] Richard A. Brealey and Stewart C. Myers, Principles of Corporate Finance (McGraw-Hill Book Company, 1996) 204-205.

[21] Haim Levy and Marshall Sarnat, Capital Investments and Decisions, 5th Ed. (Prentice/Hall International, 1986) 464-465.

> same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; . . .

Bluefield is clear, then, that it is the "risks and uncertainties" surrounding the property employed for the "convenience of the public" which determines the appropriate level of rates and not the source of the capital financing that property. In this proceeding, the property employed "for the convenience of the public" is the rate base of the Company. Therefore, it is the total investment risk of the Company and its rate base alone that is relevant.

Q. Please compare the size of the Company with that of the companies with Mr. Cassidy's water utilities.

A. As a part of my updated common equity cost rate analysis, Mr. Cassidy's sample water utilities are shown on Schedule 5. Page 25 contains a summary of an indicated small size risk adjustment based upon the Ibbotson® SBBI® Valuation Yearbook – Market Results for Stocks, Bonds, Bills and Inflation – 1926-2012 (SBBI – 2013 Valuation) size premium study, while page 26 contains a summary of the market capitalizations based upon each water company's market prices at December 31, 2013. As shown, the Company is significantly smaller than the average water utility based upon market capitalization as shown below:

Table 1

	Market Capitalization (1) ($ millions)	Times Greater than Town of Hampton ($ Millions)
ACC Witness Mr. Cassidy's Sample Water Utilities	$1,107.309	17.9x
Chaparral City Water Co.	61.983	

(1) From page 1 of Schedule 5.

The Company has no common stock which is publicly traded. Consequently, I have assumed that if it did, its common shares would be selling at the same market-to-book value as the average sample water utility. Hence, the Company's market capitalization is estimated to be $57.806 million, based upon the sample water utilities as shown in Table 1 above. In contrast, the market capitalization of the average sample water utility was $1.107 billion, or 17.9 times larger than the Company's estimated market capitalization.

Because of the Company's extremely small estimated market capitalization, relative to the estimated average market capitalization of the sample water utilities, a 4.30% small size risk premium, or the difference between the size premium applicable to the 10th decile in which the Company falls and the 7th decile in which the average sample water utility falls, is justified. In my opinion, although an adjustment of 4.30% is indicated by the SBBI – 2013 Valuation size premium study, an adjustment to common equity cost rate of 40 basis points, represents an extremely conservative and reasonable size premium applicable to the Company based upon its smaller relative size.

In view of the foregoing, an upward adjustment of 0.32 basis points to reflect the Company's greater relative credit risk and a business risk adjustment of 40 basis points, due to its smaller size are necessary. When added to the corrected Mr. Cassidy's cost rate of 9.7%, a risk-adjusted range of common equity cost rate of 10.42%, only slightly lower than my updated common equity cost rate of 10.50% discussed at the end of this testimony.

Review of Analysis of RUCO Witness David C. Parcell

Discounted Cash Flow Model

Q. Please comment upon the applicability of the DCF model in establishing a cost of common equity for the Company.

A. As with any established cost of common equity model, the extent to which the DCF is relied upon should depend upon the extent to which the cost rate results differ from those resulting from the use of other cost of common equity models. As discussed previously, the DCF model has a tendency to mis-specify investors' required return rate when the market value of common stock differs significantly from its book value. The market-based DCF model will result in a total annual dollar return on book common equity equal to the total annual dollar return expected by investors only when market and book values are equal, but market values and book values of common stocks are rarely at unity.

Q. Can the understatement of Mr. Parcell's DCF results of 8.70%, when applied to a depreciated original cost rate base, be demonstrated mathematically?

A. Yes. Mr. Parcell's single-stage DCF result of 8.70% equity cost rate is based upon an average dividend yield for his water utilities of 3.0% plus an growth rate of 5.7%. However, as demonstrated on Schedule 3, CCWC would have no realistic opportunity to actually earn Mr. Parcell's market-based rate of return. In this example, the average per share market price is 726.66 and the average per share book value is $13.57. Under these circumstances, Mr. Parcell's 8.70%, market-based cost rate implies an annual return of $2.319 consisting of $0.800 in dividends and $1.519 in growth (market-price appreciation). However, application of the 8.70% return rate to book value ($13.57), i.e., the equivalent of a utility's depreciated original cost rate base, produces an opportunity to earn a

total annual return of just $1.181. With annual dividends of $0.800, the utility could reasonably expect market-price appreciation of $0.381, or only 1.49%. In other words, there is no possible way to achieve the expected growth of $1.519 (5.7%) related to an average market price of $26.66 absent a huge cut in annual cash dividends. Of course, if the converse situation exists (market prices substantially below their book values), a market-based DCF cost rate applied to the book value of common equity would overstate the cost rate.

The DCF mis-specifies, specifically understating investors' required return, because of the confluence of recently rising market prices, the use of accounting measures as proxies for capital appreciation in the DCF, the recent dramatic rise in actual and forecasted interest rates discussed below. The magnitude of this understatement can be found in the difference between the 5.70% growth in market values, i.e., growth in EPS, shown in column 1 on Schedule 3 and the growth in market value of 1.49%, shown in column 2, when the 8.70% single-stage DCF cost rate is applied to book value, or up to approximately 421 basis points. Coupled with the added reliability and accuracy that the use of multiple cost of common equity models provides in the estimation of the cost of common equity, it is more imperative than ever to not give exclusive, primary or even simply greater reliance to the DCF analysis at this time.

Capital Asset Pricing Model

Q. At page 20 line 28 through page 21, line 2 of Mr. Parcell's direct testimony, he states "...the CAPM is generally superior to the simple RP method because the CAPM specifically recognizes the risk of a particular company or industry, (*i.e.*, beta) whereas the simple RP method assumes the same

COE for all companies exhibiting similar bond ratings or other characteristics." Please comment.

A. Mr. Parcell is incorrect. In his application of the CAPM, he relies upon the yield on 20-year U.S. Treasury bonds as the risk-free rate. By definition, the yield on 20-year U.S. Treasury bonds cannot recognize the risk of a particular company or industry because it reflects the "risk" of the U.S. Government. Moreover, beta is a measure of systematic risk only. As Mr. Parcell notes on page 21, lines 18-19, "Beta is a measure of the relative volatility (and thus risk) of a particular stock in relation to the overall market." Thus, it does not reflect non-systematic or company-specific risks. Moreover, beta measures only a small percentage of the total risk of a particular company because the R^2 (R-Squared) or the correlation coefficients average only 0.2204 for Mr. Parcell's proxy utilities, indicating that the average beta of these utilities reflect only 22.04% of the total risk for the group, as shown on Schedule ~~6~~ 1. In contrast, the risk premium method <u>relies upon the use of a company- or proxy group-specific expected bond yield</u>. As shown on Schedule 3 of Exhibit PMA-1, pages 3 through 5, S&P) explains how and why the utility bond rating process takes into account all of the basic components of business and financial risk. In addition, a significant portion of one application of the risk premium method is derived by the use of beta to allocate a total market equity risk premium. In addition, an even greater proportion of company-specific risk is reflected in the use of the Predictive Risk Premium Model™ (PRPM™). These approaches to the risk premium analysis reflect all company-specific risk. In view of the foregoing, Mr. Parcell's comments that his CAPM is somehow superior to the risk premium method because the risk premium method is "simple" are without merit.

Q. Please comment upon Mr. Parcell's CAPM analysis.

A. Mr. Parcell's CAPM analysis is flawed in three respects. First, he has incorrectly relied upon an historical risk-free rate despite the fact that both ratemaking and the cost of capital are prospective. Second, he has incorrectly calculated his market equity risk premium by relying upon: actually achieved, or non-market based, rates of return on book common equity for a proxy for the market, the S&P 500; a geometric mean historical market equity risk premium; the historical total return on U.S. Treasury securities; and, not employing a prospective, or forward-looking equity risk premium. Third, he has not incorporated an empirical CAPM (ECAPM) analysis despite the fact that empirical evidence indicates that the low-beta securities earn returns higher than the CAPM predicts and high-beta securities earn less.

Q. Please comment upon Mr. Parcell's use of historical, i.e., a recent three-month average, yields on 20-year U.S. Treasury Bonds.

A. Mr. Parcell's use of historical yields on 20-year U.S. Treasury bonds ignores the fact that both the cost of capital and ratemaking are prospective, which Mr. Parcell acknowledges himself when he states on page 7, lines 4-6 that "the cost of capital is an opportunity cost and is prospective-looking." The cost of capital, including the cost rate of common equity, is expectational in that it reflects investors' expectations of future capital markets, including an expectation of interest rate levels, as well as risks. In addition, ratemaking is prospective in that the rates set in this proceeding will be in effect for a period of time in the future.

As with forecasts of EPS growth rates, investors are also aware of the accuracy of past forecasts, whether for earnings or dividends growth or for interest rates. However, investors do not have prior knowledge of the accuracy

of the forecasts available to them at the time they make their investment decisions. The accuracy of any forecast only becomes known after some future period of time has elapsed. For example, the accuracy of the current *Blue Chip Financial Forecasts* (*Blue* Chip) January 1, 2014 consensus forecast of the 30-Year U.S. Treasury Bond of 4.40% for the second quarter 2015 (as shown from page 20 of Schedule 11), cannot be known until the end of the second quarter 2015, more than one year into the future. Therefore, consistent with the previously discussed EMH, since investors have such interest rate projections available to them and are aware of the past accuracy of such projections, prospective and not current interest rate projections should be used in cost of common equity analyses. Therefore, an appropriate risk-free rate is the average of the consensus forecasts of approximately 50 economists from Blue Chip Financial Forecasts for the six quarters ending with the second quarter 2015 from the January 1, 2014 issue and the long-range forecasts from the December 1, 2013 issue for 2015-2019 and 2020-2024, or 4.43%, derived in Note 2 on page 24 of Schedule 11.

Q. Please comment upon Mr. Parcell's estimation of the market equity risk premium for his CAPM analysis.

A. Mr. Parcell's derivation of the market equity risk premium for his CAPM analysis is flawed for the following three reasons. First, he incorrectly relied upon achieved rates of return on book common equity. Second, he incorrectly relied in part upon geometric mean historical market returns. Third, he incorrectly relied upon the historical mean total return on U.S. Treasury securities. Fourth, he did not employ a prospective equity risk premium.

Q. Please comment upon Mr. Parcell's use of the rate of return on book common equity for the S&P 500.

A. Mr. Parcell used the actual achieved rates of earnings on book common equity of the S&P 500 Composite for the period 1978-2012 as shown on Schedule 6 of Exhibit__(DCP-1). As discussed above, both the cost of capital and ratemaking are prospective in nature. In addition, the underlying theory of the CAPM requires the use of an expected market return. Therefore, the use of historically achieved earnings on book common equity is inconsistent with both the prospective nature of both the cost of capital and ratemaking as well as with the very theory of the CAPM. In his second CAPM analysis, Mr. Parcell calculates the historical risk premium using either of Ibbotson® SBBI® – 2013 Classic Yearbook – Market Results for Stocks, Bonds, Bills and Inflation – 1926-2012 (SBBI – 2013 Classic) which presents the average total return on large company stocks from 1926-2012, which are appropriately market returns – not returns on book common equity. Thus, Mr. Parcell's two CAPM analyses are a mismatch because he has mixed returns on book common equity with market returns. Moreover, in estimating the total return on the market, whether by returns on book common equity or with market returns, he did not even consider forecasted market returns. This is in total contradiction to his recognition of the need to use an expected total return (page 20, lines 13-15 of his prepared testimony) and his acknowledgement that the cost of capital is prospective (page 7, lines 4-6 of his prepared testimony).

Q. Please comment upon Mr. Parcell's use of the geometric mean historical market return.

A. At lines 9-12 on page 22 of his prepared testimony, Mr. Parcell notes that he has relied upon both the arithmetic and geometric mean returns for the S&P 500 as tabulated by Morningstar, i.e., Ibbotson Associates. Only arithmetic mean return rates and yields are appropriate for cost of capital purposes because ex-post (historical) total returns and equity risk premiums differ in size and direction over time, providing insight into the variance and standard deviation of returns. Because the arithmetic mean captures the prospect for variance in returns and equity risk premiums, it provides the valuable insight needed by investors in estimating *risk* in the future when making a current investment. Absent such valuable insight into the potential variance of returns, investors cannot meaningfully evaluate prospective risk. The geometric mean of ex-post equity risk premiums provides no insight into the potential variance of future returns because the geometric mean relates the change over many periods to a constant rate of change, rather than the year-to-year fluctuations, or variance, *critical to risk analysis* and therefore has little or no value to investors seeking to measure risk. Moreover, from a statistical perspective, stock returns and equity risk premiums are randomly generated. Thus, the arithmetic mean is also expectational, as is the cost of capital and ratemaking as noted above.

The financial literature is quite clear on this point, that risk is measured by the variability of expected returns, i.e., the probability distribution of returns.[22] Pages 56 and 57 of SBBI – 2013 Valuation (see pages 9 and 10 of Schedule 7) explain in detail why the arithmetic mean is the correct mean to use when estimating the cost of capital.

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[22] Eugene F. Brigham, Fundamentals of Financial Management (The Dryden Press, 1989) 639.

In addition, Weston and Brigham[23] provides the standard financial textbook definition of the riskiness of an asset when they state:

> The riskiness of an asset is defined in terms of the likely variability of future returns from the asset. (emphasis added)

And Morin states[24]:

> The geometric mean answers the question of what constant return you would have to achieve in each year to have your investment growth match the return achieved by the stock market. The arithmetic mean answers the question of what growth rate is the best estimate of the future amount of money that will be produced by continually reinvesting in the stock market. It is the rate of return which, compounded over multiple periods, gives the mean of the probability distribution of ending wealth. (emphasis added)

In addition, Brealey and Myers[25] note:

> The proper uses of arithmetic and compound rates of return from past investments are often misunderstood. . . Thus the arithmetic average of the returns correctly measures the opportunity cost of capital for investments. . . *Moral:* If the cost of capital is estimated from historical returns or risk premiums, use arithmetic averages, not compound annual rates of return. (italics in original)

As previously discussed, investors gain insight into relative riskiness by analyzing expected future *variability*. This is accomplished by the use of the arithmetic mean of a distribution of returns / premiums. Only the arithmetic mean takes into account all of the returns / premiums, hence, providing meaningful insight into the variance and standard deviation of those returns / premiums.

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23 J. Fred Weston and Eugene F. Brigham, Essentials of Managerial Finance Third Edition (The Dryden Press, 1974) 272.

24 Morin 133.

25 Brealey and Myers 146-147.

Q. Can it be demonstrated that the arithmetic mean takes into account all of the returns and therefore, that the arithmetic mean is appropriate to use when estimating the opportunity cost of capital in contrast to the geometric mean?

A. Yes. Pages 1 through 3 of Schedule 7 graphically demonstrate this. Page 1 charts the returns on large company stocks for each and every year, 1926 through 2012 from SBBI – 2013 Valuation. It is clear from looking at the year-to-year variation of these returns, that stock market returns, and hence, equity risk premiums, vary.

The distribution of each and every one of those returns for the entire period from 1926 through 2012 is shown on page 2. There is a clear bell-shaped pattern to the probability distribution of returns, an indication that they are randomly generated and not serially correlated. The arithmetic mean of this distribution of returns considers each and every return in the distribution. In doing so, the arithmetic mean takes into account the standard deviation or likely variance which may be experienced in the future when estimating the rate of return based upon such historical returns. In contrast, page 3 of Schedule 7 demonstrates that when the geometric mean is calculated, only two of the returns are considered, namely the initial and terminal years, which, in this case, are 1926 and 2012. Based upon only those two years, a constant rate of return is calculated by the geometric average. That constant return, graphically, is represented by a flat line, showing no year-to-year variation, over the entire 1926 to 2012 time period, which is obviously far different from reality, based upon the probability distribution of returns shown on page 2 and demonstrated on page 1.

Consequently, only the arithmetic mean takes the standard deviation of returns which is critical to risk analysis into account. The geometric mean is appropriate only when measuring historical performance and should not be used to estimate the investors required rate of return.

Q. **Please comment upon Mr. Parcell's use of the historical mean total return on U.S. Treasury securities.**

A. Although relying upon Morningstar's (i.e., Ibbotson & Associates) historical returns in his CAPM analysis, Mr. Parcell has ignored Ibbotson Associates' recommendations regarding the use of the income return and not the total return on U.S. Treasury securities in deriving an equity risk premium. As indicated on pages 55 and 56 of the SBBI – 2013 Valuation (pages 8 and 9 of Schedule 7):

> Another point to keep in mind when calculating the equity risk premium is that the income return on the appropriate-horizon Treasury security, rather than the total return, is used in the calculation. The total return is comprised of three return components: the income return, the capital appreciation return, and the reinvestment return. The income return is defined as the portion of the total return that results from a periodic cash flow or, in this case, the bond coupon payment. The capital appreciation return results from the price change of a bond over a specific period. Bond prices generally change in reaction to unexpected fluctuations in yields. Reinvestment return is the return on a given month's investment income when reinvested into the same asset class in the subsequent months of the year. The income return is thus used in the estimation of the equity risk premium because it represents the truly riskless portion of the return.[2] (footnote omitted)
>
> * * * *
>
> Anticipated changes in yields are assessed by the market and figured into the price of a bond. Future changes in yields that are not anticipated will cause the price of the bond to adjust accordingly. Price changes in bonds due to unanticipated changes in yields introduce price risk into the total return. Therefore, the total return on the bond series does not represent the riskless rate of return. The income return better represents the unbiased estimate of the purely riskless rate of return, since

an investor can hold a bond to maturity and be entitled to the income return with no capital loss.

Hence, it is appropriate to use the income return and not the total return on long-term U.S. government bonds when calculating a market equity risk premium. Therefore, the correct derivation of the historical market equity risk premium is the difference between the arithmetic mean monthly[26] total return on large company common stocks of 11.83% and the arithmetic mean 1926-2012 income return on long-term government bonds of 5.28% which results in a monthly market equity risk premium of 6.55% as derived in note 1 on page 24 of Schedule 11.

Q. Please comment upon Mr. Parcell's failure to use a prospective or forward-looking market equity risk premium.

A. As noted above, in addition to page 7, lines 4-6, Mr. Parcell clearly states on page 23, lines 9-10 of his prepared testimony that, "the cost of capital is an opportunity cost: the prospective return available to investors from alternative investments of similar risk." Therefore, it is appropriate to also give weight to expected market returns. One way to do so is to use the forecasted market risk premium derived from *Value Line's* average median price appreciation potential and average median expected dividend yield 3-5 years hence of 4.78% as derived in note 1 on page 24 of Schedule 11, coupled with a PRPM™-derived market risk premium of 10.40% also shown in Note 1 on page 24 of Schedule 11. When the Value Line-derived market equity risk premium of 4.78% and the PRPM™-derived market equity risk premium of 10.40%, averaged with the

[26] Monthly arithmetic mean to be consistent with the Predictive Risk Premium Model™ ("PRPM™") use of monthly risk premiums as detailed in Ms. Ahern's prepared testimony.

properly derived historical arithmetic mean monthly equity risk premium of 6.55%, a properly calculated arithmetic mean historical market equity risk premium and prospective market equity risk premiums results in a market equity risk premium of 7.24%.

Q. Did Mr. Parcell incorporate an empirical or ECAPM analysis?

A. No. Mr. Parcell failed to consider that, although numerous tests of the CAPM have confirmed its validity, it has been determined that the empirical Security Market Line (SML) described by the traditional CAPM is not as steeply sloped as the predicted SML.

As discussed in my direct testimony on page 38, lines 13-19, numerous tests of the CAPM have measured the extent to which security returns and betas are related as predicted by the CAPM confirming its validity. However, Morin observes that while the results of these tests support the notion that beta is related to security returns, the empirical Security Market Line (SML) described by the CAPM formula is not as steeply sloped as the predicted SML. Morin[27] states:

> With few exceptions, the empirical studies agree that ... low-beta securities earn returns somewhat higher than the CAPM would predict, and high-beta securities earn less than predicted.
>
> * * *
>
> Therefore, the empirical evidence suggests that the expected return on a security is related to its risk by the following approximation:
>
> $$K = R_F + x\,\beta(R_M - R_F) + (1-x)\ \beta(R_M - R_F)$$
>
> where x is a fraction to be determined empirically. The value of x that best explains the observed relationship Return = 0.0829 +

[27] Morin 175.

0.0520 β is between 0.25 and 0.30. If x = 0.25, the equation becomes:

$$K = R_F + 0.25(R_M - R_F) + 0.75\,\beta(R_M - R_F)$$[28]

In view of theory and practical research, both the traditional CAPM and the ECAPM should be used.

Q. Some critics of the ECAPM model claim that using adjusted betas in a traditional CAPM amounts to using an ECAPM. Is such a claim valid?

A. Using adjusted betas in a CAPM analysis is not equivalent to the ECAPM. Betas are adjusted because of the general regression tendency of betas to converge toward 1.0 <u>over time</u>, i.e., over successive calculations of beta. As noted above, numerous studies have determined that the Security Market Line (SML) described by the CAPM formula at <u>any given moment</u> in time is not as steeply sloped as the predicted SML. Morin[29] states:

> Some have argued that the use of the ECAPM is inconsistent with the use of adjusted betas, such as those supplied by Value Line and Bloomberg. This is because the reason for using the ECAPM is to allow for the tendency of betas to regress toward the mean value of 1.00 over time, and, since Value Line betas are already adjusted for such trend [sic], an ECAPM analysis results in double-counting. This argument is erroneous. Fundamentally, the ECAPM is not an adjustment, increase or decrease, in beta. This is obvious from the fact that the expected return on high beta securities is actually lower than that produced by the CAPM estimate. The ECAPM is a formal recognition that the observed risk-return tradeoff is flatter than predicted by the CAPM based on myriad empirical evidence. The ECAPM and the use of adjusted betas comprised two separate features of asset pricing. Even if a company's beta is estimated accurately, the CAPM still understates the return for low-beta stocks. Even if the ECAPM is used, the return for low-beta securities is understated if the betas are understated. Referring back to Figure 6-1, the ECAPM is a

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[28] Morin 190.

[29] Morin 191.

return (vertical axis) adjustment and not a beta (horizontal axis) adjustment. Both adjustments are necessary.

Moreover, the slope of the Security Market Line (SML) should not be confused with beta. As Eugene F. Brigham, finance professor emeritus and the author of many financial textbooks states[30] :

> The slope of the SML reflects the degree of risk aversion in the economy – the greater the average investor's aversion to risk, then (1) the steeper is the slope of the line, (2) the greater is the risk premium for any risky asset, and (3) the higher is the required rate of return on risky assets.[12]
>
> [12]Students sometimes confuse beta with the slope of the SML. This is a mistake. As we saw earlier in connection with Figure 6-8, and as is developed further in Appendix 6A, beta does represent the slope of a line, but *not* the Security Market Line. This confusion arises partly because the SML equation is generally written, in this book and throughout the finance literature, as $k_i = R_F + b_i(k_M - R_F)$, and in this form b_i looks like the slope coefficient and $(k_M - R_F)$ the variable. It would perhaps be *less confusing if the second term were written* $(k_M - R_F)b_i$, *but this* is not generally done.

Hence, the traditional CAPM understates the cost rate for common equity for companies with betas less than 1.0 and overstates the cost rate for companies with betas greater than 1.0. Consequently, Mr. Parcell erred by not employing the Empirical CAPM (ECAPM).

Q. What would Mr. Parcell's CAPM results be had he utilized the prospective yield on long-term U.S. Treasury bonds, correctly estimated the market equity risk premium based upon arithmetic mean historical returns, including the correct income return on long-term government bonds, and a prospective market equity risk premiums as well as the ECAPM?

[30] Brigham and Gapenski (1985) 203.

A. Schedule 8 presents the results of the correct application of both the traditional CAPM and the ECAPM for Mr. Parcell's water utilities. Page 1 shows the mean / median traditional CAPM results: 9.42% / 9.98%, while page 2 shows the mean / median ECAPM results: 9.50% / 10.04%. The mean / median traditional CAPM and ECAPM results average: 9.70% / 9.77% for the proxy utilities. Averaging the mean and median results as Mr. Parcell does on page 23, lines 1-3 of his prepared testimony, the CAPM-derived indicated result is 9.74% for the water group. However, this cost rate is still understated because it does not reflect any additional risk of the Company due to its greater credit risk and smaller relative size as will be discussed below.

Clearly, then, Mr. Parcell's CAPM conclusion of 7.25% is grossly understated.

Q. Do you have any final comments on Mr. Parcell's comments as to why his CAPM results are so low, *i.e.*, 7.2% - 7.3%?

A. Yes. Mr. Parcell provides two reasons for his "CAPM results" being lower than his DCF and CE results on page 27, lines 11-26 of his prepared testimony. First, he states that "risk premiums are lower currently than was the case in prior years" on lines 12-13. Second, he states on lines 15-16, that "the level of interest rates on U.S. Treasury bonds (i.e., the risk free rate) has been lower in recent years."

Q. Do you agree with Mr. Parcell that risk premiums are lower currently than in prior years.

A. No. Relative to Mr. Parcell's first points, that risk premiums are lower currently than in prior years, Schedule 9 demonstrates that the long-term market equity

risk premium has actually risen since 2009[31]. Using the PRPM™ to calculate market equity risk premiums based upon the returns on large company common stocks from SBBI – 2013 Valuation from January 1926 through each of the month-ends, September, 2009 – November 2013, it is clear that the market equity risk premium has actually risen from 9.95% in September 2009 to 10.40% in November 2013 as shown on page 1 of Schedule 9.

The PRPM™, which has been recently published in the *Journal of Regulatory Economics (JRE)*[32] was developed from the work of Robert F. Engle who shared the Nobel Prize in Economics in 2003 "for methods of analyzing economic time series with time-varying volatility (ARCH)[33]" with ARCH standing for autoregressive conditional heteroskedasticity. In other words, volatility changes over time and is related from one period to the next, especially in financial markets. Engle discovered that the volatility (usually measured by variance) in prices and returns also clusters over time, is therefore highly predictable and can be used to predict future levels of risk and risk premiums. In addition, the PRPM™ is not based upon an estimate of investor behavior, but rather upon the evaluation of the results of that behavior, i.e., the variance of historical equity risk premiums. Also, in the derivation of the premiums, greater weight is given to more recent time periods, in contrast to reliance upon the geometric mean equity risk premium which gives equal weight to the first and last

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31 September 2009 was the month in which the Company was last authorized a return on common equity, 9.9% in Docket No. W-02113A-07-0551 prior to Decision No. 71308.

32 "A New Approach for Estimating the Equity Risk Premium for Public Utilities", Pauline M. Ahern, Frank J. Hanley and Richard A. Michelfelder, Ph.D. The Journal of Regulatory Economics (December 2011), 40:261-278.

33 www.nobelprize.org

premiums only and the arithmetic mean premium which gives equal weight to each observed premium. Consequently, the market equity risk premiums derived using the PRPM™, shown on page 1 of Schedule 9 can provide valuable and statistically robust insight into market equity risk premium levels at any given point in time.

In addition, while market equity risk premiums may have been lower in any given recent year, Mr. Parcell did not rely upon recent, short-term, market equity risk premiums in his CAPM analysis. He relied upon the long-term (1926-2012) historical total returns on both large company common stocks and long-term government bonds from SBBI – 2013 Classic consistent with the long-term nature of the cost of common equity. Page 2 of Schedule 9 shows the long-term market equity risk premiums based upon large company common stocks and long-term government bonds from Ibbotson Associates (Morningstar) for 1926-2009, 1926-2010, 1926-2011 and 1926-2012. Although I have previously discussed why the use of the total return on government bonds as well as geometric means are both inappropriate for cost of capital purposes, page 2 of Schedule 9 presents these premiums for informational purposes. Page 2 also presents the correctly derived equity risk premiums based upon the arithmetic mean and the income return on long-term government bonds. It is clear that based upon all of the equity risk premiums, correctly or incorrectly derived, on page 2, that the long-term market equity risk premium is actually higher now than its current 9.9% return on common equity in October 2009.

As to Mr. Parcell's second point that interest rate levels have been lower in recent years and "have remained low and continued to decline for the past four-plus years" (lines 21-22, page 27),. Mr. Parcell also notes that the decline in

Treasury yields is not temporary (lines 18-21, page 27). Again, the cost of common equity is a long-term and prospective concept and looking at recent and expected interest rate levels over short periods of time in the future, i.e., since September 2009 and through 2014, is inconsistent with the concept that rate of return analysts are seeking to determine investors' expectations and requirements over the long term. Mr. Parcell has no basis for stating that because the Federal Reserve System (Federal Reserve) intends to maintain low interest rate levels through at least 2014[34], that these levels reflect investors' long term expectations. Moreover, on page 27, line 17, Mr. Parcell has acknowledged that the level of interest rates is "partially the result of the actions of the Federal Reserve System to stimulate the economy." Therefore, recent interest rate levels and those expected in the near-term future, *i.e.*, through 2014, are not representative of the long-term cost of capital. Page 2 of Schedule 9 corroborates this as it shows that, as measured by the geometric mean, the average total return on long-term government bonds is the same for the years 1926-2012, 5.70%, as it was for the years 1926-2009 with the correct income returns actually dropping from 5.20% for 1926-2009 to 5.10% for 1926-2012. On a correct arithmetic mean basis, the average total return on long-term government bonds are the same 6.10% for 1926-2009 as it was for 1926-2012. Similarly, the correct arithmetic mean income return on long-term government

[34] In its press release of December 18, 2013 regarding its just concluded December Federal Open Market Committee Meeting (FOMC), the Federal Reserve "reaffirmed its expectation that the current exceptionally low target range for the federal funds rate of 0 to ¼ percent will be appropriate at least as long as the unemployment rate remains about 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored."

bonds is the same, 5.2% for 1926-2009 as it was for 1926-2012, as well as for the period in between.

Clearly, then, Mr. Parcell is wrong on both points. The long-term market equity risk premium is not lower now than when the Company received its last authorized return on common equity in the fall of 2009 and, while interest rate levels have been and are expected to remain low in the short-term, long-term interest rate levels are expected to rise in the next few years. Hence, the recent low interest rate environment is anything but temporary.

Q. Do you agree with Mr. Parcell's implicit assertion that the decline in Treasury yields is not temporary?

A. No. As discussed below, in my opinion the end of the low interest rate environment of the last five years or so is coming to a close, sooner, rather than later, and capital cost will continue to rise in general in the months and years to come.

On November 22, 2013, *Value Line* published its Quarterly Forecast for the U.S. Economy. *Value Line* projects interest rates to rise significantly by 2017. Specifically, the yield on the 3-month Treasury Bill is expected to rise from a current (January 3, 2014) 0.07%[35] to 3.0% in 2017;. the yield on long-term Treasury securities to rise from a current (January 3, 2014) 3.93%[36] to 4.5% in 2017; the yield on Aaa Corporate Bonds to rise from 4.56%[37] (January 3, 2014) to 5.5% in 2017; and, the prime rate to rise from a recent (January 3, 2014)

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[35] Federal Reserve Statistical Release, January 6, 2014.
[36] Federal Reserve, January 6, 2014.
[37] Federal Reserve, January 6, 2014.

3.25%[38] to 5.0% in 2017. These are significant anticipated increases in interest rates and indicate increasing capital costs in the next few years.

In my opinion, the end of the low interest rate environment of the last five years or so, a product of intentional Fed policy, is coming to a close sooner rather than later and capital costs will [continue to] rise in general in the months and years to come, certainly during the life of the rates set in this proceeding. Hence, current and short-term consensus forecasted yields are not representative of current expected higher long-term capital costs.

Comparable Earnings Analysis (CE)

Q. Do you have any comments regarding Mr. Parcell's application of the CE?

A. Yes. At page 26, lines 7-8 of his prepared testimony, Mr. Parcell discusses his CEM result of no more than 9.0% to 10.0% for his proxy utilities. As support for his conclusion, he cites recent returns of 9.0% to 11.1% and market-to-book ratios greater than 170% as well as prospective returns of 8.8% to 9.9%, coupled with market-to-book ratios in excess of 170%. He concludes on lines 11-14 on page 26 that "[a]s a result, it is apparent that returns below this level would continue to result in market-to-book ratios of well above 100 percent. An earned return of 9.0% to 10.0% should thus result in a market-to-book ratio of well above 100 percent." By these statements, it is clear that Mr. Parcell believes that a direct relationship exists between market-to-book ratios and the rate of earnings on book common equity. Such a relationship is not supported by either the academic literature nor by an historical analysis of the experience of unregulated companies.

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[38] *Federal Reserve January 6, 2014*

Q. What does the academic literature say about the relationship between allowed regulatory rates of return on common equity and utility market-to-book ratios?

A. It is very clear from the academic literature that there is no such relationship. Phillips[39] states the following:

> Many question the assumption that market price should equal book value, believing that 'the earnings of utilities should be sufficiently high to achieve market-to-book ratios which are consistent with those prevailing for stocks of unregulated companies.

Also, as noted in my direct testimony at page 28, lines 1-10, while EPS is a significant factor influencing market prices, it is by no means the only factor that affects market prices. Bonbright[40] recognizes as much when he states:

> In the first place, commissions cannot forecast, except within wide limits, the effect their rate Orders will have on the market prices of the stocks of the companies they regulate. In the second place, *whatever the initial market prices may be, they are sure to change not only with the changing prospects for earnings, but with the changing outlook of an inherently volatile stock market.* Moreover, even if a commission did possess the power of control, any attempt to exercise it . . . would result in harmful, uneconomic shifts in public utility rate levels. (italics added)

Q. Have you performed an analysis to determine the existence of a direct relationship between the market-to-book ratios of unregulated companies and their earned rates of return on book common equity?

A. Yes. Since regulation acts as a surrogate for competition, it is reasonable to look to the competitive environment for evidence of a direct relationship between

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39 Charles F. Phillips, Jr., The Regulation of Public Utilities – Theory and Practice, 1993, Public Utilities Reports, Inc., Arlington, VA, p. 395.

40 James C. Bonbright, Albert L. Danielsen, and David R. Kamerschen, Principles of Public Utility Rates, 1988, Public Utilities Reports, Inc., Arlington, VA, p. 334.

market-to-book ratios and earned returns on common equity (ROE). To determine if Mr. Parcell's implicit assumption of such a direct relationship has any merit, I observed the market-to-book ratios and the ROEs of the S&P Industrial Index and the S&P 500 Composite Index over a long period of time. On Schedule 10, I have shown the market-to-book ratios, rates of return on book common equity (earnings/book ratios), annual inflation rates, and the earnings/book ratios net of inflation (real rate of earnings) annually for the years 1947 through 2012. In each and every year, the market-to-book ratios of the S&P Industrial Index equaled or exceeded 1.00 times. In 1949, the only year in which the market-to-book ratio was 1.00 (or 100%), the real rate of earnings on book equity, adjusted for deflation, was 18.1% (16.3% + 1.8%). In contrast, in 1961, when the S&P Industrial Index experienced a market-to-book ratio of 2.01 times, the real rate of earnings on book equity for the Index was only 9.1% (9.8% - 0.7%). In 1997, the market-to-book ratio for the Index was 5.88 times, while the average real rate of earnings on book equity was 22.9% (24.6% - 1.7%).

This analysis clearly demonstrates that competitive, unregulated companies have never sold below book value, on average, and have sold at book value in only one year since 1947. The data show that there is no relationship between earnings/book ratios and market-to-book ratios.

Because this lack of a relationship between earnings/book ratios and market-to-book ratios covers a 65-year period, 1947 through 2012, it cannot be validly argued that going forward a relationship would exist between earnings/book ratios and market-to-book ratios. The analysis shown on Schedule 10 coupled with the supportive academic literature, demonstrate the following:

1. that while regulation is a substitute for marketplace competition, it can influence but not directly control market prices, and, hence, market-to-book ratios; and,
2. that the rates of return investors expect to achieve and which influence their willingness to pay market prices well in excess of book values have no meaningful, direct relationship to rates of earnings on book equity.

Q. Do you have any comment upon the proxy groups Mr. Parcell used in his comparable earnings (CE) analysis?

A. Yes. Mr. Parcell used his water utilities as well as the S&P 500 as discussed on pages 24 and 25 of his prepared testimony. Any proxy group selected for a CE analysis should be broad-based in order to obviate any company-specific aberrations and should exclude utilities to avoid circularity since the achieved returns on book common equity of utilities, being a function of the regulatory process, are substantially influenced by regulatory awards. Therefore, the achieved ROEs of utilities are not representative of the returns that could be earned in a truly competitive market. Hence, Mr. Parcell's use of his water proxy utilities in his CE analysis should be rejected.

That leaves his use of the S&P 500 which, in my opinion, is too broad-based to be comparable in total risk to his proxy utilities and hence, the Company. Also, the use of the S&P 500 does not meet the "'corresponding risk' concept discussed in the Bluefield and Hope cases" (Mr. Parcell's prepared testimony, page 23, lines 7-8).

However, given my updated common equity cost rate analysis presented in Schedule 11, the upper end of Mr. Parcell's CE analysis of 10.0% is

reasonable at this time as it is within the range of the results of my DCF, RPM and CAPM analyses. As noted in *Hope*, it is not the methodology, but rather the end result which must not be unjust or unreasonable. As *Hope* states:

> Nor is it important to this case to determine the various permissible ways in which any rate base on which the return is computed might be arrived at. For we are of the view that the end result in this case cannot be condemned under the Act as unjust and unreasonable from the investor or company viewpoint.

Therefore, although Mr. Parcell's CE analysis is flawed, at this time the upper end of his range of CE results cannot be said to be unreasonable based upon *Hope* and the results of my updated common equity cost rate analysis as discussed below.

Corrected Conclusion of Mr. Parcell's Cost of Common Equity

Q. What would Mr. Parcell's conclusion of common equity cost rate be based upon the corrections to his analyses discussed above?

A. Based upon the corrections to Mr. Parcell's CAPM results discussed above, his three analyses produce the following:

	Value Line Water Group
DCF	8.7% (midpoint: 9.43%)
CAPM	9.70% - 9.77% (midpoint 9.74%)
CE	10.0%

NA = Not Applicable

Focusing on the midpoint of the CAPM range and rejecting the lowest common equity cost rate of 8.7% (consistent with Mr. Parcell's rejection of his lowest cost of common equity result), a range of common equity cost rate of

9.74% - 10.00% with a midpoint of 9.87% is indicated. However, this 9.87% still understates the Company's common equity cost rate because it does not reflect any adjustment for the Company's greater credit risk and business risk due to its smaller size relative to the water utilities as will be discussed below.

Adjustment to Reflect Company-Specific Risk

Credit Risk

Q. Does your correction to Mr. Parcell's common equity cost rate analysis adequately reflect the greater credit risk of the Company relative to the water utilities?

A. No. As discussed in my prepared testimony at page 43, lines 6-26, if CCWC's bonds were rated, it is my opinion that they would be rated Baa1 by Moody's. Since the water utilities have been assigned an A1/A2 bond rating by Moody's as shown on page 16 of Schedule 11, therefore, an indication of the magnitude of such an adjustment is five-sixths of a recent spread of 0.48% shown on page 17 of Schedule 11 (0.32% = 0.48% * (5/6)).

Business Risk Adjustment

Q. Does your correction to Mr. Parcell's common equity cost rate analysis adequately reflect the risk implications of the Company's small size relative to the water utilities?

A. No. As discussed previously, company size is a significant element of business risk which must be reflected in the common equity cost rate applicable to CCWC.

Q. Please compare the size of the Company with that of the companies with Mr. Parcell's water utilities.

A. As a part of my updated common equity cost rate analysis, I updated my business risk adjustment based upon CCWC's smaller size. Page 1 of Schedule

5 contains a summary of an indicated small size risk adjustment based upon the SBBI – 2013 Valuation size premium study, while page 2 contains a summary of the market capitalizations based upon each water company's[41] market prices at December 31, 2013. As shown, the Company is significantly smaller than the average water utility based upon market capitalization as shown below:

Table 2

	Market Capitalization (1) ($ millions)	Times Greater than Town of Hampton ($ Millions)
RUCO Witness Mr. Parcell's Water Utilities	$1,712.285	29.6x
Chaparral City Water Co.	57.806	

(1) From page 1 of Schedule 2.

Based upon the water utilities' market-to-book ratio at December 31, 2013, the Company's market capitalization is estimated to be $57.806 million, as shown in Table 2 above. In contrast, the market capitalization of the average water company in the water group was $1.712 billion, or 29.6 times larger than the Company's estimated market capitalization.

Because of the Company's extremely small estimated market capitalization, relative to the estimated average market capitalization of the water group, a 4.31% small size risk premium, or the difference between the size premium applicable to the 10th decile in which the Company falls and the 6th decile in which the average company in the water group falls, is justified. In my opinion, although an adjustment of 4.31% is indicated by the SBBI – 2013

[41] My proxy group of nine water companies is identical to Mr. Parcell's water utilities.

Valuation size premium study, an adjustment to common equity cost rate of 40 basis points, represents an extremely conservative and reasonable size premium which would be applicable to the Company based upon its smaller relative size.

In view of the foregoing, an upward adjustment of 0.32 basis points to reflect the Company's greater relative credit risk and a business risk adjustment of 40 basis points, due to its smaller size are necessary. When added to the corrected RUCO cost rate of 9.87%, a risk-adjusted range of common equity cost rate of 10.59%, only slightly higher than my updated common equity cost rate of 10.50%.

Response to Comments on Company Testimony

ACC Witness Cassidy's Comments

Discounted Cash Flow Model

Q. Mr. Cassidy criticizes your "sole reliance on analysts' forecasts of EPS growth to estimate the dividend growth rate (g) in your single-stage growth DCF analysis on page 33, line 8 through page 36, line 4. Please comment.

A. I have previously addressed the "superiority of analysts" forecasts of EPS growth for use in a DCF analysis, the relevance of the accuracy of such forecasts which is not known until well after the fact, the fact that investors' discount any potential optimism in such forecasts in the stock prices they pay, and the fact that Mr. Cassidy's citation from Dr. Siegel is misplaced with Dr. Siegel actually endorsing the use of analysts' forecasts of EPS in a DCF analysis. Therefore, I will not repeat that discussion here.

Q. Mr. Cassidy also criticizes your use of a 60-day average stock price in your constant growth DCF analysis on page 33, lines 9 – 12. Please comment.

A. Use of an average stock price smoothes out any temporary market aberrations reducing the "sample error resulting from random fluctuations in the market" as Mr. Cassidy notes on page 16, lines 17 – 18 relative to his use of a sample group of water utilities for his DCF analyses. As for the use of average stock prices employing "stale information", it should be noted that Mr. Cassidy's direct testimony was filed on December 18, 2013 using spot market prices from October 23, 2013, nearly two months earlier. In contrast, my updated cost of common equity uses a 60-day average market price through December 31, 2013.

Risk Premium Model ("RPM"), Capital Asset Pricing Model ("CAPM") and Predictive Risk Premium Model™ ("PRPM™")

Q. Mr. Cassidy criticizes your risk-free rate in your RPM, CAPM and PRPM™. Please comment.

A. Since my prepared testimony was filed and in response to rising interest rates throughout the last year, my update reflects the use of forecasted yields based upon an average of the consensus of the approximate 50 economists contributing to *Blue Chip* for the six quarters ending with the second quarter 2015, for 2015 – 2019 and 2020 – 2014 from the January 1, 2014 and December 1, 2013 *Blue Chip*. Mr. Cassidy's comments are limited to his "suggestion" that my cost of equity estimates from the RPM, CAPM and PRPM™ are overstated. As discussed previously, since the cost of capital and ratemaking are both prospective, it is imperative that forecasted interest rates be used in the RPM, CAPM and PRPM™.

Q. Mr. Cassidy also criticizes the fact that you did not disclose the exact weighting of the results of your cost of common equity analysis on page 37, line 11 through page 39, line 7. Please comment.

A. It can be mathematically determined that the indicated common equity cost rate prior to adjustments for credit and business risks of 10.48% is based upon an average of the average results of 10.21% and the median result of 10.75%. (10.48% = (10.21% + 10.75%) / 2). Since the filing of my prepared testimony, I now rely upon the median result of my applications of multiple cost of common equity models consistent with my use of the median DCF result.

Credit and Business Risk Adjustments

Q. Mr. Cassidy also criticizes both your credit and business risk adjustments. Please comment.

A. Once again, since I have previously addressed the need for both of these adjustments, both in this testimony and in my direct testimony, I will not repeat the discussion here.

RUCO Witness Parcell's Comments

Q. On page 29, lines 13 – 21 of his prepared testimony, Mr. Parcell briefly discusses your application of the PRPM™. Please comment.

A. Mr. Parcell's comments are limited to commenting that the PRPM™ is "a relatively new type of risk premium approach" and that its results are a "higher cost of equity result." While the PRPM™ is new relative to the DCF and CAPM, as discussed in my direct testimony at page 29, line 23 through page 30, line 14, the PRPM™ is based upon the work of Robert F. Engle who shared the Nobel Prize in Economics in 2003 "for methods of analyzing economic time series with time-varying volatility," based, in part, upon Engle's research which culminated in

"Estimating Time Varying Risk Premia in the Term Structure: The ARCH-M Model", *Econometrica*, (Engle, R.F., Lilein, D., & Robins, R) (1987). Hence, the methodology is not "relatively new." In addition, the PRPM™ is in the public domain, having been published twice in academically peer reviewed journals, *The Journal of Regulatory Economics* (December 2011) and *The Electricity Journal* (May 2013).

The PRPM™ has also been presented to a number of utility industry / regulatory / academic groups including the following as noted in Appendix A to my direct testimony: The Edison Electric Institute Cost of Capital Working Group; The NARUC Staff Subcommittee on Accounting and Finance; The National Association of Water Companies Finance/Accounting/Taxation and Rates and Regulations Committees; the NARUC Water Committee; The Wall Street Utility Group; the Indiana Utility Regulatory Commission Cost of Capital Task Force; the Financial Research Institute of the University of Missouri Hot Topic Hotline Webinar; and the Center for Research and Regulated Industries Annual Eastern Conference on two occasions. The PRPM™ also formed the basis of "Comparative Evaluation of the Predictive Risk Premium Model™" (co-authored with Richard A. Michelfelder, Ph.D., Rutgers Univ., Dylan W. D'Ascendis and Frank J. Hanley (both of AUS Consultants, The Electricity Journal, May 2013), a follow-up article to the original "A New Approach for Estimating the Equity Risk Premium for Public Utilities".

In addition, the PRPM™ has been presented in thirty-four (34) rate cases before seventeen (17) regulatory commission during the last two years.

Q. At line 24 on page 30 through line 8 on page 31 of his prepared testimony, Mr. Parcell criticizes your use of the holding period returns published in SBBI – 2013 Valuation. Please comment.

A. Mr. Parcell's criticism of the long-term average holding period returns for the period 1926-2012 is invalid for the reasons given by Ibbotson Associates in its SBBI – 2013 Valuation above, pages 57-59 of SBBI – 2013 Valuation (pages 10 and 11 of Schedule 7). Mr. Parcell states on lines 6 on page 30 of his direct testimony that "[u]se of total returns over the 1926-2012 period, in connection with bond yields over the same long period, seems to imply that "investors in 2013 expect relationships to be the same". More than ever, given the recent deep recession experienced by the U.S. and international markets, unprecedented unemployment, continuing stock market volatility, etc., an appreciation of what can occur over the long historical period of 1926-2012 is necessary for investors in formulating their expectations. At the present time, it is still unclear how rapidly, smoothly or persistently the current fledgling recovery will be. Hence, SBBI – 2013 Valuation's words are more relevant than ever[42]:

> It is even difficult for economists to predict the economic environment of the future. For example, if one were analyzing the stock market in 1987 before the crash, it would be statistically improbable to predict the impending short-term volatility without considering the stock market crash and market volatility of the 1929-1931 period.
>
> Without an appreciation of the 1920s and 1930s, no one would believe that such events could happen. . . . Finally, because historical event-types (not specific events) tend to repeat themselves, long-run capital market return studies can reveal a great deal about the future. Investors probably expect "unusual" events to occur from time to time and their expectations reflect this.

---

[42] SBBI - 2013 Valuation 59.

I would also note that Mr. Parcell himself relied upon SBBI 2012 long-term holding period returns in arriving at his conclusion of the expected total return for the S&P 500 for use in his application of the CAPM.

In addition, the use of the long-term arithmetic mean, by both myself and Mr. Parcell in part, is consistent with the long-term investment horizon of utilities' common stock. The typical application of the DCF model used in regulation presumes an infinite, i.e., long-term, investment horizon and a constant growth rate. This presumption of a constant growth rate is no different than the presumption of a constant equity risk premium based upon long-term historical holding period returns. Both must be expectationally constant.

As stated above, the foregoing confirms that the RPM is similar to the DCF model. The use of a very long-term historic mean equity risk premium does not mean that it is actually constant from year to year in order for the model to be valid. The equity risk premium may vary randomly around some average expected value. Therefore, in view of the foregoing and Mr. Parcell's own use of long-term historic mean holding period returns, his criticisms of my use of such returns are unfounded, invalid, and should be disregarded.

Q. **On lines 6-15 on page 30 of his prepared direct testimony, Mr. Parcell obliquely criticizes your use of the income return on U.S. Treasury securities as invalid. Please comment.**

A. As discussed above, SBBI – 2013 Valuation, upon which both Mr. Parcell and I relied in part for our historical market equity risk premium, is very clear that the income return on long-term bonds is appropriate for cost of capital purposes as

stated on pages 55 and 56 in SBBI - 2013 Valuation (pages 8 and 9 of Schedule 7).

Hence, Mr. Parcell's oblique criticism is unsupported and unwarranted.

Credit Risk Adjustment

Q. On page 31, lines 10-26 of his prepared testimony, Mr. Parcell "disagrees" with your credit risk adjustment. Please comment.

A. Mr. Parcell's "disagreement" is unfounded. As discussed on page 19, line 19 through page 20, line 9 of my prepared direct testimony, notwithstanding the Company's debt ratio of 18.83%, it is my opinion that, were its bonds rated by either Moody's or S&P or were it to be assigned a credit rating by S&P CCWC would be rated in the Baa/BBB bond rating category. First, smaller companies have less financial flexibility as they are unable to cope with significant events affecting sales, revenues and earnings. As such, smaller companies need to maintain lower debt ratios (higher equity ratios) as mitigation but not elimination of their increased risk due to size. Second, the bond rating agencies link the bond ratings of subsidiary companies with those of their parent holding companies.

Since EPCOR Water (USA), Inc. ("EPCOR" or "the Parent"), CCWC's parent, has been assigned a credit rating of BBB+ and since Moody's bond/credit ratings are generally analogous to S&P's, CCWC would likely be assigned a BBB+ bond/credit rating by S&P and Baa1 by Moody's. A Moody's bond/credit rating of Baa1 indicates slightly greater credit risk than that of the proxy group, on average, of A1/A2, as shown on page 16 of Schedule 11. Hence, an upward credit adjustment is indeed warranted. An indication of the magnitude of such an

adjustment is five-sixths of a recent three-month average spread of 0.48% shown on page 17 of Schedule 11 (0.32% = 0.48% * (5/6)).

Therefore, Mr. Parcell's "disagreement" is unwarranted.

Business Risk Adjustment

Q. At lines 1-3 on page 31 of his prepared direct testimony, Mr. Parcell "disagrees" with the business risk adjustment to your recommended common equity cost rate based upon CCWC's small size. Do you agree?

A. No. Mr. Parcell has provided no support for his "disagreement". Thus, it should be disregarded. As stated previously in both this testimony and my prepared testimony, CCWC's size is a risk factor which must be taken into account in developing a common equity cost rate for CCWC. To reiterate, the rate of return established by the Commission in this proceeding will be applied to CCWC's jurisdictional rate base. Also, as discussed previously, it is a generally-accepted financial principle that the risk of any investment is directly related to the assets in which the capital is invested. The Commission must focus on the risk and return of an investment in CCWC's jurisdictional rate base alone because it is only CCWC's rates which will be set in this proceeding and it is only CCWC's rate base which serves its customers.

Updated Overall Cost of Capital and Rate of Return on Common Equity

Q. Have you updated you recommended overall rate of return and rate of return on common equity for CCWC?

A. Yes. Page 1 of Schedule 11 shows my updated common equity cost rate recommendation of 10.50%. In arriving at my updated common equity cost rate recommendation, I have applied the same three cost of common equity models in an manner identical to their application in my direct testimony, with the

exception that I relied exclusively upon forecasted interest rates in my risk premium and CAPM analyses.

Q. Does that conclude your rebuttal testimony?

A. Yes.

EXHIBIT A
SCHEDULES

Chaparral City Water Company Cost of Capital Calculation
Return on Common Equity Implied in
ACC Staff Witness Cassidy's Capital Structure
and Weighted Average Cost of Capital

[A]	[B]	[C]	[D]	[E]
Description	Weight (%) (1)	Cost (1)	Weighted Cost (1)	Pre-Tax Weighted Cost
ACC Staff Recommended Structure				
Debt	40.0%	5.9%	2.4%	2.4%
Common Equity	60.0%	9.3%	5.6%	9.1%
Weighted Average Cost of Capital			8.0%	11.5%
Company Proposed Structure - Revised				
Debt	14.45%	5.97%	0.86%	0.86%
Common Equity	85.55%	7.65% (5)	6.55% (5)	10.6%
Weighted Average Cost of Capital			7.41%	11.5%

Notes:
(1) From Schedule JAC-1
(2) Assuming a company-provided effective composite Federal and State income tax rate of 38.29%, the pre-tax weighted cost of common equity based upon ACC Staff Witness Cassidy's recommended 9.3% common equ cost rate and hypothetical capital structure is: 9.1%. 9.1% = 9.3%/(1 + 0.3829)
(3) Pre-tax weighted cost rate of common equity equals the pre-tax overall weighted cost rate (11.5%) based up ACC Staff Witness Cassidy's recommended 9.3% common equity cost rate and hypothetical capital structure minus the weighted cost rate of debt based upon Chaparral City Water Company's proposed capital structure (reviesd) 0.86%. 11.5% - 0.86% = 10.6%.
(4) Pre-tax weighted overall cost of capital based upon ACC Staff Witness Cassidy's proposed overall rate of ret
(5) Weighted cost of common equity calculated as the pre-tax weighted cost of common equity, 6.55%, divided b Chaparral City Water Company's proposed capital structure ratio, 85.55%. 7.65% = 6.55% / 85.55%.

Exhibit PMA-2
Schedule 2R

Chaparral City Water Company
CAPITALIZATION AND FINANCIAL STATISTICS (1)
2008 - 2012, INCLUSIVE

	2012	2011	2010	2009	2008	
			(MILLIONS OF DOLLARS)			
CAPITALIZATION STATISTICS						
AMOUNT OF CAPITAL EMPLOYED						
TOTAL PERMANENT CAPITAL	$ 31.884	$ 28.154	$ 28.602	$ 27.769	$ 28.458	
SHORT-TERM DEBT	-	-	-	1.178	2.440	
TOTAL-CAPITAL EMPLOYED	$ 31.884	$ 28.154	$ 28.602	$ 28.947	$ 30.898	
INDICATED AVERAGE CAPITAL COST RATES (2)						
TOTAL DEBT	5.55 %	6.06 %	5.56 %	5.13 %	5.34 %	
PREFERRED STOCK						
CAPITAL STRUCTURE RATIOS						
BASED ON TOTAL PERMANENT CAPITAL:						5 YEAR
LONG-TERM DEBT	15.48 %	18.83 %	19.74 %	21.52 %	22.09 %	19.53 %
PREFERRED STOCK	-	-	-	-	-	-
COMMON EQUITY	84.52	81.17	80.26	78.48	77.91	80.47
TOTAL	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
BASED ON TOTAL CAPITAL:						
TOTAL DEBT, INCLUDING SHORT-TERM	15.48 %	18.83 %	19.74 %	24.71 %	28.24 %	21.40 %
PREFERRED STOCK	-	-	-	-	-	-
COMMON EQUITY	84.52	81.17	80.26	75.29	71.76	78.60
TOTAL	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
DIVIDEND PAYOUT RATIO	96.96 %	107.35 %	- %	- %	- %	40.86 %
RATE OF RETURN ON AVERAGE COMMON EQUITY	6.21 %	6.10 %	5.20 %	(1.75) %	(18.39) %	(0.53) %
TOTAL DEBT / EBITDA (3)	1.36 x	1.09 x	1.35 x	3.97 x	(1.77) x	1.20 x
FUNDS FROM OPERATIONS / TOTAL DEBT (4)	38.00 %	58.00 %	56.00 %	38.00 %	30.00 %	44.00 %
TOTAL DEBT / TOTAL CAPITAL	15.48 %	18.83 %	19.74 %	24.71 %	28.24 %	21.40 %

Notes:

(1) *All capitalization and financial statistics for the group are the arithmetic average of the achieved results*

(2) Computed by relating actual total debt interest or preferred stock dividends booked to average of

(3) Total debt as a percentage of EBITDA (Earnings before Interest, Income Taxes, Depreciation and

(4) Funds from Operations (sum of net income, depreciation, amortization, net deferred income tax and

Source of Information: Chaparral City Water Company Audited Financial Statements

Chaparral City Water Company
Example of the Inadequacy of
DCF Return Rate Related to Book Value
When Market Value Exceeds Book Value

Line No.		Based on ACC Staff Witness Cassidy's Sample Water Utilities		Based upon RUCO Witness Parcell's Water Utilities	
		(1) Market Value	(2) Book Value	(3) Market Value	(4) Book Value
1.	Per Share	$ 25.49 (1)	$ 11.58 (1)	$ 26.66 (2)	$ 13.57 (3)
2.	DCF Cost Rate (3)	8.10%	8.10%	8.70%	8.70%
3.	Return in Dollars	$ 2.065	$ 0.938	$ 2.319	$ 1.181
4.	Dividends	$ 0.739 (4)	$ 0.739 (4)	$ 0.800 (5)	$ 0.800 (5)
5.	Growth in Dollars	$ 1.326	$ 0.199	$ 1.519	$ 0.381
6.	Return on Market Value (6)	8.10%	3.68%	9.10%	4.63%
7.	Rate of Growth on Market Value (7)	5.20%	0.78%	5.70%	1.49%

Notes:
(1) Derived from From Schedule JAC-7.
(2) Derived from Exhibit___(DCP-1), Schedule 5, page 1.
(3) From page 26 of Schedule 11 of this Exhibit.
(4) Dividends per share based upon a 2.9% dividend yield. $0.739 = $25.49 * 2.9%.
(5) Dividends per share based upon a 3.0% dividend yield. $0.800 = $26.66 * 3.0%.
(6) Line 3 / market value per share (line 1 column (a)).
(7) Line 6 - average dividend yield.

Chaparral City Water Company Cost of Capital Calculation
Final Cost of Equity Estimates
Sample Water Utilities

[A]	[B]	[C]		[D]		[E]
DCF Method		D_1/P_0 [1]	+	g [2]	=	k
Constant Growth DCF Estimate		2.9%	+	5.9%	=	8.8%
Multi-Stage DCF Estimate					=	9.3%
Average DCF Estimate						**9.1%**

Staff's Estimated Cost of Equity	**9.1%**
Economic Assessment Adjustment	0.6%
Sub-Total	**9.7%**
Financial Risk Adjustment	0.0%
Total	**9.7%**

Earnings Per Share Projected Growth EPS

American States Water	6.0 %
California Water	6.5
Aqua America	8.0
Connecticut Water	5.5
Middlesex Water	4.0
SJW Corp	7.5
York Water	4.0
Average Sample Water Utilities	5.9 %

Source of Information: *Value Line Investment Survey*, October 18, 2013

Chaparral City Water Company Cost of Capital Calculation
Multi-Stage DCF Estimates
Sample Water Utilities

[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
Company	Current Mkt. Price (P_o)[1] 10/23/2013	Projected Dividends[2] (Stage 1 growth) (D_t) d_1	d_2	d_3	d_4	Stage 2 growth[3] (g_n)	Equity Cost Estimate (K)[4]
American States Water	27.8	0.76	0.81	0.86	0.91	6.5%	9.2%
California Water	21.3	0.65	0.68	0.72	0.77	6.5%	9.5%
Aqua America	25.2	0.59	0.63	0.67	0.71	6.5%	8.8%
Connecticut Water	32.5	1.01	1.07	1.14	1.20	6.5%	9.6%
Middlesex Water	21.1	0.79	0.84	0.88	0.94	6.5%	10.2%
SJW Corp	29.5	0.73	0.78	0.82	0.87	6.5%	8.9%
York Water	21.1	0.58	0.61	0.65	0.69	6.5%	9.2%
						Average	**9.3%**

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{(1+K)^t} + \frac{D_n(1+g_n)}{K-g_n}\left[\frac{1}{(1+K)}\right]^n$$

Where : P_0 = current stock price
D_t = dividends expected during stage 1
K = cost of equity
n = years of non – constant growth
D_n = dividend expected in year n
g_n = constant rate of growth expected after year n

1 [B] see Schedule JAC-7
2 Derived from Value Line information using EPS growth rates from page 1 of this Schedule.
3 Average annual growth in GDP 1929 - 2012 in current dollars. (From JAC-9)
4 Internal Rate of Return of Projected Dividends

AMER. STATES WATER NYSE-AWR

RECENT PRICE 26.48 | P/E RATIO 17.9 (Trailing: 17.4 Median: 22.0) | RELATIVE P/E RATIO 1.02 | DIV'D YLD 3.1% | VALUE LINE

TIMELINESS 3 Lowered 8/16/13
SAFETY 2 Raised 7/20/12
TECHNICAL 3 Raised 8/23/13
BETA .70 (1.00 = Market)

High:	14.5	14.5	13.4	17.3	21.9	23.1	21.0	19.4	19.8	18.2	24.1	33.1				
Low:	10.1	10.8	10.4	12.2	15.1	16.8	13.5	14.9	15.6	15.3	17.0	24.0				

Target Price Range 2016 | 2017 | 2018

2016-18 PROJECTIONS

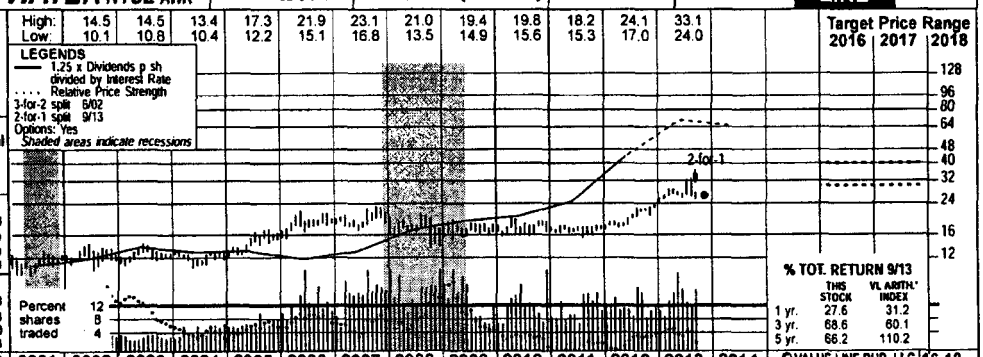
	Price	Gain	Ann'l Total Return
High	40	(+50%)	14%
Low	30	(+15%)	7%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	1	0	0	0	0	2	1	0
Options	1	1	1	0	0	1	4	4	0
to Sell	2	3	1	0	0	0	5	5	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	77	93	98
to Sell	64	59	70
Hld's(000)	24066	24964	24268



% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	27.6	31.2
3 yr.	68.6	60.1
5 yr.	66.2	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
5.72	5.51	6.45	6.08	6.53	6.89	6.99	6.81	7.03	7.88	8.75	9.21	9.74	10.71	11.12	12.12	12.30	12.50	Revenues per sh	12.75
.92	1.02	1.13	1.10	1.26	1.27	1.04	1.11	1.32	1.45	1.65	1.69	1.70	2.11	2.13	2.48	2.60	2.65	"Cash Flow" per sh	3.20
.52	.54	.60	.64	.67	.67	.39	.53	.66	.67	.81	.78	.81	1.11	1.12	1.41	1.50	1.55	Earnings per sh A	1.70
.42	.42	.43	.43	.43	.44	.44	.44	.45	.46	.48	.50	.51	.52	.55	.64	.76	.83	Div'd Decl'd per sh B■	.95
1.29	1.56	2.15	1.51	1.59	1.34	1.88	2.51	2.12	1.95	1.45	2.23	2.09	2.12	2.13	1.77	2.15	2.20	Cap'l Spending per sh	2.10
5.62	5.74	5.91	6.37	6.61	7.02	6.98	7.51	7.86	8.32	8.77	8.97	9.70	10.13	10.84	11.80	11.85	12.50	Book Value per sh	14.25
26.87	26.87	26.87	30.24	30.24	30.36	30.42	33.50	33.60	34.10	34.46	34.60	37.06	37.26	37.70	38.53	39.00	40.00	Common Shs Outst'g C	44.00
14.5	15.5	17.1	15.9	16.7	18.3	31.9	23.2	21.9	27.7	24.0	22.6	21.2	15.7	15.4	14.3	Bold figures are		Avg Ann'l P/E Ratio	19.5
.84	.81	.97	1.03	.86	1.00	1.82	1.23	1.17	1.50	1.27	1.36	1.41	1.00	.97	.91	Value Line		Relative P/E Ratio	1.30
5.5%	5.0%	4.2%	4.2%	3.9%	3.6%	3.5%	3.6%	3.1%	2.5%	2.5%	2.9%	2.9%	3.0%	3.2%	3.1%	estimates		Avg Ann'l Div'd Yield	3.1%

CAPITAL STRUCTURE as of 6/30/13
Total Debt $335.8 mill. **Due in 5 Yrs** $10.6 mill.
LT Debt $332.4 mill. **LT Interest** $8.0 mill.
(LT interest earned: 5.2x: total interest coverage: 4.9x) (42% of Cap'l)
Leases, Uncapitalized: Annual rentals $3.0 mill.
Pension Assets-12/12 $107.6 mill. **Oblig.** $163.2 mill.
Pfd Stock None.
Common Stock 38,688,804 shs. as of 8/6/13 *(Reflects 2-for-1 stock split paid 9/3/13.)*
MARKET CAP: $1.0 billion (Mid Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
212.7	228.0	236.2	268.6	301.4	318.7	361.0	398.9	419.3	466.9	480	500	Revenues ($mill)	560
11.9	16.5	22.5	23.1	28.0	26.8	29.5	41.4	42.0	54.1	58.0	60.0	Net Profit ($mill)	73.0
43.5%	37.4%	47.0%	40.5%	42.6%	37.8%	38.9%	43.2%	41.7%	39.9%	40.0%	40.0%	Income Tax Rate	40.0%
--	--	--	12.2%	8.5%	-6.9%	3.2%	5.8%	2.0%	2.5%	2.5%	2.5%	AFUDC % to Net Profit	2.5%
52.0%	47.7%	50.4%	48.6%	46.9%	46.2%	45.9%	44.3%	45.4%	42.2%	43.0%	43.0%	Long-Term Debt Ratio	43.0%
48.0%	52.3%	49.6%	51.4%	53.1%	53.8%	54.1%	55.7%	54.6%	57.8%	57.0%	57.0%	Common Equity Ratio	57.0%
442.3	480.4	532.5	551.6	569.4	577.0	685.0	677.4	749.1	787.0	805	875	Total Capital ($mill)	1025
602.3	664.2	713.2	750.6	776.4	825.3	866.4	855.0	896.5	917.8	940	985	Net Plant ($mill)	1100
4.6%	5.2%	5.4%	6.0%	6.7%	6.4%	5.9%	7.6%	7.1%	8.3%	7.0%	7.0%	Return on Total Cap'l	6.5%
5.6%	6.6%	6.5%	8.1%	9.3%	8.6%	8.2%	11.0%	10.3%	11.9%	12.5%	12.0%	Return on Shr. Equity	11.5%
5.6%	6.6%	8.5%	8.1%	9.3%	8.6%	8.2%	11.0%	10.3%	11.9%	12.5%	12.0%	Return on Com Equity	11.5%
NMF	1.0%	2.8%	2.7%	3.9%	3.1%	3.2%	5.8%	5.3%	6.6%	6.0%	6.0%	Retained to Com Eq	5.0%
113%	84%	67%	67%	58%	64%	61%	47%	49%	45%	51%	54%	All Div'ds to Net Prof	56%

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	1.3	23.5	8.5
Other	164.3	160.5	172.6
Current Assets	165.6	184.0	181.1
Accts Payable	37.9	40.6	55.2
Debt Due	.3	3.3	3.4
Other	66.2	49.8	43.8
Current Liab.	104.4	93.7	102.4
Fix. Chg. Cov.	401%	442%	450%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	5.5%	7.5%	2.0%
"Cash Flow"	6.5%	9.0%	6.0%
Earnings	6.5%	11.5%	6.0%
Dividends	3.0%	4.5%	9.0%
Book Value	5.0%	5.5%	2.0%

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	88.4	95.5	111.3	103.7	398.9
2011	94.3	109.8	119.9	95.3	419.3
2012	107.6	114.3	133.5	111.5	466.9
2013	110.5	120.7	135	113.8	480
2014	115	125	140	120	500

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.23	.24	.31	.33	1.11
2011	.19	.34	.42	.17	1.12
2012	.27	.40	.49	.26	1.41
2013	.35	.43	.48	.24	1.50
2014	.33	.42	.55	.30	1.60

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.125	.125	.125	.13	.51
2010	.13	.13	.13	.13	.52
2011	.13	.14	.14	.14	.55
2012	.14	.14	.178	.178	.64
2013	.178	.178	.203		

BUSINESS: American States Water Co. operates as a holding company. Through its principal subsidiary, Golden State Water Company, it supplies water to more than 250,000 customers in 75 communities in 10 counties. Service areas include the greater metropolitan areas of Los Angeles and Orange Counties. The company also provides electric utility services to nearly 23,250 customers in the city of Big Bear Lake and in areas of San Bernardino County. Sold Chaparral City Water of Arizona (6/11). Has 728 employees. Officers & directors own 2.9% of common stock (4/12 Proxy). Chairman: Lloyd Ross. President & CEO: Robert J. Sprowls. Inc: CA. Addr: 630 East Foothill Boulevard, San Dimas, CA 91773. Tel: 909-394-3600. Internet: www.aswater.com.

Nonutility operations are a key component of American States Water. Last year, its nonregulated subsidiary, American States Utilities Services (ASUS), accounted for $0.39 a share, or 28% of the company's share net. This percentage was easily the highest among the eight water utilities that *Value Line* follows.

Estimating future profits from these businesses will be more difficult in the years ahead. The core of the ASUS profits has come from operating and maintaining water services at eight U.S. military bases. Some analysts on Wall Street believe that 2012 was perhaps the peak earnings year for ASUS, but we think that these projections are conservative. True, the company's backlog of new projects isn't large. However, with a substantial number of military facilities yet to be privatized, we believe that ASUS' good reputation with the Department of Defense will greatly help it win a fair share of future contracts. Thus, we think earnings of between $0.40 a share and $0.50 a share from this segment are attainable to the 2016-2018 pull. Since winning contracts is less predictable than its core business, American States earnings might experience greater swings than in the past.

Meanwhile, core regulated operations are doing fine. Due mostly TO a recent rate increase granted to Golden State Water (the main water utility), earnings growth should be somewhere in the 5%-7% range. Indeed,

We're raising our earnings projections again. For the second straight quarter, American States share net exceeded expectations in the June period. As a result, we are nudging the company's earnings-per-share estimates higher by $0.05 in 2013, and $0.10 in 2014, respectively. *(Please note that all figures on the page have been changed to reflect the two-for-one stock split paid on September 3rd.)*

American States' shares offer slightly better-than-average potential long-term returns for a water utility. The current yield is typical for the industry, but dividend growth prospects are higher than the group norm. Moreover, the company is the third-largest water utility we follow, and is the only one that rates an A Financial Strength Rating.

James A. Flood *October 18, 2013*

(A) Primary earnings. Excludes nonrecurring gains/(losses): '04, 7¢; '05, 13¢; '06, 3¢; '08, (14¢); '10, (23¢) '11, 10¢. Next earnings report due early November. Quarterly egs. may not add due to rounding.
(B) Dividends historically paid in early March, June, September, and December. ■ Div'd reinvestment plan available.
(C) In millions, adjusted for splits.

Company's Financial Strength	A
Stock's Price Stability	90
Price Growth Persistence	75
Earnings Predictability	90

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AMERICAN WATER NYSE-AWK

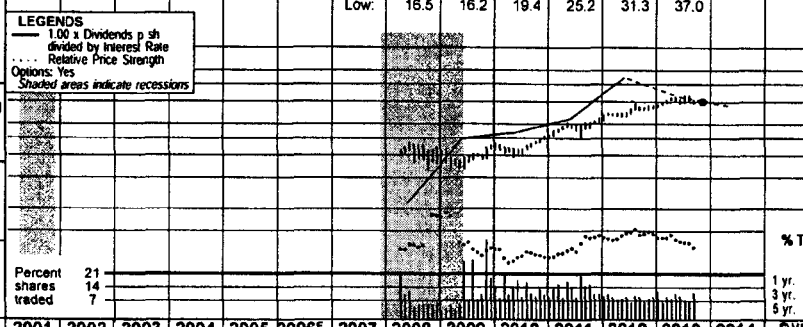
RECENT PRICE 40.09 | P/E RATIO 18.0 (Trailing: 19.5 Median: NMF) | RELATIVE P/E RATIO 1.02 | DIV'D YLD 2.9% | VALUE LINE

TIMELINESS 3 Raised 10/4/13
SAFETY 3 New 7/25/08
TECHNICAL 3 Lowered 8/9/13
BETA .65 (1.00 = Market)

	2008	2009	2010	2011	2012	2013
High:	23.7	23.0	25.8	32.8	39.4	43.7
Low:	16.5	16.2	19.4	25.2	31.3	37.0

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.00 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
Options: Yes
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	60	(+50%)	13%
Low	45	(+10%)	6%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	4	0	0	0	8	0	3	0	0
to Sell	4	0	0	0	8	0	3	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	188	191	165
to Sell	175	186	209
Hld's(000)	146609	145912	144834

Percent shares traded 21 14 7

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	14.4	31.2
3 yr.	93.8	60.1
5 yr.	127.5	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006E	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
--	--	--	--	--	--	--	--	--	13.08	13.84	14.61	13.98	15.49	15.18	16.25	*16.60*	*17.50*	Revenues per sh	*20.25*
--	--	--	--	--	--	--	--	--	.65	d.47	2.87	2.89	3.56	3.73	4.27	*4.45*	*4.70*	"Cash Flow" per sh	*5.25*
--	--	--	--	--	--	--	--	--	d.97	d2.14	1.10	1.25	1.53	1.72	2.11	*2.20*	*2.40*	Earnings per sh A	*2.90*
--	--	--	--	--	--	--	--	--	--	--	.40	.82	.86	.91	.96	*1.06*	*1.20*	Div'd Decl'd per sh B■	*1.40*
--	--	--	--	--	--	--	--	--	4.31	4.74	6.31	4.50	4.38	5.27	5.25	*5.35*	*5.35*	Cap'l Spending per sh	*5.50*
--	--	--	--	--	--	--	--	--	23.86	28.39	25.64	22.91	23.59	24.11	25.10	*26.40*	*27.50*	Book Value per sh D	*30.00*
--	--	--	--	--	--	--	--	--	160.00	160.00	160.00	174.63	175.00	175.66	176.99	*178.50*	*180.00*	Common Shs Outst'g C	*185.00*
--	--	--	--	--	--	--	--	--	--	--	18.9	15.6	14.6	16.8	16.7	*Bold figures are*		Avg Ann'l P/E Ratio	*18.5*
--	--	--	--	--	--	--	--	--	--	--	1.14	1.04	.93	1.05	1.07	*Value Line*		Relative P/E Ratio	*1.25*
--	--	--	--	--	--	--	--	--	--	--	1.9%	4.2%	3.8%	3.1%	2.7%	*estimates*		Avg Ann'l Div'd Yield	*2.7%*
						--	--	--	2093.1	2214.2	2336.9	2440.7	2710.7	2666.2	2876.9	*2960*	*3150*	Revenues ($mill)	*3750*
						--	--	--	d155.8	d342.3	187.2	209.9	267.8	304.9	375.0	*390*	*430*	Net Profit ($mill)	*535*
						--	--	--	--	--	37.4%	37.9%	40.4%	39.5%	40.7%	*40.0%*	*40.0%*	Income Tax Rate	*40.0%*
						--	--	--	--	--	--	--	--	12.5%	6.2%	*8.0%*	*10.0%*	AFUDC % to Net Profit	*12.0%*
						--	--	--	56.1%	50.9%	53.1%	56.9%	56.8%	55.7%	53.8%	*54.0%*	*54.0%*	Long-Term Debt Ratio	*54.5%*
						--	--	--	43.9%	49.1%	46.9%	43.1%	43.2%	44.2%	46.0%	*46.0%*	*46.0%*	Common Equity Ratio	*45.5%*
						--	--	--	8692.8	9245.7	8750.2	9289.0	9561.3	9580.3	9652.7	*10300*	*10800*	Total Capital ($mill)	*11800*
						--	--	--	8720.6	9318.0	9991.8	10524	11059	11021	11739	*12300*	*12800*	Net Plant ($mill)	*14200*
						--	--	--	NMF	NMF	3.7%	3.8%	4.4%	4.8%	5.5%	*5.5%*	*5.5%*	Return on Total Cap'l	*6.0%*
						--	--	--	NMF	NMF	4.6%	5.2%	6.5%	7.2%	8.4%	*8.0%*	*8.5%*	Return on Shr. Equity	*9.5%*
						--	--	--	NMF	NMF	4.6%	5.2%	6.5%	7.2%	8.4%	*8.0%*	*8.5%*	Return on Com Equity	*9.5%*
						--	--	--	NMF	NMF	3.0%	1.8%	2.8%	3.5%	4.6%	*4.5%*	*4.5%*	Retained to Com Eq	*4.5%*
						--	--	--	--	--	34%	65%	56%	52%	45%	*48%*	*50%*	All Div'ds to Net Prof	*50%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $5761.0 mil. Due in 5 Yrs $1034.0 mil.
LT Debt $5180.7 mil. LT Interest $301.0 mil.
(Total interest coverage: 4.4x) (53% of Cap'l)

Leases, Uncapitalized: Annual rentals $28.1 mill.
Pension Assets $1157.7 mill
Oblig. $1621.2 mill.
Pfd Stock $17.6 mill. Pfd Div'd $.7 mill

Common Stock 177,964,133 shs.
as of 8/1/13

MARKET CAP: $7.1 billion (Large Cap)

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	14.2	24.4	20.4
Other	1383.5	475.0	525.4
Current Assets	1397.7	499.4	545.8
Accts Payable	243.7	279.6	178.4
Debt Due	543.9	385.9	580.3
Other	701.5	329.3	290.6
Current Liab.	1489.1	994.8	1049.3
Fix. Chg. Cov.	256%	292%	300%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	--	3.0%	*5.0%*
"Cash Flow"	--	NMF	*6.5%*
Earnings	--	--	*10.0%*
Dividends	--	--	*9.0%*
Book Value	--	-1.5%	*4.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	588.1	671.2	786.9	664.5	2710.7
2011	596.7	668.8	760.9	639.8	2666.2
2012	618.7	745.6	831.8	680.8	2876.9
2013	636.1	724.3	*890*	*709.6*	*2960*
2014	*670*	*775*	*945*	*760*	*3150*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.18	.42	.71	.23	1.53
2011	.23	.42	.73	.32	1.72
2012	.28	.66	.87	.30	2.11
2013	.32	.57	*.90*	*.41*	*2.20*
2014	*.35*	*.65*	*1.00*	*.40*	*2.40*

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.20	.20	.21	.21	.82
2010	.21	.21	.22	.22	.86
2011	.22	.23	.23	.23	.91
2012	.23	.23	.25	.25	.96
2013	.25	.25	.28		

BUSINESS: American Water Works Company, Inc. is the largest investor-owned water and wastewater utility in the U.S., providing services to over 14 million people in over 30 states and Canada. It's nonregulated business assists municipalities and military bases with the maintenance and upkeep as well. Regulated operations made up 89.1% of 2012 revenues. New Jersey is its biggest market accounting for 22.2% of revenues. Has roughly 7,000 employees. Depreciation rate, 2.6% in '12. BlackRock, Inc., owns 10.3% of the common stock outstanding. Off. & dir. own less than 1% (3/13 Proxy). President & CEO; Jeffry Sterba. Chairman; George Mackenzie. Address: 1025 Laurel Oak Road, Voorhees, NJ 08043. Telephone: 856-346-8200. Internet: www.amwater.com.

American Water Works continues to do a good job of staying on the right side of regulators. The company must contend with 30 different state regulatory commissions in order to recoup the large sums that it is investing in its individual water systems located throughout the country. The utility's basic formula for success in dealing with regulators has been to keep costs low. This feat has been achieved by improving operating margins and continually reducing expense ratios, a trend we expect to continue. Indeed, effective cost containment makes it much more difficult for state commissions to deny much needed rate increases.

Expansion via acquisitions will remain a key element to American Water's long-term growth. The company should continue to scoop up some of the small water utilities that cash-strapped municipalities are willing to sell. Sixteen purchases were made last year and 10 have already been completed so far in 2013. It is American Water's expertise in integrating these new entities into its existing operations and reducing overhead that is behind its leaner cost structure.

American Water's construction budget should be large but manageable. Capital expenditures will probably be close to $1 billion a year over the next 3- to 5-year period, due to the need to upgrade and repair the company's aging infrastructure. Internally generated funds will probably cover only about 75% of the outlays over this time frame. As a result, American Water will most likely have to issue more debt to make up the difference.

American Water's earnings and dividend growth prospects are good. The combination of efficient operations, inorganic growth, and greater contributions from nonutility businesses should enable annual earnings and dividend increases in the 7% to 10% range (versus about 5% for the industry) for the foreseeable future.

Long-term, income-oriented investors might like these shares. The yield on AWK's stock is close to the industry norm, yet its dividend growth prospects are well above-average. So, even though the stock is currently not timely, it still holds more appeal than most water utilities to the pull to 2016-2018.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Excludes nonrecurring losses: '08, $4.62; '09, $2.63; '11, $0.07. Discontinued operations: '06, (4¢); '11, 3¢; '12, (10¢). Next earnings report due late October. Quarterly earnings may not sum due to rounding. (B) Dividends paid in March, June, September, and December. ■ Div. reinvestment available. (C) In millions. (D) Includes intangibles. In 2012: $1.207 billion, $6.82/share. (E) Pro forma numbers for '06 & '07.

Company's Financial Strength	B+
Stock's Price Stability	95
Price Growth Persistence	90
Earnings Predictability	20

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AQUA AMERICA NYSE-WTR

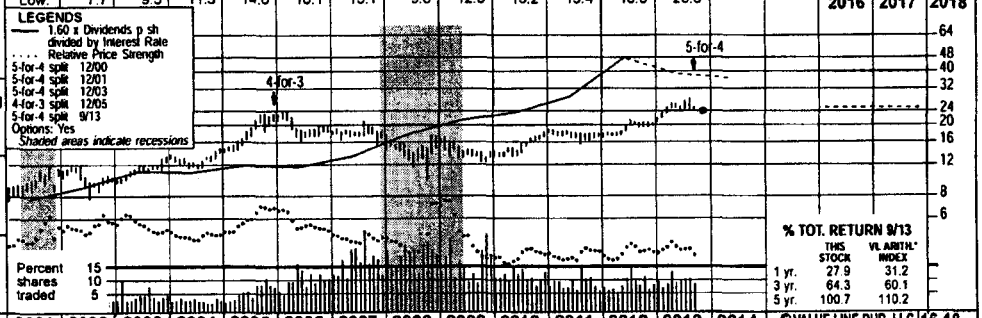
RECENT PRICE 23.97 | P/E RATIO 20.3 (Trailing: 22.7 Median: 24.0) | RELATIVE P/E RATIO 1.15 | DIV'D YLD 2.6% | VALUE LINE

TIMELINESS 3 Lowered 5/24/13
SAFETY 2 Raised 4/20/12
TECHNICAL 3 Raised 9/13/13
BETA .60 (1.00 = Market)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
High:	12.0	13.4	14.8	23.4	23.8	21.3	17.6	17.2	18.4	19.0	21.5	28.1
Low:	7.7	9.5	11.3	14.0	16.1	15.1	9.8	12.3	13.2	15.4	16.8	20.6

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.60 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
5-for-4 split 12/00
5-for-4 split 12/01
5-for-4 split 12/03
4-for-3 split 12/05
5-for-4 split 9/13
Options: Yes
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	40	(+65%)	19%
Low	25	(+5%)	4%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	1	3	2	2	0	0	1	3
to Sell	0	0	2	0	0	0	0	2	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	118	136	141
to Sell	117	116	130
Hld's(000)	83977	82403	82501

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	27.9	31.2
3 yr.	64.3	60.1
5 yr.	100.7	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
1.61	1.67	1.93	1.97	2.16	2.28	2.38	2.78	3.08	3.23	3.61	3.71	3.93	4.21	4.10	4.32	*4.45*	*4.60*	Revenues per sh	*4.95*
.45	.49	.58	.61	.69	.76	.77	.87	.97	1.01	1.10	1.14	1.29	1.42	1.45	1.51	*1.60*	*1.70*	"Cash Flow" per sh	*1.85*
.27	.32	.33	.37	.41	.43	.46	.51	.57	.56	.57	.58	.62	.72	.83	.87	*1.15*	*1.25*	Earnings per sh A	*1.45*
.19	.20	.22	.23	.24	.26	.28	.29	.32	.35	.38	.41	.44	.47	.50	.54	*.58*	*.64*	Div'd Decl'd per sh B■	*.85*
.46	.65	.72	.93	.87	.96	1.06	1.23	1.47	1.64	1.43	1.58	1.66	1.89	1.90	1.98	*2.15*	*2.15*	Cap'l Spending per sh	*2.15*
2.27	2.57	2.74	3.08	3.32	3.49	4.27	4.71	5.04	5.57	5.85	6.26	6.50	6.81	7.21	7.90	*8.90*	*9.60*	Book Value per sh	*11.50*
84.33	90.25	133.50	139.78	142.47	141.49	154.31	158.97	161.21	165.41	166.75	169.21	170.61	172.46	173.60	175.43	*177.50*	*179.50*	Common Shs Outst'g C	*184.00*
17.8	22.5	21.2	18.2	23.6	23.6	24.5	25.1	31.8	34.7	32.0	24.9	23.1	21.1	21.3	21.9	*Bold figures are*		Avg Ann'l P/E Ratio	*22.5*
1.03	1.17	1.21	1.18	1.21	1.29	1.40	1.33	1.69	1.87	1.70	1.50	1.54	1.34	1.34	1.40	*Value Line*		Relative P/E Ratio	*1.50*
3.9%	2.9%	3.0%	3.3%	2.5%	2.5%	2.5%	2.3%	1.8%	1.8%	2.1%	2.8%	3.1%	3.1%	2.8%	2.8%	*estimates*		Avg Ann'l Div'd Yield	*2.6%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $1648.4 mill. Due in 5 Yrs $368.3 mill.
LT Debt $1489.8 mill. LT Interest $60.0 mill.
(LT interest earned: 5.0x; total interest coverage: 4.1x) (51% of Cap'l)
Pension Assets-12/12 $190.1 mill. Oblig. $303.1 mill.
Pfd Stock None
Common Stock 176,463,469 shares as of 7/26/13 *(Reflects 5-for-4 stock split paid 9/1/13.)*
MARKET CAP: $4.2 billion (Mid Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
367.2	442.0	496.8	533.5	602.5	627.0	670.5	726.1	712.0	757.8	*790*	*830*	Revenues ($mill)	*915*
67.3	80.0	91.2	92.0	95.0	97.9	104.4	124.0	144.8	153.1	*205*	*225*	Net Profit ($mill)	*265*
39.3%	39.4%	38.4%	39.6%	38.9%	39.7%	39.4%	39.2%	32.9%	39.0%	*40.0%*	*40.0%*	Income Tax Rate	*40.0%*
--	--	--	--	--	--	--	--	2.9%	3.1%	*3.0%*	*3.0%*	AFUDC % to Net Profit	*2.0%*
51.4%	50.0%	52.0%	51.6%	55.4%	54.1%	55.6%	56.6%	52.7%	52.7%	*50.0%*	*50.0%*	Long-Term Debt Ratio	*50.0%*
48.6%	50.0%	48.0%	48.4%	44.6%	45.9%	44.4%	43.4%	47.3%	47.3%	*50.0%*	*50.0%*	Common Equity Ratio	*50.0%*
1355.7	1497.3	1690.4	1904.4	2191.4	2306.6	2495.5	2706.2	2646.8	2929.7	*3150*	*3450*	Total Capital ($mill)	*4230*
1824.3	2069.8	2280.0	2506.0	2792.8	2997.4	3227.3	3469.3	3612.9	3936.2	*4150*	*4350*	Net'Plant ($mill)	*4900*
6.4%	6.7%	6.9%	6.4%	5.9%	5.7%	5.6%	5.9%	6.9%	6.6%	*6.0%*	*6.0%*	Return on Total Cap'l	*6.5%*
10.2%	10.7%	11.2%	10.0%	9.7%	9.3%	9.4%	10.6%	11.6%	11.0%	*12.0%*	*12.0%*	Return on Shr. Equity	*12.5%*
10.2%	10.7%	11.2%	10.0%	9.7%	9.3%	9.4%	10.6%	11.6%	11.0%	*12.0%*	*12.0%*	Return on Com Equity	*12.5%*
4.2%	4.6%	4.9%	3.7%	3.2%	2.8%	2.7%	3.7%	4.6%	4.3%	*6.0%*	*6.0%*	Retained to Com Eq	*5.0%*
59%	57%	56%	63%	67%	70%	72%	65%	60%	61%	*52%*	*52%*	All Div'ds to Net Prof	*59%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	8.2	5.5	4.3
Receivables	81.1	92.9	98.3
Inventory (AvgCst)	11.2	11.8	12.5
Other	220.0	150.7	106.5
Current Assets	320.5	260.9	221.6
Accts Payable	68.3	55.5	47.0
Debt Due	80.4	125.4	158.6
Other	277.0	93.3	101.1
Current Liab.	425.7	274.2	306.7
Fix. Chg. Cov.	367%	398%	398%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	8.0%	7.5%	*3.5%*
"Cash Flow"	8.5%	8.0%	*4.5%*
Earnings	6.5%	4.5%	*8.0%*
Dividends	7.5%	8.0%	*8.0%*
Book Value	9.0%	7.0%	*6.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	160.5	178.5	207.8	179.3	726.1
2011	163.6	178.3	197.3	172.7	712.0
2012	164.0	191.7	214.6	187.5	757.8
2013	180.0	195.7	*219.3*	*195*	*790*
2014	*190*	*215*	*225*	*200*	*830*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	.13	.18	.26	.15	.72
2011	.18	.22	.24	.19	.83
2012	.15	.24	.29	.19	.87
2013	.26	.30	*.34*	*.25*	*1.15*
2014	*.25*	*.32*	*.40*	*.28*	*1.25*

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.108	.108	.108	.116	.44
2010	.116	.116	.116	.124	.47
2011	.124	.124	.124	.132	.50
2012	.132	.132	.132	.14	.54
2013	.14	.14	.152		

BUSINESS: Aqua America, Inc. is the holding company for water and wastewater utilities that serve approximately three million residents in Pennsylvania, Ohio, North Carolina, Illinois, Texas, New Jersey, Florida, Indiana, and five other states. Acquired AquaSource, 7/03; Consumers Water, 4/99; and others. Water supply revenues '12: residential, 60.5%; commercial, 16.1%; industrial & other, 23.4%. Officers and directors own 1.4% of the common stock; Blackrock, Inc, 6.3%; State Street Capital Corp., 5.7%; Vanguard Group 5.6% (4/13 Proxy). Chairman & Chief Executive Officer: Nicholas DeBenedictis. Incorporated: Pennsylvania. Address: 762 West Lancaster Avenue, Bryn Mawr, Pennsylvania 19010. Telephone: 610-525-1400. Internet: www.aquaamerica.com.

Aqua America's main long-term strategy is to grow through acquisitions. The United States is filled with thousands of small water utilities that are run by local municipalities. Due to the lack of proper maintenance, many of the facilities are in terrible shape. Since a large number of local governments are financially strapped, they find it more advantageous to sell their water systems to entities that have both greater managerial experience and the financial wherewithal to invest the funds required for the systems to operate properly. Aqua America bought 18 new companies last year and should add a similar number of new utilities in 2013.

Aqua America has been successful driving synergies through acquisitions. Historically, many of the operational benefits promised to shareholders of companies involved in acquisitions never take place. However, Aqua America has proven that it can purchase other water utilities and slash redundant overhead costs to improve operating margins.

Dividend growth prospects are excellent. Last quarter's 9% hike in the quarterly payout (all of our numbers have been adjusted for the recent five-for-four stock split) was much higher than that of a typical utility. Thanks in part to the company's low payout ratio, we estimate that the annual dividend hike will average about 10% for the foreseeable future.

Nonutility operations will play a larger role in the company's future. Aqua America recently completed another extension of its water pipeline in Pennsylvania. The pipeline is used to supply water to natural gas producers drilling in the Marcellus Shale. We expect the company to become much more involved in constructing pipelines because this is a more efficient way of providing the water needed for drilling than by using trucks.

Investors have to pay a slight premium for these shares. The average yield for a water utility is close to 3%. Thus, WTR's payout is about 40 basis points lower than the industry norm. We believe that this is a very reasonable price to pay for the company's robust dividend growth prospects, which should provide better-than-average total returns for a water utility over the pull to 2016-2018.

James A. Flood *October 18, 2013*

(A) Diluted egs. Excl. nonrec. gains (losses): '99, (9¢); '00, 2¢; '01, 2¢; '02, 4¢; '03, 3¢; '12, 18¢. Excl. gain from disc. operations: '12, 7¢; '13, 3¢. May not sum due to rounding. Next earnings report due late October.
(B) Dividends historically paid in early March, June, Sept. & Dec. ■ Div'd. reinvestment plan available (5% discount).
(C) In millions, adjusted for stock splits.

Company's Financial Strength	B++
Stock's Price Stability	100
Price Growth Persistence	70
Earnings Predictability	100

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ARTESIAN RES. CORP. NDQ–ARTNA

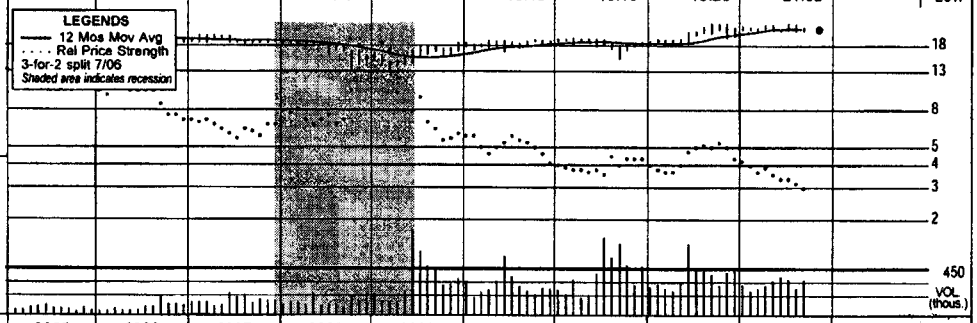
RECENT PRICE	TRAILING P/E RATIO	RELATIVE P/E RATIO	DIV'D YLD	
22.18	22.2	1.15	3.7%	VALUE LINE

RANKS

PERFORMANCE	2	Above Average
Technical	2	Above Average
SAFETY	3	Average
BETA .60	(1.00 = Market)	

Financial Strength	B
Price Stability	95
Price Growth Persistence	60
Earnings Predictability	85

22.62	22.33	20.67	19.31	18.73	19.59	19.99	24.43	24.27	High
17.20	17.90	18.26	13.00	12.81	16.43	15.16	18.20	21.52	Low



© VALUE LINE PUBLISHING LLC	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014/2015
SALES PER SH	7.52	7.77	7.20	7.59	8.11	8.48	7.56	8.10	--	
"CASH FLOW" PER SH	1.56	1.75	1.57	1.65	1.84	1.92	1.64	2.04	--	
EARNINGS PER SH	.81	.97	.90	.86	.97	1.00	.83	1.13	*1.05*[A,B]	*1.23*[C]*/NA*
DIV'DS DECL'D PER SH	.58	.61	.66	.71	.72	.75	.76	.79	--	
CAP'L SPENDING PER SH	3.35	5.08	3.66	6.09	2.32	2.57	1.83	2.36	--	
BOOK VALUE PER SH	9.60	10.15	11.66	11.86	12.15	12.44	13.12	13.57	--	
COMMON SHS OUTST'G (MILL)	6.02	6.09	7.30	7.40	7.51	7.65	8.61	8.71	--	
AVG ANN'L P/E RATIO	24.2	20.3	21.5	20.1	16.4	18.2	22.5	18.3	*21.1*	*18.0/NA*
RELATIVE P/E RATIO	1.28	1.10	1.14	1.21	1.09	1.16	1.41	1.17	--	
AVG ANN'L DIV'D YIELD	2.9%	3.1%	3.4%	4.1%	4.5%	4.1%	4.1%	3.8%	--	
SALES ($MILL)	45.3	47.3	52.5	56.2	60.9	64.9	65.1	70.6	--	*Bold figures are consensus earnings estimates and, using the recent prices, P/E ratios.*
OPERATING MARGIN	100.0%	45.6%	45.6%	45.1%	46.9%	46.5%	45.5%	48.7%	--	
DEPRECIATION ($MILL)	4.4	4.6	5.2	5.8	6.6	7.0	7.4	7.9	--	
NET PROFIT ($MILL)	5.0	6.1	6.3	6.4	7.3	7.6	6.7	9.8	--	
INCOME TAX RATE	39.9%	39.0%	39.8%	40.8%	40.1%	40.0%	40.8%	40.2%	--	
NET PROFIT MARGIN	11.1%	12.8%	11.9%	11.4%	11.9%	11.7%	10.4%	14.0%	--	
WORKING CAP'L ($MILL)	d1.8	d8.8	2.5	d20.9	d23.3	d27.9	d11.4	d11.4	--	
LONG-TERM DEBT ($MILL)	92.4	92.1	91.8	107.6	106.0	105.1	106.5	106.3	--	
SHR. EQUITY ($MILL)	57.8	61.8	85.1	87.8	91.2	95.1	113.0	118.2	--	
RETURN ON TOTAL CAP'L	5.3%	5.8%	5.3%	4.7%	5.2%	5.6%	4.6%	5.9%	--	
RETURN ON SHR. EQUITY	8.7%	9.8%	7.4%	7.3%	8.0%	8.0%	6.0%	8.3%	--	
RETAINED TO COM EQ	2.7%	3.8%	2.1%	1.4%	2.1%	2.0%	.5%	2.5%	--	
ALL DIV'DS TO NET PROF	69%	61%	71%	81%	74%	75%	92%	70%	--	

[A]No. of analysts changing earn. est. in last 4 days: 0 up, 0 down, consensus 5-year earnings growth not available. [B]Based upon 4 analysts' estimates. [C]Based upon 4 analysts' estimates.

ANNUAL RATES

of change (per share)	5 Yrs.	1 Yr.
Sales	1.5%	7.0%
"Cash Flow"	3.0%	24.0%
Earnings	2.0%	36.0%
Dividends	4.5%	4.0%
Book Value	4.5%	3.5%

Fiscal Year	QUARTERLY SALES ($mill.) 1Q	2Q	3Q	4Q	Full Year
12/31/11	14.8	16.5	17.7	16.1	65.1
12/31/12	16.7	17.9	19.0	17.0	70.6
12/31/13	16.3	17.8			
12/31/14					

Fiscal Year	EARNINGS PER SHARE 1Q	2Q	3Q	4Q	Full Year
12/31/10	.22	.24	.38	.16	1.00
12/31/11	.14	.23	.26	.20	.83
12/31/12	.28	.32	.33	.20	1.13
12/31/13	.19	.28	*.34*	*.25*	
12/31/14	*.20*				

Cal-endar	QUARTERLY DIVIDENDS PAID 1Q	2Q	3Q	4Q	Full Year
2010	.187	.188	.188	.189	.75
2011	.19	.19	.19	.193	.76
2012	.193	.198	.198	.203	.79
2013	.203	.206	.206	.209	

INSTITUTIONAL DECISIONS

	4Q'12	1Q'13	2Q'13
to Buy	28	32	31
to Sell	32	26	30
Hld's(000)	3052	3036	3029

ASSETS ($mill.)	2011	2012	6/30/13
Cash Assets	.3	.6	.5
Receivables	8.6	8.7	9.1
Inventory	1.5	1.4	1.5
Other	2.9	2.8	1.2
Current Assets	13.3	13.5	12.3
Property, Plant & Equip, at cost	435.0	454.4	--
Accum Depreciation	77.4	83.8	--
Net Property	357.6	370.6	374.8
Other	7.8	7.6	7.6
Total Assets	378.7	391.7	394.7
LIABILITIES ($mill.)			
Accts Payable	2.8	3.5	1.9
Debt Due	13.8	12.6	10.7
Other	8.1	8.8	9.2
Current Liab	24.7	24.9	21.8

LONG-TERM DEBT AND EQUITY as of 6/30/13

Total Debt $116.8 mill. Due in 5 Yrs. NA
LT Debt $106.1 mill.
Including Cap. Leases NA (47% of Cap'l)

Leases, Uncapitalized Annual rentals NA

Pension Liability $.4 mill. in '12 vs. $.5 mill. in '11

Pfd Stock None Pfd Div'd Paid None

Common Stock 8,781,642 shares (53% of Cap'l)

INDUSTRY: Water Utility

BUSINESS: Artesian Resources Corporation, through its subsidiaries, provides water, wastewater, and other services on the Delmarva Peninsula. It distributes and sells water to residential, commercial, industrial, municipal, and utility customers in Delaware, Maryland, and Pennsylvania. The company also offers water for public and private fire protection to customers in its service territories. In addition, it provides contract water and wastewater services, water and sewer service line protection plans, and wastewater management services, as well as design, construction, and engineering services. As of December 31, 2012, the company served approximately 79,000 metered water customers through 1,162 miles of transmission and distribution mains. Has 229 employees. Chairman, C.E.O. & President: Dian C. Taylor. Address: 664 Churchmans Rd., Newark, DE 19702. Tel.: (302) 453-6900. Internet: http://www.artesianwater.com.

J.V.

October 18, 2013

TOTAL SHAREHOLDER RETURN

Dividends plus appreciation as of 9/30/2013

3 Mos.	6 Mos.	1 Yr.	3 Yrs.	5 Yrs.
0.79%	0.84%	-0.68%	31.05%	63.01%

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CALIFORNIA WATER NYSE-CWT

RECENT PRICE 19.73 | P/E RATIO 22.4 (Trailing: 21.2 Median: 21.0) | RELATIVE P/E RATIO 1.27 | DIV'D YLD 3.4% | VALUE LINE

TIMELINESS 4 Lowered 10/4/13
SAFETY 3 Lowered 7/27/07
TECHNICAL 3 Lowered 8/23/13
BETA .65 (1.00 = Market)

High:	13.4	15.7	19.0	21.1	22.9	22.7	23.3	24.1	19.8	19.4	19.3	22.3			
Low:	10.2	11.8	13.0	15.6	16.4	17.1	13.8	16.7	16.9	16.7	16.8	18.4			

Target Price Range 2016 | 2017 | 2018

2016-18 PROJECTIONS

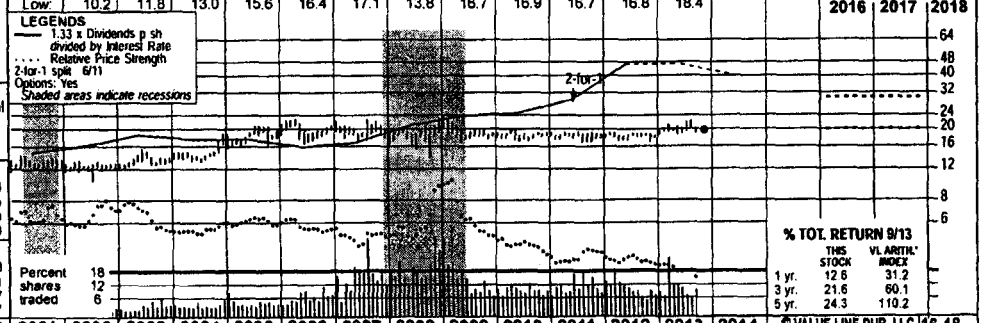
	Price	Gain	Ann'l Total Return
High	30	(+50%)	13%
Low	20	(Nil)	4%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	20	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	54	86	61
to Sell	63	39	57
Hld's(000)	22078	26409	26677



% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	12.6	31.2
3 yr.	21.6	60.1
5 yr.	24.3	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
7.74	7.38	7.98	8.08	8.13	8.67	8.18	8.59	8.72	8.10	8.88	9.90	10.82	11.05	12.00	13.34	*12.55*	*14.15*	Revenues per sh	*16.00*
1.46	1.30	1.37	1.26	1.10	1.32	1.26	1.42	1.52	1.36	1.56	1.86	1.93	1.93	2.07	2.32	*2.05*	*2.25*	"Cash Flow" per sh	*2.75*
.92	.73	.77	.66	.47	.63	.61	.73	.74	.67	.75	.95	.98	.91	.86	1.02	*.80*	*1.05*	Earnings per sh A	*1.35*
.53	.54	.54	.55	.56	.56	.56	.57	.57	.58	.58	.59	.59	.60	.62	.63	*.64*	*.68*	Div'd Decl'd per sh B ■	*.90*
1.30	1.37	1.72	1.23	2.04	2.91	2.19	1.87	2.01	2.14	1.84	2.41	2.66	2.97	2.83	3.04	*2.65*	*2.90*	Cap'l Spending per sh	*3.00*
6.50	6.69	6.71	6.45	6.48	6.56	7.22	7.83	7.90	9.07	9.25	9.72	10.13	10.45	10.76	11.28	*13.40*	*13.85*	Book Value per sh C	*15.00*
25.24	25.24	25.87	30.29	30.36	30.36	33.86	36.73	36.78	41.31	41.33	41.45	41.53	41.67	41.82	41.98	*47.75*	*48.00*	Common Shs Outst'g D	*50.0*
12.6	17.8	17.8	19.6	27.1	19.8	22.1	20.1	24.9	29.2	26.1	19.8	19.7	20.3	21.3	17.9	*Bold figures are*		Avg Ann'l P/E Ratio	*19.0*
.73	.93	1.01	1.27	1.39	1.08	1.26	1.06	1.33	1.58	1.39	1.19	1.31	1.29	1.34	1.14	*Value Line*		Relative P/E Ratio	*1.25*
4.6%	4.2%	4.0%	4.3%	4.4%	4.5%	4.2%	3.9%	3.1%	2.9%	3.0%	3.1%	3.1%	3.2%	3.4%	3.5%	*estimates*		Avg Ann'l Div'd Yield	*3.6%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $507.6 mill. Due in 5 Yrs $65.3 mill.

LT Debt $430.7 mill. LT Interest $29.5 mill.
(LT interest earned: 6.7x; total int. cov.: 6.0x)
(43% of Cap'l)

Pension Assets-12/12 $202.9 mill.
Oblig. $402.9 mill.

Pfd Stock None

Common Stock 47,734,035 shs.
as of 8/1/13

MARKET CAP: $950 million (Small Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
277.1	315.6	320.7	334.7	367.1	410.3	449.4	460.4	501.8	560.0	*590*	*650*	Revenues ($mill) E	*800*
19.4	26.0	27.2	25.6	31.2	39.8	40.6	37.7	36.1	42.6	*40.0*	*53.0*	Net Profit ($mill)	*67.0*
39.9%	39.6%	42.4%	37.4%	39.9%	37.7%	40.3%	39.5%	40.5%	37.5%	*34.0%*	*39.0%*	Income Tax Rate	*39.0%*
10.3%	3.2%	3.3%	10.6%	8.3%	8.6%	7.6%	4.2%	7.6%	8.0%	*8.0%*	*8.5%*	AFUDC % to Net Profit	*10.0%*
50.2%	48.6%	48.3%	43.5%	42.9%	41.6%	47.1%	52.4%	51.7%	47.8%	*42.0%*	*46.5%*	Long-Term Debt Ratio	*50.0%*
49.1%	50.8%	51.1%	55.9%	56.6%	58.4%	52.9%	47.6%	48.3%	52.2%	*58.0%*	*53.5%*	Common Equity Ratio	*50.0%*
498.4	565.9	568.1	670.1	674.9	690.4	794.9	914.7	931.5	908.2	*1050*	*1125*	Total Capital ($mill)	*1400*
759.5	800.3	862.7	941.5	1010.2	1112.4	1198.1	1294.3	1381.1	1457.1	*1510*	*1575*	Net Plant ($mill)	*1825*
5.6%	6.1%	6.3%	5.2%	5.9%	7.1%	6.5%	5.5%	5.5%	6.3%	*5.5%*	*6.0%*	Return on Total Cap'l	*6.5%*
7.8%	8.9%	9.3%	6.8%	8.1%	9.9%	9.6%	8.6%	8.0%	9.0%	*7.0%*	*8.0%*	Return on Shr. Equity	*9.5%*
7.9%	9.0%	9.3%	6.8%	8.1%	9.9%	9.6%	8.6%	8.0%	9.0%	*7.0%*	*8.0%*	Return on Com Equity	*9.5%*
.7%	2.1%	2.1%	1.0%	1.8%	3.8%	3.8%	3.0%	2.3%	3.4%	*1.5%*	*3.0%*	Retained to Com Eq	*3.0%*
91%	77%	78%	86%	77%	61%	60%	66%	71%	62%	*75%*	*62%*	All Div'ds to Net Prof	*67%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	27.2	38.8	38.8
Other	86.7	107.8	125.4
Current Assets	113.9	146.6	164.1
Accts Payable	48.9	46.8	46.7
Debt Due	53.7	136.3	76.9
Other	49.3	59.7	72.6
Current Liab.	151.9	242.8	196.2
Fix. Chg. Cov.	278%	297%	325%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	4.0%	7.0%	*4.5%*
"Cash Flow"	5.5%	7.5%	*4.5%*
Earnings	5.0%	5.5%	*6.5%*
Dividends	1.0%	1.5%	*6.5%*
Book Value	5.0%	4.5%	*5.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.)E Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	90.3	118.3	146.3	105.5	460.4
2011	98.1	131.4	169.3	103.0	501.8
2012	116.8	143.6	178.1	121.5	560.0
2013	111.4	154.6	*190*	*134*	*590*
2014	*135*	*165*	*210*	*140*	*650*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	.05	.25	.49	.12	.91
2011	.03	.29	.50	.04	.86
2012	.03	.31	.56	.12	1.02
2013	d.03	.28	*.50*	*.05*	*.80*
2014	*.05*	*.30*	*.55*	*.15*	*1.05*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.148	.148	.148	.148	.59
2010	.149	.149	.149	.149	.60
2011	.154	.154	.154	.154	.62
2012	.1575	.1575	.1575	.1575	.63
2013	.16	.16	.16		

BUSINESS: California Water Service Group provides regulated and nonregulated water service to roughly 471,900 customers in 83 communities in California, Washington, New Mexico, and Hawaii. Main service areas: San Francisco Bay area, Sacramento Valley, Salinas Valley, San Joaquin Valley & parts of Los Angeles. Acquired Rio Grande Corp; West Hawaii Utilities (9/08). Revenue breakdown, '12: residential, 66%; business, 18%; public authorities, 4%; industrial, 4%; other 8%. '12 reported depreciation rate: 2.8%. Has 1,131 employees. President, Chairman, and Chief Executive Officer: Peter C. Nelson. Inc.: Delaware. Address: 1720 North First Street, San Jose, California 95112-4598. Telephone: 408-367-8200. Internet: www.calwatergroup.com.

This will not be an easy year for the California Water Service Group. As expected, the utility posted its second-consecutive year-over-year negative earnings comparison in the June-ended period. What's more, we expect this trend to continue for the second half of the year.

What's behind the bad earnings? In California, utilities run on three-year regulatory cycles. This means that they can only seek rate relief every third year. Quite often, by the final year of the cycle, expenses have outpaced the higher revenues that were originally permitted.

A major rate case is close to being settled. In mid-2012, California filed a petition with the California Public Utility Commission (CPUC) seeking to raise its rates by 20%. The utility has been in negotiations with the CPUC for months, and it now believes that 95% of the matters involved are resolved. Even though many of California Water's expenses were prudently spent on improving its infrastructure, that doesn't mean that its request will be automatically approved. There is a tremendous amount of political pressure brought upon regulators to keep water customers (i.e. voters) rates low. On balance, we estimate the final decision will be fairly reasonable. The allowed return on equity will most likely be low on a relative basis, but the utility will at least have a good chance of earning it.

All told, earnings should decline sharply in 2013, but rebound in 2014. Due to the aforementioned reasons, we think that California Water's share net will plunge 22% this year. Next year, due mostly to rate relief, we expect the bottom line to snap back, by $0.25, to $1.05 a share.

We think that there are other stocks in the water utility industry that hold greater appeal than California Water. On the plus side, these shares have a yield that is nearly 70 basis points greater than certain of its peers. Moreover, as a result of a large stock issuance earlier this year, the company's finances have improved significantly. However, the utility's subpar dividend growth potential over the next several years and the equity's Below Average Timeliness rank more than offset these positives, in our opinion.

James A. Flood *October 18, 2013*

(A) Basic EPS. Excl. nonrecurring gain (loss): '00, (4¢); '01, 2¢; '02, 4¢; '11, 4¢. Next earnings report due mid-August.
(B) Dividends historically paid in late Feb., May, Aug., and Nov. ■ Div'd reinvestment plan available.
(C) Incl. intangible assets. In '12: $18.8 mill., $0.44/sh.
(D) In millions, adjusted for splits.
(E) Excludes non-reg. rev.

Company's Financial Strength	B++
Stock's Price Stability	100
Price Growth Persistence	50
Earnings Predictability	90

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CONNECTICUT WATER NDQ-CTWS

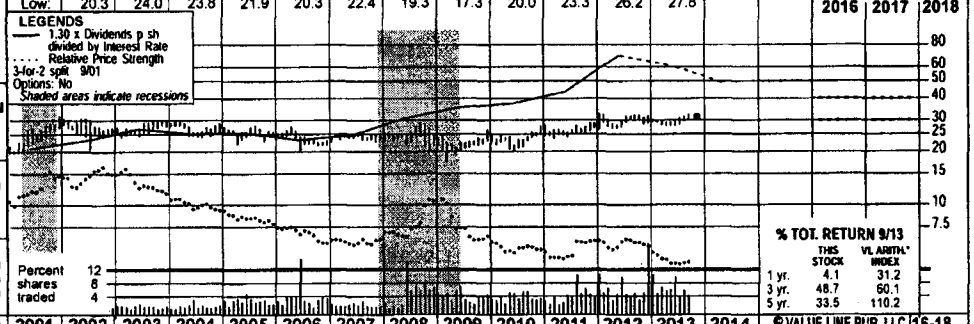
RECENT PRICE 31.35 | P/E RATIO 18.9 (Trailing: 21.5 Median: 23.0) | RELATIVE P/E RATIO 1.07 | DIV'D YLD 3.2% | VALUE LINE

TIMELINESS 4 Lowered 3/29/13
SAFETY 3 New 1/18/13
TECHNICAL 3 Lowered 10/11/13
BETA .75 (1.00 = Market)

High:	31.1	30.4	29.8	28.2	27.7	25.6	29.0	26.4	27.9	29.1	32.8	32.4
Low:	20.3	24.0	23.8	21.9	20.3	22.4	19.3	17.3	20.0	23.3	26.2	27.8

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.30 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
3-for-2 split 9/01
Options: No
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	40	(+30%)	10%
Low	30	(-5%)	3%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	2	0	0	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	48	52	39
to Sell	16	21	39
Hld's(000)	4069	4336	4492

Percent shares traded 12 8 4

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	4.1	31.2
3 yr.	48.7	60.1
5 yr.	33.5	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
5.67	5.58	5.87	5.70	5.93	5.77	5.91	6.04	5.81	5.68	7.05	7.24	6.93	7.65	7.93	7.63	*8.65*	*8.90*	Revenues per sh	*11.25*
1.51	1.59	1.65	1.73	1.78	1.78	1.89	1.91	1.62	1.52	1.90	1.95	1.93	2.04	2.11	2.10	*2.55*	*2.65*	"Cash Flow" per sh	*2.75*
1.00	1.02	1.03	1.09	1.13	1.12	1.15	1.16	.88	.81	1.05	1.11	1.19	1.13	1.13	1.53	*1.60*	*1.70*	Earnings per sh A	*1.80*
.77	.78	.79	.79	.80	.81	.83	.84	.85	.86	.87	.88	.90	.92	.94	.96	*.98*	*1.01*	Div'd Decl'd per sh B■	*1.11*
1.99	1.12	1.42	1.43	1.86	1.98	1.49	1.58	1.96	1.96	2.24	2.44	3.28	3.06	2.61	2.34	*2.75*	*2.85*	Cap'l Spending per sh	*2.90*
8.26	8.52	8.61	8.92	9.25	10.06	10.46	10.94	11.52	11.60	11.95	12.23	12.67	13.05	13.50	16.89	*17.25*	*17.80*	Book Value per sh D	*20.40*
6.79	6.80	7.26	7.28	7.65	7.94	7.97	8.04	8.17	8.27	8.38	8.46	8.57	8.68	8.76	10.97	*11.10*	*11.25*	Common Shs Outst'g C	*12.00*
12.9	15.5	18.2	18.2	21.5	24.3	23.5	22.9	28.6	29.0	23.0	22.2	18.4	20.7	23.0	19.4	*Bold figures are*		Avg Ann'l P/E Ratio	*20.0*
.74	.81	1.04	1.18	1.10	1.33	1.34	1.21	1.52	1.57	1.22	1.34	1.23	1.32	1.44	1.24	*Value Line*		Relative P/E Ratio	*1.35*
6.0%	4.9%	4.2%	4.0%	3.3%	3.0%	3.0%	3.1%	3.4%	3.6%	3.6%	3.6%	4.1%	3.9%	3.6%	3.2%	*estimates*		Avg Ann'l Div'd Yield	*3.4%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $180.2 mill. Due in 5 Yrs $14.8 mill.
LT Debt $178.7 mill. LT Interest $7.6 mill.
(Total interest coverage: 8.8x)
(49% of Cap'l)
Leases, Uncapitalized: Annual rentals $.2 mill.
Pension Assets $45.4 mill.
Oblig. $66.5 mill.

Pfd Stock $0.8 mill. Pfd Divd NMF

Common Stock 11,003,512 shs.
as of 7/31/13
MARKET CAP: $350 million (Small Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
47.1	48.5	47.5	46.9	59.0	61.3	59.4	66.4	69.4	83.8	*95.0*	*100*	Revenues ($mill)	*135*
9.2	9.4	7.2	6.7	8.8	9.4	10.2	9.8	9.9	13.6	*17.5*	*19.0*	Net Profit ($mill)	*21.0*
17.9%	22.9%	--	23.5%	32.4%	27.2%	19.5%	35.2%	41.3%	32.0%	*32.0%*	*33.0%*	Income Tax Rate	*35%*
--	--	--	--	--	1.7%	--	--	1.8%	1.7%	*2.0%*	*2.0%*	AFUDC % to Net Profit	*3.0%*
43.5%	42.8%	44.9%	44.4%	47.8%	46.9%	50.6%	49.5%	53.2%	49.0%	*49.5%*	*49.5%*	Long-Term Debt Ratio	*48.5%*
55.9%	56.7%	54.6%	55.1%	51.8%	52.7%	49.1%	50.2%	46.5%	50.8%	*50.5%*	*50.5%*	Common Equity Ratio	*51.5%*
148.9	155.1	172.3	174.1	193.2	196.5	221.3	225.6	254.2	364.6	*375*	*395*	Total Capital ($mill)	*475*
238.9	246.1	247.7	268.1	284.3	302.3	325.2	344.2	362.4	447.9	*470*	*490*	Net Plant ($mill)	*550*
7.5%	7.0%	5.0%	4.9%	5.5%	5.9%	5.5%	5.4%	4.9%	4.8%	*5.5%*	*5.0%*	Return on Total Cap'l	*5.5%*
10.9%	10.6%	7.5%	6.9%	8.7%	9.0%	9.3%	8.6%	8.3%	7.3%	*9.0%*	*9.5%*	Return on Shr. Equity	*8.5%*
11.0%	10.6%	7.6%	7.0%	8.7%	9.1%	9.4%	8.7%	8.3%	7.3%	*9.0%*	*9.5%*	Return on Com Equity	*8.5%*
3.2%	3.1%	.3%	NMF	1.6%	1.9%	2.3%	1.6%	1.4%	2.7%	*3.5%*	*3.5%*	Retained to Com Eq	*3.0%*
71%	71%	95%	105%	82%	79%	76%	81%	83%	62%	*62%*	*59%*	All Div'ds to Net Prof	*62%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	1.0	13.2	7.5
Accounts Receivable	14.9	11.5	12.1
Other	3.0	11.7	13.5
Current Assets	18.9	36.4	33.1
Accts Payable	7.2	10.0	7.3
Debt Due	- -	3.0	1.5
Other	23.2	2.9	3.1
Current Liab.	30.4	15.9	11.9
Fix. Chg. Cov.	419%	455%	*460%*

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	3.5%	6.0%	*6.5%*
"Cash Flow"	2.5%	6.0%	*4.5%*
Earnings	1.5%	6.5%	*5.5%*
Dividends	1.5%	2.0%	*3.5%*
Book Value	5.5%	6.5%	*6.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	13.8	15.9	21.0	15.7	66.4
2011	16.0	17.4	20.6	15.4	69.4
2012	18.5	21.3	24.5	19.5	83.8
2013	21.5	22.5	*27.0*	*24.0*	*95.0*
2014	*22.0*	*24.0*	*30.0*	*24.0*	*100*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.12	.27	.54	.20	1.13
2011	.26	.37	.39	.11	1.13
2012	.22	.47	.67	.16	1.53
2013	.24	.39	*.68*	*.29*	*1.60*
2014	*.30*	*.47*	*.68*	*.25*	*1.70*

Cal-endar	QUARTERLY DIVIDENDS PAID B Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.222	.222	.228	.228	.90
2010	.228	.228	.233	.233	.922
2011	.233	.233	.238	.238	.942
2012	.238	.238	.2425	.2425	.962
2013	.2425	.2425	.2475		

BUSINESS: Connecticut Water Service, Inc. is a non-operating holding company, whose income is derived from earnings of its wholly-owned subsidiary companies (regulated water utilities). Its largest subsidiary, Connecticut Water, accounted for about 85% of the holding company's net income in 2012, and provides water services to 400,000 people in 55 towns throughout Connecticut and Maine. Acquired The Maine Water Co., 1/12; Biddeford and Saco Water, 12/12. Inc.: CT. Has about 260 employees. Chairman/President/CEO: Eric W. Thornburg. Officers and directors own 2.2% of the common stock; BlackRock, Inc. 6.7%; The Vanguard Group, 5.3%. Address: 93 West Main Street, Clinton, CT 06413. Telephone: (860) 669-8636. Internet: www.ctwater.com.

Connecticut Water Service has finally reached a definitive deal with all of the state's regulators. In September, the Connecticut Public Regulatory Authority (PURA) agreed to a deal that had been reached earlier among Connecticut Water and the state's Attorney General and Consumer Council. PURA was the final hurdle in the approval process, and it didn't alter the agreement in any meaningful way.

Ratepayers will benefit from the settlement. Customers will see their water bills decline over the next two years as Connecticut Water will pass along to them a tax refund it was granted by the IRS for the 2010-2012 period. In addition, the utility agreed not to seek higher rates before October, 2015.

Connecticut Water will benefit too. Permission was granted for the company to establish a Revenue Adjustment Mechanism, which will allow it to keep the tax benefit from the IRS refund going forward. These funds will be allowed to flow through to shareholders until the next time the company seeks higher rates.

The earnings picture looks brighter. Following four static years of earnings, the company enjoyed strong results in 2012, as share net rose 35%. With the new arrangement with regulators in place, we think that Connecticut Water's bottom line will increase close to 5%, both this year and next. Moreover, the company will earn close to its allowed return on equity.

The recent dividend hike was somewhat disappointing. Over the past five- and 10-year periods, Connecticut Water's dividend growth rate averaged only 2.0%, and 1.5%, respectively. Both percentages were among the lowest in the water utility industry. Following the company's solid profits in 2012, along with its improved earning prospects, we had hoped that the most recent quarterly payout to shareholders would have been more generous than the 2% increase declared in August.

We can't find too many reasons to recommend these shares at this juncture. While the stock's yield is slightly higher than the average of its peers, its dividend growth prospects to 2016-2018 are subpar for the group. Furthermore, this equity carries a 4 (Below Average) rank for Timeliness.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Next earnings report due mid-November. Quarterly earnings do no add in '12 due to rounding.
(B) Dividends historically paid in mid-March, June, September, and December. ● Div'd reinvestment plan available.
(C) In millions, adjusted for split.
(D) Includes intangibles. In '12: $31.7 million/$2.89 a share.

Company's Financial Strength	B+
Stock's Price Stability	90
Price Growth Persistence	50
Earnings Predictability	80

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MIDDLESEX WATER NDQ-MSEX

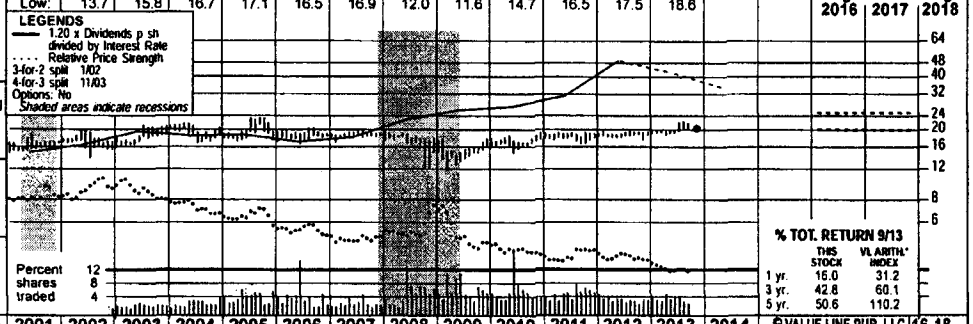
RECENT PRICE 20.31 | P/E RATIO 20.9 (Trailing: 19.7 / Median: 22.0) | RELATIVE P/E RATIO 1.19 | DIV'D YLD 3.7% | VALUE LINE

TIMELINESS 2 Raised 6/7/13
SAFETY 2 New 10/21/11
TECHNICAL 3 Lowered 10/18/13
BETA .70 (1.00 = Market)

High:	20.0	21.2	21.8	23.5	20.5	20.2	19.8	17.9	19.3	19.4	19.6	22.5	
Low:	13.7	15.8	16.7	17.1	16.5	16.9	12.0	11.6	14.7	16.5	17.5	18.6	

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.20 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
3-for-2 split 1/02
4-for-3 split 11/03
Options: No
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	25	(+25%)	9%
Low	20	(Nil)	4%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	1	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	1

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	38	38	37
to Sell	26	30	35
Hld's(000)	6696	6579	6489

Percent shares traded 12 8 4

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	16.0	31.2
3 yr.	42.8	60.1
5 yr.	50.6	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
4.72	4.39	5.35	5.39	5.87	5.98	6.12	6.25	6.44	6.16	6.50	6.79	6.75	6.60	6.50	6.98	*7.50*	*7.70*	Revenues per sh	*9.10*
1.02	1.02	1.19	.99	1.18	1.20	1.15	1.28	1.33	1.33	1.49	1.53	1.40	1.55	1.46	1.56	*1.65*	*1.85*	"Cash Flow" per sh	*2.30*
.67	.71	.76	.51	.66	.73	.61	.73	.71	.82	.87	.89	.72	.96	.84	.90	*1.00*	*1.05*	Earnings per sh A	*1.15*
.57	.58	.60	.61	.62	.63	.65	.66	.67	.68	.69	.70	.71	.72	.73	.74	*.75*	*.76*	Div'd Decl'd per sh B■	*.80*
1.20	2.68	2.33	1.32	1.25	1.59	1.87	2.54	2.18	2.31	1.66	2.12	1.49	1.90	1.50	1.36	*1.50*	*1.65*	Cap'l Spending per sh	*2.00*
6.00	6.80	6.95	6.98	7.11	7.39	7.60	8.02	8.26	9.52	10.05	10.03	10.33	11.13	11.27	11.48	*11.75*	*12.10*	Book Value per sh D	*12.90*
8.54	9.82	10.00	10.11	10.17	10.36	10.48	11.36	11.58	13.17	13.25	13.40	13.52	15.57	15.70	15.82	*16.00*	*16.25*	Common Shs Outst'g C	*17.00*
13.4	15.2	17.6	28.7	24.6	23.5	30.0	26.4	27.4	22.7	21.6	19.8	21.0	17.8	21.7	20.8	*Bold figures are*		Avg Ann'l P/E Ratio	*20.0*
.77	.79	1.00	1.87	1.26	1.28	1.71	1.39	1.46	1.23	1.15	1.19	1.40	1.13	1.36	1.33	*Value Line*		Relative P/E Ratio	*1.35*
6.3%	5.4%	4.4%	4.2%	3.8%	3.7%	3.5%	3.4%	3.5%	3.7%	3.7%	4.0%	4.7%	4.2%	4.0%	4.0%	*estimates*		Avg Ann'l Div'd Yield	*3.6%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $166.7 mill. Due in 5 Yrs $60.0 mill.
LT Debt $133.5 mill. LT Interest $7.0 mill.
(LT interest coverage: 4.1x)
(42% of Cap'l)

Pension Assets-12/12 $37.9 mill.
Oblig. $62.8 mill.
Pfd Stock $3.4 mill. Pfd Div'd: $.2 mill.

Common Stock 15,847,729 shs.
as of 7/31/13

MARKET CAP: $325 million (Small Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
64.1	71.0	74.6	81.1	86.1	91.0	91.2	102.7	102.1	110.4	*120*	*125*	Revenues ($mill)	*155*
6.6	8.4	8.5	10.0	11.8	12.2	10.0	14.3	13.4	14.4	*15.5*	*17.0*	Net Profit ($mill)	*20.0*
32.8%	31.1%	27.6%	33.4%	32.6%	33.2%	34.1%	32.1%	32.7%	33.9%	*34.0%*	*34.0%*	Income Tax Rate	*34.0%*
--	--	--	--	--	--	--	6.8%	6.1%	3.4%	*4.5%*	*4.5%*	AFUDC % to Net Profit	*5.0%*
53.8%	53.8%	55.3%	49.5%	49.0%	45.6%	46.6%	43.1%	42.3%	41.5%	*43.0%*	*43.0%*	Long-Term Debt Ratio	*43.0%*
44.0%	42.5%	44.3%	47.5%	49.6%	51.8%	52.1%	55.8%	56.6%	57.4%	*57.0%*	*57.0%*	Common Equity Ratio	*57.0%*
181.1	214.5	231.7	264.0	268.8	259.4	267.9	310.5	312.5	316.5	*330*	*345*	Total Capital ($mill)	*400*
230.9	262.9	288.0	317.1	333.9	366.3	376.5	405.9	422.2	435.2	*440*	*450*	Net Plant ($mill)	*510*
5.0%	5.1%	5.0%	5.1%	5.6%	5.8%	5.0%	5.7%	5.2%	5.4%	*4.5%*	*5.0%*	Return on Total Cap'l	*5.5%*
7.9%	8.5%	8.2%	7.5%	8.6%	8.6%	7.0%	8.1%	7.5%	7.8%	*8.0%*	*8.5%*	Return on Shr. Equity	*9.0%*
8.0%	9.0%	8.6%	7.8%	8.7%	8.9%	7.0%	8.2%	7.5%	7.8%	*8.0%*	*8.5%*	Return on Com Equity	*9.0%*
NMF	.9%	.6%	1.3%	1.8%	2.0%	.1%	2.1%	1.0%	1.4%	*2.0%*	*2.5%*	Retained to Com Eq	*3.0%*
106%	90%	94%	84%	79%	78%	98%	75%	87%	83%	*80%*	*73%*	All Div'ds to Net Prof	*70%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	3.1	3.0	3.0
Other	19.8	21.6	23.1
Current Assets	22.9	24.6	26.1
Accts Payable	5.7	3.8	5.1
Debt Due	4.8	11.1	33.2
Other	36.4	41.1	17.6
Current Liab.	46.7	56.0	55.9
Fix. Chg. Cov.	380%	410%	*415%*

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	1.5%	1.0%	*5.5%*
"Cash Flow"	3.0%	2.0%	*7.0%*
Earnings	3.5%	2.5%	*4.0%*
Dividends	1.5%	1.5%	*1.5%*
Book Value	4.5%	4.0%	*2.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	21.6	26.5	29.6	25.0	102.7
2011	24.0	26.1	28.7	23.3	102.1
2012	23.5	27.4	32.3	27.1	110.4
2013	27.0	29.1	*34.0*	*29.9*	*120*
2014	*30.0*	*30.0*	*35.0*	*30.0*	*125*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.11	.31	.37	.17	.96
2011	.17	.23	.32	.12	.84
2012	.11	.23	.38	.17	.90
2013	.20	.28	*.35*	*.17*	*1.00*
2014	*.17*	*.28*	*.40*	*.20*	*1.05*

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.178	.178	.178	.180	.71
2010	.180	.180	.180	.183	.72
2011	.183	.183	.183	.185	.73
2012	.185	.185	.185	.1875	.74
2013	.1875	.1875	.1875		

BUSINESS: Middlesex Water Company engages in the ownership and operation of regulated water utility systems in New Jersey, Delaware, and Pennsylvania. It also operates water and wastewater systems under contract on behalf of municipal and private clients in NJ and DE. Its Middlesex System provides water services to 60,000 retail customers, primarily in Middlesex County, New Jersey. in 2012, the Middlesex System accounted for 65% of total revenues. At 12/31/12, the company had 279 employees. Incorporated: NJ. President, CEO, and Chairman: Dennis W. Doll. Officers/directors own 3.1% of the common stock; BlackRock, 6.3%; The Vanguard Group, 5.7% (4/13 proxy). Address: 1500 Ronson Road, Iselin, NJ 08830. Tel.: 732-634-1500. Internet: www.middlesexwater.com.

Historically, Middlesex Water's dividend increases have been incredibly consistent. Over the past nine years, (from 2003 to 2012), the utility has raised its annual payout by $0.01 a share.

Sometimes predictability isn't a positive. Over the past five and 10 years, respectively, the average dividend hike has been a meager 1.5%. This ranks near the bottom when compared to the other seven water utilities that *Value Line* covers.

Could Middlesex finally break its streak this quarter? Late October is usually the time when the company implements its annual dividend rate hike. With decent earnings comparisons, it's possible that Middlesex could go against convention and raise the payout by more than the traditional one-quarter of a cent per share. We are taking a show-me approach, with our figures representing the usual quarterly increase.

The utility's earnings have been improving. In the June period, Middlesex experienced its fourth-consecutive positive earnings comparison. This was mostly due to the implementation of higher rates in mid-2012, as well a better contract with the borough of Avalon, NJ, a wholesale client.

Performance in the industrial markets has impaired Middlesex. The utility lost a contract to supply water to the borough of Sayreville, NJ this past August. Another setback was the closure of a Hess oil refinery earlier in the year.

The company is targeting the residential market. Despite recently winning a contract to privatize the water system at the Dover Air Force Base in Delaware, Middlesex has budgeted $25 million a year over the next three years to improve the infrastructure of its residential business. We agree with this strategy as the residential market is both more predictable and profitable.

Middlesex shares are ranked to outperform the market in the year ahead. Some investors may also be attracted to the stock's high current yield. Those with a long-term horizon, however, can find other water utilities with higher total-return potential through the pull to 2016-2018.

James A. Flood *October 18, 2013*

(A) Diluted earnings. May not sum due to rounding. Next earnings report due early November.
(B) Dividends historically paid in mid-Feb., May, Aug., and November.■ Div'd reinvestment plan available.
(C) In millions, adjusted for splits.
(D) Intangible assets in 2012: $9.2 million, $0.58 a share.

Company's Financial Strength	B++
Stock's Price Stability	95
Price Growth Persistence	40
Earnings Predictability	80

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SJW CORP. NYSE-SJW

RECENT PRICE 27.72 | P/E RATIO 20.8 (Trailing: 21.7 Median: 23.0) | RELATIVE P/E RATIO 1.18 | DIV'D YLD 2.7% | VALUE LINE

TIMELINESS 1 Raised 8/9/13
SAFETY 3 New 4/22/11
TECHNICAL 4 Lowered 10/18/13
BETA .85 (1.00 = Market)

High:	15.1	15.0	19.6	27.8	45.3	43.0	35.1	30.4	28.2	26.8	26.9	28.9
Low:	12.7	12.6	14.6	16.1	21.2	27.7	20.0	18.2	21.6	20.9	22.6	24.5

Target Price Range 2016 | 2017 | 2018

2016-18 PROJECTIONS

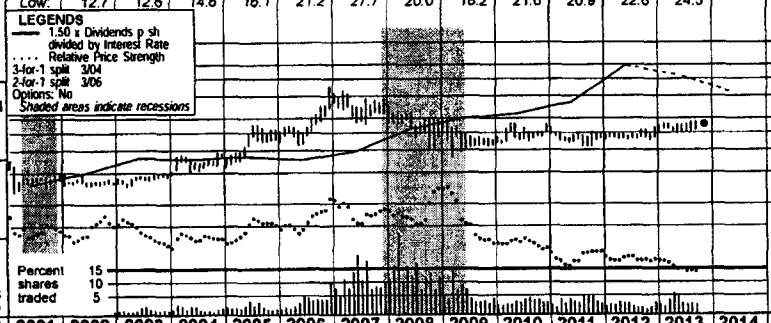
	Price	Gain	Ann'l Total Return
High	40	(+45%)	12%
Low	30	(+10%)	5%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	4	0	0	0	0	0	0	0	0
Options	0	1	0	0	0	0	0	0	0
to Sell	0	1	0	0	0	0	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	34	46	47
to Sell	30	20	28
Hld's(000)	9043	10000	10629



% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	13.6	31.2
3 yr.	24.0	60.1
5 yr.	7.9	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
5.79	5.58	6.40	6.74	7.45	7.97	8.20	9.14	9.86	10.35	11.25	12.12	11.68	11.62	12.85	14.01	14.05	14.75	Revenues per sh	16.30
1.27	1.26	1.43	1.23	1.49	1.55	1.75	1.89	2.21	2.38	2.30	2.44	2.21	2.38	2.80	2.97	3.25	3.50	"Cash Flow" per sh	3.65
.80	.76	.87	.58	.77	.78	.91	.87	1.12	1.19	1.04	1.08	.81	.84	1.11	1.18	1.30	1.40	Earnings per sh A	1.60
.38	.39	.40	.41	.43	.46	.49	.51	.53	.57	.61	.65	.66	.68	.69	.71	.73	.75	Div'd Decl'd per sh B■	.90
1.27	1.81	1.77	1.89	2.63	2.06	3.41	2.31	2.83	3.87	6.62	3.79	3.17	5.65	3.75	5.67	5.25	5.20	Cap'l Spending per sh	4.85
7.02	7.53	7.88	7.90	8.17	8.40	9.11	10.11	10.72	12.48	12.90	13.99	13.66	13.75	14.20	14.71	15.40	16.40	Book Value per sh	19.15
19.02	19.01	18.27	18.27	18.27	18.27	18.27	18.27	18.27	18.28	18.36	18.18	18.50	18.55	18.59	18.67	20.25	21.00	Common Shs Outst'g C	23.00
11.2	13.1	15.5	33.1	18.5	17.3	15.4	19.6	19.7	23.5	33.4	26.2	28.7	29.1	21.2	20.4	Bold figures are		Avg Ann'l P/E Ratio	22.0
.65	.68	.88	2.15	.95	.94	.88	1.04	1.05	1.27	1.77	1.58	1.91	1.85	1.33	1.30	Value Line		Relative P/E Ratio	1.45
4.3%	3.9%	3.0%	2.1%	3.0%	3.4%	3.5%	3.0%	2.4%	2.0%	1.7%	2.3%	2.8%	2.8%	2.9%	3.0%	estimates		Avg Ann'l Div'd Yield	2.6%
						149.7	166.9	180.1	189.2	206.6	220.3	216.1	215.6	239.0	261.5	285	310	Revenues ($mill)	375
						16.7	16.0	20.7	22.2	19.3	20.2	15.2	15.8	20.9	22.3	26.0	29.0	Net Profit ($mill)	37.0
						36.2%	42.1%	41.6%	40.8%	39.4%	39.5%	40.4%	38.8%	41.1%	41.1%	41.0%	40.0%	Income Tax Rate	40.0%
						1.6%	2.1%	1.6%	2.1%	2.7%	2.3%	2.0%	--	2.0%	2.0%	3.0%	4.0%	AFUDC % to Net Profit	5.0%
						45.6%	43.7%	42.6%	41.8%	47.7%	46.0%	49.4%	53.7%	56.6%	55.0%	54.5%	54.0%	Long-Term Debt Ratio	51.0%
						54.4%	56.3%	57.4%	58.2%	52.3%	54.0%	50.6%	46.3%	43.4%	45.0%	45.5%	46.0%	Common Equity Ratio	49.0%
						306.0	328.3	341.2	391.8	453.2	470.9	499.6	550.7	607.9	610.2	685	745	Total Capital ($mill)	900
						428.5	456.8	484.8	541.7	645.5	684.2	718.5	785.5	756.2	831.6	890	950	Net Plant ($mill)	1150
						6.9%	6.5%	7.6%	7.0%	5.7%	5.8%	4.4%	4.3%	4.9%	5.0%	5.0%	5.0%	Return on Total Cap'l	6.0%
						10.0%	8.7%	10.6%	9.7%	8.2%	8.0%	6.0%	6.2%	7.9%	8.1%	8.5%	8.5%	Return on Shr. Equity	8.5%
						10.0%	8.7%	10.6%	9.7%	8.2%	8.0%	6.0%	6.2%	7.9%	8.1%	8.5%	8.5%	Return on Com Equity	8.5%
						4.7%	3.6%	5.6%	5.2%	3.5%	3.3%	1.2%	1.2%	3.1%	3.3%	3.5%	4.0%	Retained to Com Eq	3.5%
						53%	58%	47%	46%	57%	59%	80%	80%	61%	59%	56%	54%	All Div'ds to Net Prof	56%

CAPITAL STRUCTURE as of 6/30/13
Total Debt $335.8 mill. Due in 5 Yrs $21.2 mill.
LT Debt $335.3 mill. LT Interest $18.6 mill.
(Total interest coverage: 4.6x) (52% of Cap'l)

Leases, Uncapitalized: Annual rentals $4.7 mill.

Pension Assets $75.5 mill. Oblig. $141.0 mill.

Pfd Stock None.

Common Stock 20,137,197 shs. as of7/26/13

MARKET CAP: $650 million (Small Cap)

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	26.7	2.5	4.0
Other	42.2	40.4	44.2
Current Assets	68.9	42.9	48.2
Accts Payable	7.4	8.5	15.9
Debt Due	.8	20.7	.5
Other	20.1	19.9	28.8
Current Liab.	28.3	49.1	45.2
Fix. Chg. Cov.	276%	247%	231%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	5.5%	4.0%	4.0%
"Cash Flow"	6.5%	3.5%	5.0%
Earnings	4.0%	-1.5%	7.5%
Dividends	5.0%	4.0%	4.5%
Book Value	5.5%	3.5%	5.0%

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	40.4	54.1	70.3	50.8	215.6
2011	43.7	59.0	73.9	62.4	239.0
2012	51.1	65.6	82.4	62.4	261.5
2013	50.1	74.2	90.7	70.0	285
2014	60.0	75.0	100	75.0	310

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.055	.24	.44	.11	.84
2011	.03	.29	.44	.35	1.11
2012	.06	.28	.53	.31	1.18
2013	.07	.37	.54	.32	1.30
2014	.10	.35	.60	.35	1.40

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.165	.165	.165	.165	.66
2010	.17	.17	.17	.17	.68
2011	.173	.173	.173	.173	.69
2012	.1775	.1775	.1775	.1775	.71
2013	.1825	.1825	.1825		

BUSINESS: SJW Corporation engages in the production, purchase, storage, purification, distribution, and retail sale of water. It provides water service to approximately one million people in the San Jose area and 8,700 connections that serve approximately 36,000 residents in a service area in the region between San Antonio and Austin, Texas. The company offers nonregulated water-related services, including water system operations, cash remittances, and maintenance contract services. SJW also owns and operates commercial real estate investments. Has about 375 employees. Chrm.: Charles J. Toeniskoetter. Inc.: CA. Address: 110 W. Taylor Street, San Jose, CA 95110. Tel.: (408) 279-7800. Int: www.sjwater.com.

A final decision on SJW's pending rate case will be delayed. The California Public Utility Commission (CPUC) has had to divert much of its resources to investigate the San Bruno gas pipeline explosion, which killed eight people in 2010.

Meanwhile, 2013 is benefiting from interim rate relief. SJW is seeking substantial rate increases of 21.5% for 2013, 4.9% in 2014, and 12.6% in 2016. Until a final decision is reached on this request, the utility has been allowed to raise rates on an interim basis. Though earnings comparisons won't be impressive in the second half of the year, we still think that the utility's share net can increase 10%, to $1.30

SJW's future is in the hands of regulators. While this statement is true for all utilities, SJW is more vulnerable than most. This is due to the enormous size of the rate hikes that it has petitioned for. Even though we view the company's expenditures as essential to the operations of its system, the sheer size of the requests puts the CPUC in a difficult position. It is politically very hard to raise rate payers' bills by such a large extent without a significant amount of political blow-back.

Therefore, our 2014 profit estimate for the company is pretty tenuous. Earnings should be fine as long as the interim rate relief is in place. Once the CPUC makes a final decision, things could change for the worse. In any case, we should point out that California regulators have been reasonable in the past, and hopefully some sort of deal that satisfies both sides can be reached.

We expect SJW to tap the external markets in the years ahead. The company estimates that it will have to invest $100 million annually through 2016-2018 in order to upgrade its aging infrastructure. Internal cash flow will fall well short of generating sufficient funds to meet these outlays. Thus, there will be dilutive equity offerings and costly debt issuance. Both of these moves will impair the company's earnings growth.

SJW shares now carry our Highest rank (1) for Timeliness. Momentum investors may find this stock of interest, others might be scared off by the possibility of a harsh regulatory decision.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Excludes nonrecurring losses : '03, $1.97; '04, $3.78; '05, $1.09; '06, $16.36; '08, $1.22; '10, 46¢. Next earnings report due late October. Quarterly egs. may not add due to rounding.
(B) Dividends historically paid in early March, June, September, and December. ■ Div'd reinvestment plan available.
(C) In millions, adjusted for stock splits.

Company's Financial Strength	B+
Stock's Price Stability	80
Price Growth Persistence	50
Earnings Predictability	80

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YORK WATER NDQ-YORW

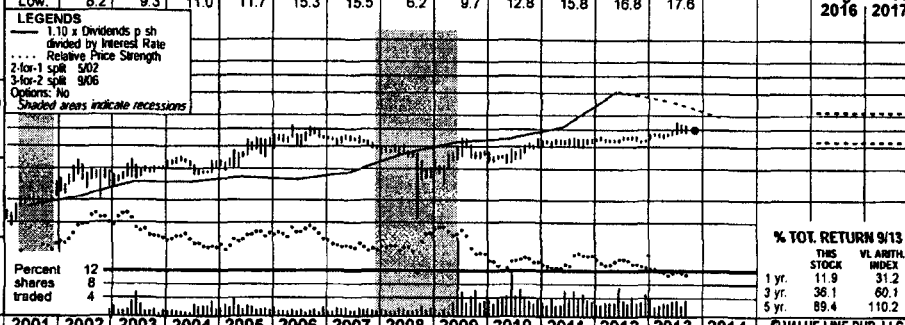
RECENT PRICE 19.90 | P/E RATIO 25.8 (Trailing: 26.5 Median: 25.0) | RELATIVE P/E RATIO 1.47 | DIV'D YLD 2.9% | VALUE LINE

TIMELINESS 4 Lowered 10/4/13
SAFETY 2 New 7/19/13
TECHNICAL 3 Lowered 8/2/13
BETA .70 (1.00 = Market)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
High:	13.4	13.5	14.0	17.9	21.0	18.5	16.5	18.0	18.0	18.1	18.5	22.0	
Low:	8.2	9.3	11.0	11.7	15.3	15.5	6.2	9.7	12.8	15.8	16.8	17.6	

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.10 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
2-for-1 split 5/02
3-for-2 split 9/06
Options: No
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	25	(+25%)	8%
Low	17	(-15%)	Nil

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	4	0	0	4	0	1	5
Options	0	0	0	0	0	0	0	0	0
to Sell	0	1	0	0	0	1	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	26	33	32
to Sell	27	21	26
Hld's(000)	3178	3375	3346

Percent shares traded 12 8 4

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	11.9	31.2
3 yr.	36.1	60.1
5 yr.	89.4	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
--	--	--	--	2.05	2.05	2.17	2.18	2.58	2.56	2.79	2.89	2.95	3.07	3.18	3.21	*3.40*	*3.50*	Revenues per sh	*3.55*
--	--	--	--	.59	.57	.65	.65	.79	.77	.86	.88	.95	1.07	1.09	1.12	*1.20*	*1.30*	"Cash Flow" per sh	*1.40*
--	--	--	--	.43	.40	.47	.49	.56	.58	.57	.57	.64	.71	.71	.72	*.75*	*.85*	Earnings per sh A	*.90*
--	--	--	--	.34	.35	.37	.39	.42	.45	.48	.49	.51	.52	.53	.54	*.55*	*.57*	Div'd Decl'd per sh B	*.65*
--	--	--	--	.75	.66	1.07	2.50	1.69	1.85	1.69	2.17	1.18	.83	.74	.94	*.90*	*.80*	Cap'l Spending per sh	*.90*
--	--	--	--	3.79	3.90	4.06	4.65	4.85	5.84	5.97	6.14	6.92	7.19	7.45	7.73	*8.05*	*8.35*	Book Value per sh	*8.60*
--	--	--	--	9.46	9.55	9.63	10.33	10.40	11.20	11.27	11.37	12.56	12.69	12.79	12.92	*13.00*	*13.20*	Common Shs Outst'g C	*14.00*
--	--	--	--	17.8	26.9	24.5	25.7	26.3	31.2	30.3	24.6	21.9	20.7	23.9	24.4	*Bold figures are*		Avg Ann'l P/E Ratio	*22.5*
--	--	--	--	.91	1.47	1.40	1.36	1.40	1.68	1.61	1.48	1.46	1.32	1.50	1.55	*Value Line*		Relative P/E Ratio	*1.50*
--	--	--	--	4.4%	3.3%	3.2%	3.1%	2.9%	2.5%	2.8%	3.5%	3.6%	3.5%	3.1%	3.1%	*estimates*		Avg Ann'l Div'd Yield	*3.2%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $84.9 mill. Due in 5 Yrs $19.5 mill.
LT Debt $84.9 mill. LT Interest $5.2 mill.
(Total interest coverage: 2.9x)
(46% of Cap'l)
Pension Assets 12/12 $22.7 mill. Oblig. $34.7 mill.

Pfd Stock None

Common Stock 12,912,243 shs. as of 8/6/13

MARKET CAP: $260 million (Small Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
20.9	22.5	26.8	28.7	31.4	32.8	37.0	39.0	40.6	41.4	*43.0*	*46.0*	Revenues ($mill)	*50.0*
4.4	4.8	5.8	6.1	6.4	6.4	7.5	8.9	9.1	9.3	*10.2*	*11.3*	Net Profit ($mill)	*12.6*
34.8%	36.7%	36.7%	34.4%	36.5%	36.1%	37.9%	38.5%	35.3%	37.6%	*36.0%*	*36.0%*	Income Tax Rate	*36.0%*
--	--	--	7.2%	3.6%	10.1%	--	1.2%	1.1%	1.1%	*1.0%*	*1.0%*	AFUDC % to Net Profit	*1.0%*
43.4%	42.5%	44.1%	48.3%	46.5%	54.5%	45.7%	48.3%	47.1%	46.0%	*45.0%*	*45.0%*	Long-Term Debt Ratio	*43.0%*
56.6%	57.5%	55.9%	51.7%	53.5%	45.5%	54.3%	51.7%	52.9%	54.0%	*55.0%*	*55.0%*	Common Equity Ratio	*57.0%*
69.0	83.6	90.3	126.5	125.7	153.4	160.1	176.4	180.2	184.8	*190*	*197*	Total Capital ($mill)	*220*
116.5	140.0	155.3	174.4	191.6	211.4	222.0	228.4	233.0	240.3	*245*	*250*	Net Plant ($mill)	*265*
8.5%	7.6%	8.4%	6.2%	6.7%	5.7%	6.2%	6.5%	6.4%	6.4%	*6.5%*	*7.0%*	Return on Total Cap'l	*7.0%*
11.4%	10.0%	11.6%	9.3%	9.5%	9.2%	8.6%	9.8%	9.5%	9.3%	*9.5%*	*10.0%*	Return on Shr. Equity	*10.0%*
11.4%	10.0%	11.6%	9.3%	9.5%	9.2%	8.6%	9.8%	9.5%	9.3%	*9.5%*	*10.0%*	Return on Com Equity	*10.0%*
2.6%	2.1%	3.0%	2.2%	1.7%	1.4%	1.9%	2.7%	2.5%	2.4%	*3.0%*	*3.0%*	Retained to Com Eq	*3.0%*
77%	79%	74%	77%	82%	85%	78%	72%	73%	74%	*71%*	*67%*	All Div'ds to Net Prof	*72%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	4.0	4.0	4.2
Accounts Receivable	6.0	6.4	4.0
Other	1.4	1.2	4.0
Current Assets	11.4	11.6	12.2
Accts Payable	1.1	1.1	1.5
Debt Due	.1	.1	--
Other	4.1	4.3	4.0
Current Liab.	5.3	5.5	5.5
Fix. Chg. Cov.	160%	156%	154%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	4.5%	3.5%	*2.0%*
"Cash Flow"	6.5%	6.5%	*4.0%*
Earnings	5.5%	4.5%	*4.0%*
Dividends	1.5%	3.0%	*3.5%*
Book Value	7.0%	6.0%	*2.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	9.0	9.7	10.5	9.8	39.0
2011	9.6	10.5	10.5	10.0	40.6
2012	9.6	10.4	11.0	10.4	41.4
2013	10.1	10.7	*11.2*	*11.0*	*43.0*
2014	*10.5*	*11.5*	*12.2*	*11.8*	*46.0*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.15	.18	.21	.17	.71
2011	.17	.19	.19	.16	.71
2012	.15	.17	.22	.18	.72
2013	.17	.18	*.21*	*.19*	*.75*
2014	*.19*	*.21*	*.23*	*.22*	*.85*

Cal-endar	QUARTERLY DIVIDENDS PAID B Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.126	.126	.126	.126	.504
2010	.128	.128	.128	.128	.512
2011	.131	.131	.131	.131	.524
2012	.134	.134	.134	.134	.535
2013	.138	.138	.138	.138	

BUSINESS: The York Water Company is the oldest investor-owned regulated water utility in the United States. It has operated continuously since 1816. As of December 31, 2012, the company's average daily availability was 35.0 million gallons and its service territory had an estimated population of 189,000. Has more than 63,000 customers. Residential customers accounted for 63% of 2012 revenues; commercial and industrial (29%); other (8%). It also provides sewer billing services. Incorporated: PA. York had 103 full-time employees at 12/31/12. President/CEO: Jeffrey R. Hines. Officers/directors own 1.2% of the common stock (3/13 proxy). Address: 130 East Market Street York, Pennsylvania 17401. Telephone: (717) 845-3601. Internet: www.yorkwater.com.

There have been very few surprises at The York Water Company in the recent past. From 2010 through 2012, the company's annual share earnings varied by only $0.01 a share. The dividend was also very predictable, as it rose by just $0.01 a share annually during the same time span.

York is awaiting the outcome of a major rate case. Last May, the utility petitioned Pennsylvania regulators for a 17% rate increase (about $7.1 million in revenues a year). The request was to recoup the $49 million that York has spent since 2010 to modernize and update its aging infrastructure. In addition, along with the help of a large rate increase for wastewater customers, the added funds will help the utility replace 30 miles of pipeline and reduce water leakage for the 190,000 people it services.

We think that the outcome will be relatively reasonable. There is no doubt that the current and projected expenditures by York are essential to keeping the system operating efficiently. However, we should point out that no matter how justified utility spending is, regulators face strong political pressure not to implement significant rate hikes.

Dividend growth should remain relatively modest in the years ahead. Though we think that the company will raise its annual payout by $0.02 a share in 2014, the growth rate over the next three- to five-year period will be slightly on the low side for a water utility.

Finances are in decent shape. The equity-to-total capital ratio is healthy at a solid 54%. Still, our Financial Strength rating for York is an average B+. This metric would be higher if the company's capital base was more substantial.

There is nothing particularly noteworthy about York Water's shares. Both the equity's current yield and dividend growth prospects are in line with those of most of its peers. Moreover, the stock has performed fairly well of late and is now trading at over 25 times our 12 month share-earnings estimate. And finally, according to our proprietary Timeliness Ranking System, York shares should underperform the market averages in the upcoming six- to 12-month period.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Next earnings report due early November.
(B) Dividends historically paid in mid-January, April, July, and October.
(C) In millions, adjusted for splits.

Company's Financial Strength	B+
Stock's Price Stability	90
Price Growth Persistence	75
Earnings Predictability	100

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Chaparral City Water Company
Derivation of Investment Risk Adjustment Based upon
Ibbotson Associates' Size Premia for the Decile Portfolios of the NYSE/AMEX/NASDAQ

Line No.		1 Market Capitalization on December 31, 2013 (1) (millions)	(times larger)	2 Applicable Decile of the NYSE/AMEX/ NASDAQ (2)	3 Applicable Size Premium (3)	4 Spread from Applicable Size Premium for (4)
1.	Chaparral City Water Company					
a.	Based Upon the Proxy Group of Nine Water Companies	$ 57.806		10	6.03%	
b.	Based Upon ACC Staff Witness Cassidy's Sample Water Utilities	$ 61.983		10	6.03%	
2.	Proxy Group of Nine Water Companies	$ 1,712.285	29.6	6	1.72%	4.31%
3.	ACC Staff Witness Cassidy's Sample Water Utilities	$ 1,107.309	17.9	7	1.73%	4.30%

	(A) Decile	(B) Number of Companies (millions)	(C) Recent Total Market Capitalization (millions)	(D) Recent Average Market Capitalization (millions)	(E) Size Premium (Return in Excess of CAPM) (2)
Largest	1	173	$ 10,255,341.469	$ 59,279.430	-0.37%
	2	193	2,219,118.548	$ 11,498.024	0.76%
	3	187	1,072,861.025	$ 5,737.225	0.92%
	4	202	695,897.336	$ 3,445.036	1.14%
	5	205	473,139.360	$ 2,307.997	1.70%
	6	234	377,485.205	$ 1,613.185	1.72%
	7	317	329,504.738	$ 1,039.447	1.73%
	8	329	214,084.258	$ 650.712	2.46%
	9	466	166,708.095	$ 357.743	2.70%
Smallest	10	1068	107,517.520	$ 100.672	6.03%

*From Ibbotson 2013 Valuation Yearbook

Notes:

(1) From Page 26 of this Schedule.
(2) Gleaned from Column (D) on the bottom of this page. The appropriate decile (Column (A)) corresponds to the market capitalization of the proxy group, which is found in Column 1.
(3) Corresponding risk premium to the decile is provided on Column (E) on the bottom of this page.
(4) Line No. 1a Column 3 – Line No. 2 Column 3 and Line No. 1b, Column 3 – Line No. 3 of Column 3 etc.. For example, the 4.31% in Column 4, Line No. 2 is derived as follows 4.31% = 6.03% - 1.72%.

Chaparral City Water Company
Market Capitalization of Chaparral City Water Company and
the Proxy Group of Nine Water Companies and ACC Staff Witness Cassidy's Sample Water Utilities

Company	Exchange	1 Common Stock Shares Outstanding at Fiscal Year End 2012 (millions)	2 Book Value per Share at Fiscal Year End 2012 (1)	3 Total Common Equity at Fiscal Year End 2012 (millions)	4 Closing Stock Market Price on December 31, 2013	5 Market-to-Book Ratio on December 31, 2013 (2)	6 Market Capitalization on December 31, 2013 (3) (millions)
Chaparral City Water Company		NA	NA	$ 26.949 (4)	NA	214.5 % (5)	$ 57.806 (6)
Based Upon the Proxy Group of Nine Water Companies						230.0	$ 61.983
Based Upon ACC Staff Witness Cassidy's Sample Water Utilities							
Proxy Group of Nine Water Companies							
American States Water Co.		38.474	$ 11.815	$ 454.579	$ 28.730	243.2 %	$ 1,105.370
American Water Works Co., Inc.		176.988	$ 25.115	$ 4,444.988	$ 42.260	168.3	$ 7,479.513
Aqua America, Inc.		175.209	$ 7.909	$ 1,385.704	$ 23.590	298.3	$ 4,133.182
Artesian Resources Corp.		7.838	$ 15.078	$ 118.180	$ 22.950	152.2	$ 179.884
California Water Service Group		41.908	$ 11.304	$ 473.712	$ 23.070	204.1	$ 966.823
Connecticut Water Service, Inc.		10.939	$ 17.014	$ 186.121	$ 35.510	208.7	$ 388.461
Middlesex Water Company		15.795	$ 11.498	$ 181.632	$ 20.940	182.1	$ 330.747
SJW Corporation		18.671	$ 14.706	$ 274.804	$ 29.790	202.5	$ 556.196
York Water Company		12.919	$ 7.727	$ 99.825	$ 20.930	270.9	$ 270.387
Average		55.416	$ 13.574	$ 846.594	$ 27.530	214.5 %	$ 1,712.285
ACC Staff Witness Cassidy's Sample Water Utilities		44.845 (7)	$ 11.711 (7)	$ 438.597 (7)	$ 26.080 (7)	230.0 (7)	$ 1,107.309 (7)

NA= Not Available

Notes: (1) Column 3 / Column 1.
(2) Column 4 / Column 2.
(3) Column 5 * Column 3.
(4) From Financial Statements of Chaparral City Water Company for Fiscal Year End 2012.
(5) The market-to-book ratio of Chaparral City Water Company on December 31, 2013 is assumed to be equal to the market-to-book ratio of the Proxy Group of Nine Water Companies at December 31, 2013.
(6) Chaparral City Water Company's common stock, if traded, would trade at a market-to-book ratio equal to the average market-to-book ratio at December 31, 2013 of the Proxy Group of Nine Water Companies, 214.5%, and Chaparral City Water Company's market capitalization on December 31, 2013 would therefore have been $57.806 million.
(5) The market-to-book ratio of Chaparral City Water Company on December 31, 2013 is assumed to be equal to the market-to-book ratio of ACC Staff Witness Cassidy's Sample Water Utilities at December 31, 2013.
(6) Chaparral City Water Company's common stock, if traded, would trade at a market-to-book ratio equal to the average market-to-book ratio at December 31, 2013 of ACC Staff Witness Cassidy's Sample Water Utilities, 230.0%, and Chaparral City Water Company's market capitalization on December 31, 2013 would therefore have been $61.983 million.

(9) Average for ACC Staff Witness Cassidy's sample water utilities.

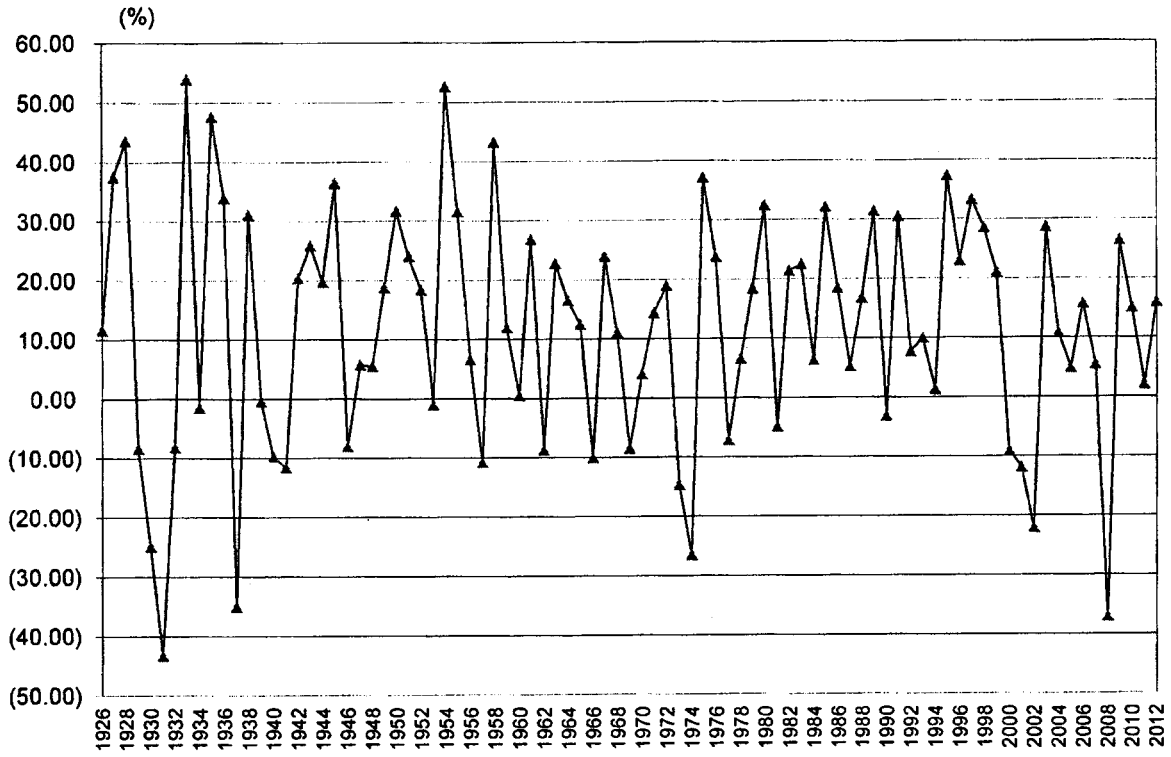
Source of Information: 2012 Annual Forms 10K
yahoo.finance.com

Chaparral City Water Company
R-Squared or Correlation Coefficient for
RUCO Witness Parcell's Water Utilities

RUCO Witness Parcell's Water Utilities	Value Line Adjusted Beta	Unadjusted Beta	R-Squared
American States Water Co.	0.70	0.4522	0.2045
American Water Works	0.65	0.4275	0.1828
Aqua America, Inc.	0.60	0.3914	0.1532
Artesian Resources Corp.	0.60	0.3517	0.1237
California Water Service Group	0.65	0.4831	0.2334
Connecticut Water Service, Inc.	0.75	0.5241	0.2747
Middlesex Water Company	0.70	0.5496	0.3021
SJW Corporation	0.85	0.5494	0.3018
York Water Company	0.70	0.4552	0.2072
Average	0.69	0.4649	0.2204

Source of Information:
Value Line, Inc. December 15, 2013

Large Company Stock Returns
From 1926 to 2012



Source of Information:
Ibbotson® SBBI® - 2013 Valuation Yearbook - Market Results for Stocks Bonds Bills and Inflation - 1926-2012, Morningstar, Inc., 2013 Chicago, IL.

Total Returns on Large Company Stocks
1926 to 2012

Large Company Stocks

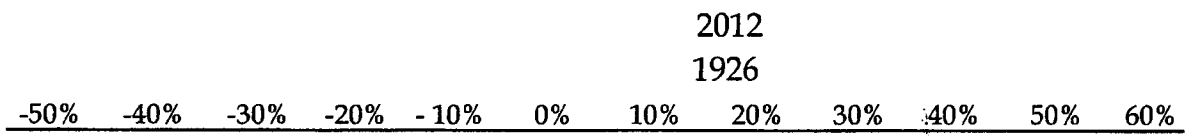
-50%	-40%	-30%	-20%	-10%	0%	10%	20%	30%	40%	50%	60%
						2012					
						2010					
						2006					
					2011	2004	2009				
					2007	1988	2003	1997			
				1990	2005	1986	1999	1995			
				1981	1994	1979	1998	1991			
				1977	1993	1972	1996	1989			
				1969	1992	1971	1983	1985			
				1962	1987	1968	1982	1980			
				1953	1984	1965	1976	1975			
			2001	1946	1978	1964	1967	1955			
			2000	1940	1970	1959	1963	1950			
			1973	1939	1960	1952	1961	1945			
		2002	1966	1934	1956	1949	1951	1938	1958		
	2008	1974	1957	1932	1948	1944	1943	1936	1935	1954	
1931	1937	1930	1941	1929	1947	1926	1942	1927	1928	1933	

Arithmetic Mean: $r_A = \sum_{t=1}^{n} r_t / n$

Source : Ibbotson® SBBI ® - 2013 Valuation Yearbook - Market Results for Stocks, Bonds, Bills, and Inflation -1926-2012, p. 183
Morningstar, Inc., 2013 Chicago, IL

Total Returns on Large Company Stocks
1926 to 2012

Large Company Stocks



Geometric Mean: $r_G = \left[V_n \ / \ V_0 \right]^{1/n} - 1$

Source : Ibbotson® SBBI ® - 2013 Valuation Yearbook - Market Results for Stocks, Bonds, Bills, and Inflation -1926-2012, pp. 182-183
Morningstar, Inc., 2013 Chicago, IL

Ibbotson® SBBI®

2013 Valuation Yearbook

Market Results for
Stocks, Bonds, Bills, and Inflation
1926–2012

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Chapter 5

The Equity Risk Premium

The expected equity risk premium can be defined as the additional return an investor expects to receive to compensate for the additional risk associated with investing in equities as opposed to investing in riskless assets. It is an essential component in several cost of equity estimation models, including the buildup method, the capital asset pricing model (CAPM), and the Fama-French three factor model. It is important to note that the expected equity risk premium, as it is used in discount rates and cost of capital analysis, is a forward-looking concept. That is, the equity risk premium that is used in the discount rate should be reflective of what investors think the risk premium will be going forward.

Unfortunately, the expected equity risk premium is unobservable in the market and therefore must be estimated. Typically, this estimation is arrived at through the use of historical data. The historical equity risk premium can be calculated by subtracting the long-term average of the income return on the riskless asset (Treasuries) from the long-term average stock market return (measured over the same period as that of the riskless asset). In using a historical measure of the equity risk premium, one assumes that what has happened in the past is representative of what might be expected in the future. In other words, the assumption one makes when using historical data to measure the expected equity risk premium is that the relationship between the returns of the risky asset (equities) and the riskless asset (Treasuries) is stable. The stability of this relationship will be examined later in this chapter.

Since the expected equity risk premium must be estimated, there is much controversy regarding how the estimation should be conducted. A variety of different approaches to calculating the equity risk premium have been utilized over the years. Such studies can be categorized into four groups based on the approaches they have taken. The first group of studies tries to derive the equity risk premium from historical returns between stocks and bonds as was mentioned above. The second group, embracing a supply side model, uses fundamental information such as earnings, dividends, or overall economic productivity to measure the expected equity risk premium. A third group adopts demand side models that derive the expected returns of equities through the payoff demanded by investors for bearing the risk of equity investments.[1] The opinions of financial professionals through broad surveys are relied upon by the fourth and final group.

The range of equity risk premium estimates used in practice is surprisingly large. Using a low equity risk premium estimate as opposed to a high estimate can have a significant impact on the estimated value of a stream of cash flows. This chapter addresses many of the controversies surrounding estimation of the equity risk premium and focuses primarily on the historical calculation but also discusses the supply side model.

Calculating the Historical Equity Risk Premium

In measuring the historical equity risk premium one must make a number of decisions that can impact the resulting figure; some decisions have a greater impact than others. These decisions include selecting the stock market benchmark, the risk-free asset, either an arithmetic or a geometric average, and the time period for measurement. Each of these factors has an impact on the resulting equity risk premium estimate.

The Stock Market Benchmark

The stock market benchmark chosen should be a broad index that reflects the behavior of the market as a whole. Two examples of commonly used indexes are the S&P 500® and the New York Stock Exchange Composite Index. Although the Dow Jones Industrial Average is a popular index, it would be inappropriate for calculating the equity risk premium because it is too narrow.

We use the total return of our large company stock index (currently represented by the S&P 500) as our market benchmark when calculating the equity risk premium. The S&P 500 was selected as the appropriate market benchmark because it is representative of a large sample of companies across a large number of industries. The S&P 500 is also one of the most widely accepted market benchmarks. In short, the S&P 500 is a good measure of the equity market as a

whole. Table 5-1 illustrates the equity risk premium calculation using several different market indices and the income return on three government bonds of different horizons.

Table 5-1: Equity Risk Premium with Different Market Indices

	Equity Risk Premia		
	Long-Horizon (%)	Intermediate-Horizon (%)	Short-Horizon (%)
S&P 500	6.70	7.24	8.24
Total Value-Weighted NYSE	6.49	7.03	8.02
NYSE Deciles 1–2	5.96	6.51	7.50

Data from 1926–2012.

The equity risk premium is calculated by subtracting the arithmetic mean of the government bond income return from the arithmetic mean of the stock market total return. Table 5-2 demonstrates this calculation for the long-horizon equity risk premium.

Table 5-2: Long-Horizon Equity Risk Premium Calculation

	Arithmetic Mean				
Long-Horizon	Market Total Return (%)	–	Risk-Free Rate (%)	=	Equity Risk Premium (%)
S&P 500	11.82	–	5.12	=	6.70
Total Value-Weighted NYSE	11.60	–	5.12	=	6.48
NYSE Deciles 1–2	11.08	–	5.12	=	5.96

Data from 1926–2012.

Data for the New York Stock Exchange is obtained from Morningstar and the Center for Research in Security Prices (CRSP) at the University of Chicago's Graduate School of Business. The "Total" series is a capitalization-weighted index and includes all stocks traded on the New York Stock Exchange except closed-end mutual funds, real estate investment trusts, foreign stocks, and Americus Trusts. Capitalization-weighted means that the weight of each stock in the index, for a given month, is proportionate to its market capitalization (price times number of shares outstanding) at the beginning of that month. The "Decile 1–2" series includes all stocks with capitalizations that rank within the upper 20 percent of companies traded on the New York Stock Exchange, and it is therefore a large-capitalization index. For more information on the Center for Research in Security Pricing data methodology, see Chapter 7.

The resulting equity risk premia vary somewhat depending on the market index chosen. It is expected that using the "Total" series will result in a higher equity risk premium than using the "Decile 1–2" series, since the "Decile 1–2" series is a large-capitalization series. As of September 30, 2012, deciles 1–2 of the New York Stock Exchange contained the largest 285 companies traded on the exchange. The "Total" series includes smaller companies that have had historically higher returns, resulting in a higher equity risk premium.

The higher equity risk premium arrived at by using the S&P 500 as a market benchmark is more difficult to explain. One possible explanation is that the S&P 500 is not restricted to the largest 500 companies; other considerations such as industry composition are taken into account when determining if a company should be included in the index. Some smaller stocks are thus included, which may result in the higher equity risk premium of the index. Another possible explanation would be what is termed the "S&P inclusion effect." It is thought that simply being included among the stocks listed on the S&P 500 augments a company's returns. This is due to the large quantity of institutional funds that flow into companies that are listed in the index.

Comparing the S&P 500 total returns to those of another large-capitalization stock index may help evaluate the potential impact of the "S&P inclusion effect." Prior to March 1957, the S&P index that is used throughout this publication consisted of 90 of the largest stocks. The index composition was then changed to include 500 large-capitalization stocks that, as stated earlier, are not necessarily the 500 largest. Deciles 1–2 of the NYSE contained just over 200 of the largest companies, ranked by market capitalization, in March of 1957. The number of companies included in the deciles of the NYSE fluctuates from quarter to quarter, and by September of 2012, deciles 1–2 contained 285 companies. Though one cannot draw a causal relationship between the change in construction and the correlation of these two indices, this analysis does indicate that the "S&P inclusion effect" does not appear to be very significant in recent periods.

Another possible explanation could be differences in how survivorship is treated when calculating returns. The Center for Research in Security Prices includes the return for a company in the average decile return for the period following the company's removal from the decile,

whether caused by a shift to a different decile portfolio, bankruptcy, or other such reason. On the other hand, the S&P 500 does not make this adjustment. Once a company is no longer included among the S&P 500, its return is dropped from the index. However, this effect may be lessened by the advance announcement of companies being dropped from or added to the S&P 500. In many instances throughout this publication we will present equity risk premia using both the S&P 500 and the NYSE "Deciles 1–2" portfolio to provide a comparison between these large-capitalization benchmarks.

The Market Benchmark and Firm Size

Although not restricted to include only the 500 largest companies, the S&P 500 is considered a large company index. The returns of the S&P 500 are capitalization weighted, which means that the weight of each stock in the index, for a given month, is proportionate to its market capitalization (price times number of shares outstanding) at the beginning of that month. The larger companies in the index therefore receive the majority of the weight. The use of the NYSE "Deciles 1–2" series results in an even purer large company index. Yet many valuation professionals are faced with valuing small companies, which historically have had different risk and return characteristics than large companies. If using a large stock index to calculate the equity risk premium, an adjustment is usually needed to account for the different risk and return characteristics of small stocks. This will be discussed further in Chapter 7 on the size premium.

The Risk-Free Asset

The equity risk premium can be calculated for a variety of time horizons when given the choice of risk-free asset to be used in the calculation. The *2013 Ibbotson® Stocks, Bonds, Bills, and Inflation® Classic Yearbook* provides equity risk premia calculations for short-, intermediate-, and long-term horizons. The short-, intermediate-, and long-horizon equity risk premia are calculated using the income return from a 30-day Treasury bill, a 5-year Treasury bond, and a 20-year Treasury bond, respectively.

Although the equity risk premia of several horizons are available, the long-horizon equity risk premium is preferable for use in most business-valuation settings, even if an investor has a shorter time horizon. Companies are entities that generally have no defined life span; when determining a company's value, it is important to use a long-term discount rate because the life of the company is assumed to be infinite. For this reason, it is appropriate in most cases to use the long-horizon equity risk premium for business valuation.

20-Year versus 30-Year Treasuries

Our methodology for estimating the long-horizon equity risk premium makes use of the income return on a 20-year Treasury bond; however, the Treasury currently does not issue a 20-year bond. The 30-year bond that the Treasury recently began issuing again is theoretically more correct due to the long-term nature of business valuation, yet Ibbotson Associates instead creates a series of returns using bonds on the market with approximately 20 years to maturity. The reason for the use of a 20-year maturity bond is that 30-year Treasury securities have only been issued over the relatively recent past, starting in February of 1977, and were not issued at all through the early 2000s.

The same reason exists for why we do not use the 10-year Treasury bond—a long history of market data is not available for 10-year bonds. We have persisted in using a 20-year bond to keep the basis of the time series consistent.

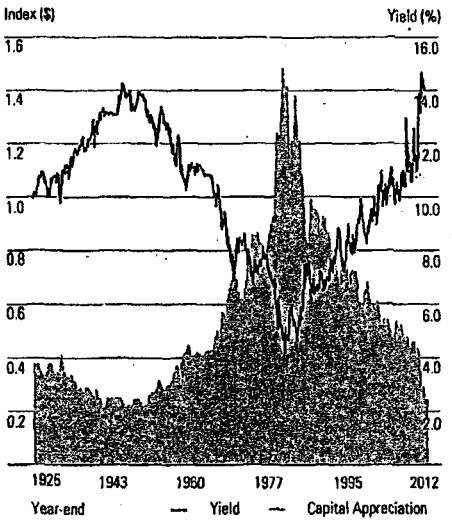
Income Return

Another point to keep in mind when calculating the equity risk premium is that the income return on the appropriate-horizon Treasury security, rather than the total return, is used in the calculation. The total return is comprised of three return components: the income return, the capital appreciation return, and the reinvestment return. The income return is defined as the portion of the total return that results from a periodic cash flow or, in this case, the bond coupon payment. The capital appreciation return results from the price change of a bond over a specific period. Bond prices generally change in reaction to unexpected fluctuations in yields. Reinvestment return is the return on a given month's investment income when reinvested into the same asset class in the subsequent months of the year. The income return is thus used in the estimation of the equity risk premium because it represents the truly riskless portion of the return.[2]

Yields have generally risen on the long-term bond over the 1926–2012 period, so it has experienced negative capital appreciation over much of this time. This trend has turned

around since the 1980s, however. Graph 5-1 illustrates the yields on the long-term government bond series compared to an index of the long-term government bond capital appreciation. In general, as yields rose, the capital appreciation index fell, and vice versa. Had an investor held the long-term bond to maturity, he would have realized the yield on the bond as the total return. However, in a constant maturity portfolio, such as those used to measure bond returns in this publication, bonds are sold before maturity (at a capital loss if the market yield has risen since the time of purchase). This negative return is associated with the risk of unanticipated yield changes.

Graph 5-1: Long-term Government Bond Yields versus Capital Appreciation Index



Data from 1925–2012.

For example, if bond yields rise unexpectedly, investors can receive a higher coupon payment from a newly issued bond than from the purchase of an outstanding bond with the former lower-coupon payment. The outstanding lower-coupon bond will thus fail to attract buyers, and its price will decrease, causing its yield to increase correspondingly, as its coupon payment remains the same. The newly priced outstanding bond will subsequently attract purchasers who will benefit from the shift in price and yield; however, those investors who already held the bond will suffer a capital loss due to the fall in price.

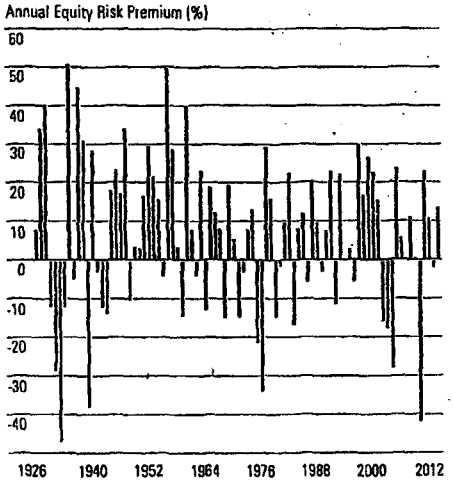
Anticipated changes in yields are assessed by the market and figured into the price of a bond. Future changes in yields that are not anticipated will cause the price of the bond to adjust accordingly. Price changes in bonds due to unanticipated changes in yields introduce price risk into the total return. Therefore, the total return on the bond series does not represent the riskless rate of return. The income return better represents the unbiased estimate of the purely riskless rate of return, since an investor can hold a bond to maturity and be entitled to the income return with no capital loss.

Arithmetic versus Geometric Means

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

The argument for using the arithmetic average is quite straightforward. In looking at projected cash flows, the equity risk premium that should be employed is the equity risk premium that is expected to actually be incurred over the future time periods. Graph 5-2 shows the realized equity risk premium for each year based on the returns of the S&P 500 and the income return on long-term government bonds. (The actual, observed difference between the return on the stock market and the riskless rate is known as the realized equity risk premium.) There is considerable volatility in the year-by-year statistics. At times the realized equity risk premium is even negative.

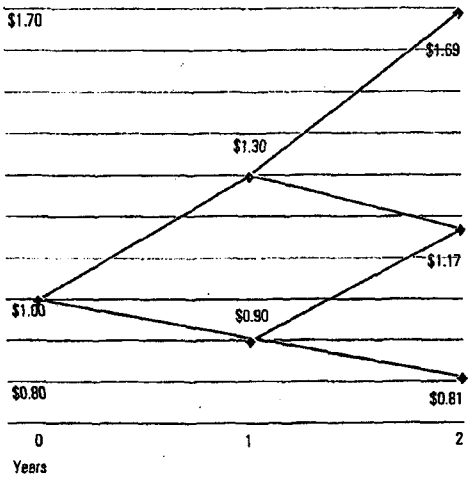
Graph 5-2: Realized Equity Risk Premium Per Year



Data from 1926–2012.

To illustrate how the arithmetic mean is more appropriate than the geometric mean in discounting cash flows, suppose the expected return on a stock is 10 percent per year with a standard deviation of 20 percent. Also assume that only two outcomes are possible each year: +30 percent and –10 percent (i.e., the mean plus or minus one standard deviation). The probability of occurrence for each outcome is equal. The growth of wealth over a two-year period is illustrated in Graph 5-3.

Graph 5-3: Growth of Wealth Example



The most common outcome of $1.17 is given by the geometric mean of 8.2 percent. Compounding the possible outcomes as follows derives the geometric mean:

$$\left[(1+0.30)\times(1-0.10)\right]^{1/2}-1=0.082$$

However, the expected value is predicted by compounding the arithmetic, not the geometric, mean. To illustrate this, we need to look at the probability-weighted average of all possible outcomes:

(0.25 × $1.69) =	$0.4225
+ (0.50 × $1.17) =	$0.5850
+ (0.25 × $0.81) =	$0.2025
Total	$1.2100

Therefore, $1.21 is the probability-weighted expected value. The rate that must be compounded to achieve the terminal value of $1.21 after 2 years is 10 percent, the *arithmetic mean*:

$$\$1\times(1+0.10)^2=\$1.21$$

The geometric mean, when compounded, results in the *median of the distribution*:

$$\$1\times(1+0.082)^2=\$1.17$$

The arithmetic mean equates the expected future value with the present value; it is therefore the appropriate discount rate.

Appropriate Historical Time Period

The equity risk premium can be estimated using any historical time period. For the U.S., market data exists at least as far back as the late 1800s. Therefore, it is possible to estimate the equity risk premium using data that covers roughly the past 100 years.

Our equity risk premium covers the time period from 1926 to the present. The original data source for the time series comprising the equity risk premium is the Center for Research in Security Prices. CRSP chose to begin their analysis of market returns with 1926 for two main reasons. CRSP determined that the time period around 1926 was

approximately when quality financial data became available. They also made a conscious effort to include the period of extreme market volatility from the late twenties and early thirties; 1926 was chosen because it includes one full business cycle of data before the market crash of 1929. These are the most basic reasons why our equity risk premium calculation window starts in 1926.

Implicit in using history to forecast the future is the assumption that investors' expectations for future outcomes conform to past results. This method assumes that the price of taking on risk changes only slowly, if at all, over time. This "future equals the past" assumption is most applicable to a random time-series variable. A time-series variable is random if its value in one period is independent of its value in other periods.

Does the Equity Risk Premium Revert to Its Mean Over Time?

Some have argued that the estimate of the equity risk premium is upwardly biased since the stock market is currently priced high. In other words, since there have been several years with extraordinarily high market returns and realized equity risk premia, the expectation is that returns and realized equity risk premia will be lower in the future, bringing the average back to a normalized level. This argument relies on several studies that have tried to determine whether reversion to the mean exists in stock market prices and the equity risk premium.[3] Several academics contradict each other on this topic; moreover, the evidence supporting this argument is neither conclusive nor compelling enough to make such a strong assumption.

Our own empirical evidence suggests that the yearly difference between the stock market total return and the U.S. Treasury bond income return in any particular year is random. Graph 5-2, presented earlier, illustrates the randomness of the realized equity risk premium.

A statistical measure of the randomness of a return series is its serial correlation. Serial correlation (or autocorrelation) is defined as the degree to which the return of a given series is related from period to period. A serial correlation near positive one indicates that returns are predictable from one period to the next period and are positively related. That is, the returns of one period are a good predictor of the returns in the next period. Conversely, a serial correlation near negative one indicates that the returns in one period are inversely related to those of the next period. A serial correlation near zero indicates that the returns are random or unpredictable from one period to the next. Table 5-3 contains the serial correlation of the market total returns, the realized long-horizon equity risk premium, and inflation.

Table 5-3: Interpretation of Annual Serial Correlations

Series	Serial Correlation	Interpretation
Large Company Stock Total Returns	0.01	Random
Equity Risk Premium	0.02	Random
Inflation Rates	0.64	Trend

Data from 1926–2012.

The significance of this evidence is that the realized equity risk premium next year will not be dependent on the realized equity risk premium from this year. That is, there is no discernible pattern in the realized equity risk premium—it is virtually impossible to forecast next year's realized risk premium based on the premium of the previous year. For example, if this year's difference between the riskless rate and the return on the stock market is higher than last year's, that does not imply that next year's will be higher than this year's. It is as likely to be higher as it is lower. The best estimate of the expected value of a variable that has behaved randomly in the past is the average (or arithmetic mean) of its past values.

Table 5-4 also indicates that the equity risk premium varies considerably by decade. The complete decades ranged from a high of 17.9 percent in the 1950s to a low of -3.7 percent in the 2000s. This look at historical equity risk premium reveals no observable pattern.

Table 5-4: Long-Horizon Equity Risk Premium by Decade (%)

1920s*	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	03-2012
17.6	2.3	8.0	17.9	4.2	0.3	7.9	12.1	-3.7	4.6

Data from 1926–2012.
*Based on the period 1926–1929.

Finnerty and Leistikow perform more econometrically sophisticated tests of mean reversion in the equity risk premium. Their tests demonstrate that—as we suspected from our simpler tests—the equity risk premium that was realized over 1926 to the present was almost perfectly free of mean reversion and had no statistically identifiable time trends.[4] Lo and MacKinlay conclude, "the rejection of the random walk for weekly returns does not support a mean-reverting model of asset prices."

Choosing an Appropriate Historical Period

The estimate of the equity risk premium depends on the length of the data series studied. A proper estimate of the equity risk premium requires a data series long enough to give a reliable average without being unduly influenced by very good and very poor short-term returns. When calculated using a long data series, the historical equity risk premium is relatively stable.[5] Furthermore, because an average of the realized equity risk premium is quite volatile when calculated using a short history, using a long series makes it less likely that the analyst can justify any number he or she wants. The magnitude of how shorter periods can affect the result will be explored later in this chapter.

Some analysts estimate the expected equity risk premium using a shorter, more recent time period on the basis that recent events are more likely to be repeated in the near future; furthermore, they believe that the 1920s, 1930s, and 1940s contain too many unusual events. This view is suspect because all periods contain "unusual" events. Some of the most unusual events of the last hundred years took place quite recently, including the inflation of the late 1970s and early 1980s, the October 1987 stock market crash, the collapse of the high-yield bond market, the major contraction and consolidation of the thrift industry, the collapse of the Soviet Union, the development of the European Economic Community, the attacks of September 11, 2001 and the more recent liquidity crisis of 2008 and 2009.

It is even difficult for economists to predict the economic environment of the future. For example, if one were analyzing the stock market in 1987 before the crash, it would be statistically improbable to predict the impending short-term volatility without considering the stock market crash and market volatility of the 1929–1931 period.

Without an appreciation of the 1920s and 1930s, no one would believe that such events could happen. The 87-year period starting with 1926 is representative of what can happen: it includes high and low returns, volatile and quiet markets, war and peace, inflation and deflation, and prosperity and depression. Restricting attention to a shorter historical period underestimates the amount of change that could occur in a long future period. Finally, because historical event-types (not specific events) tend to repeat themselves, long-run capital market return studies can reveal a great deal about the future. Investors probably expect "unusual" events to occur from time to time, and their return expectations reflect this.

A Look at the Historical Results

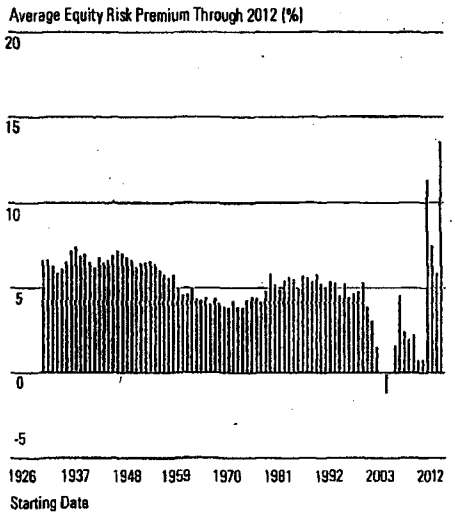
It is interesting to take a look at the realized returns and realized equity risk premium in the context of the above discussion. Table 5-5 shows the average stock market return and the average (arithmetic mean) realized long-horizon equity risk premium over various historical time periods. Similarly, Graph 5-5 shows the average (arithmetic mean) realized equity risk premium calculated through 2012 for different ending dates. The table and the graph both show that using a longer historical period provides a more stable estimate of the equity risk premium. The reason is that any unique period will not be weighted heavily in an average covering a longer historical period. It better represents the probability of these unique events occurring over a long period of time.

Table 5-5: Stock Market Return and Equity Risk Premium Over Time

Length (Yrs.)	Period Dates	Large Company Stock Arithmetic Mean Total Return (%)	Long-Horizon Equity Risk Premium (%)
87	1926–2012	11.8	6.7
80	1933–2012	12.8	7.5
70	1943–2012	12.7	7.1
60	1953–2012	11.9	5.7
50	1963–2012	11.2	4.5
40	1973–2012	11.4	4.2
30	1983–2012	12.3	5.7
20	1993–2012	10.0	4.7
15	1998–2012	6.3	1.6
10	2003–2012	8.8	4.6
5	2008–2012	4.5	0.9

Data from 1926–2012.

Graph 5-4: Equity Risk Premium Using Different Starting Dates



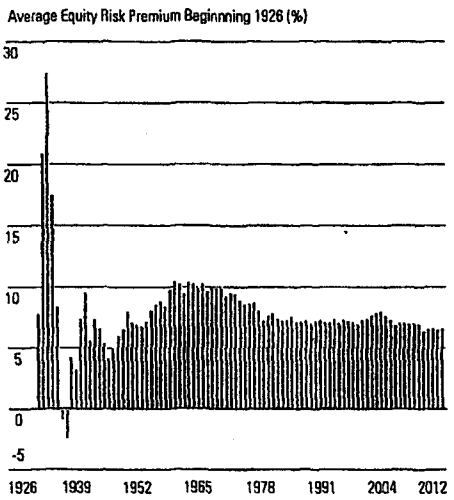
Data from 1926–2012.

Looking carefully at Graph 5-4 will clarify this point. The graph shows the realized equity risk premium for a series of time periods through 2012, starting with 1926. In other words, the first value on the graph represents the average realized equity risk premium over the period 1926–2012. The next value on the graph represents the average realized equity risk premium over the period 1927–2012, and so on, with the last value representing the average over the most recent five years, 2006–2012. Concentrating on the left side of Graph 5-5, one notices that the realized equity risk premium, when measured over long periods of time, is relatively stable. In viewing the graph from left to right, moving from longer to shorter historical periods, one sees that the value of the realized equity risk premium begins to decline significantly. Why does this occur? The reason is that the severe bear market of 1973–1974 is receiving proportionately more weight in the shorter, more recent average. If you continue to follow the line to the right, however, you will also notice that when 1973 and 1974 fall out of the recent average, the realized equity risk premium jumps up by nearly 1.2 percent.

Additionally, use of recent historical periods for estimation purposes can lead to illogical conclusions. As seen in Table 5-5, the bear market in the early 2000's and in 2008 has caused the realized equity risk premium in the shorter historical periods to be lower than the long-term average.

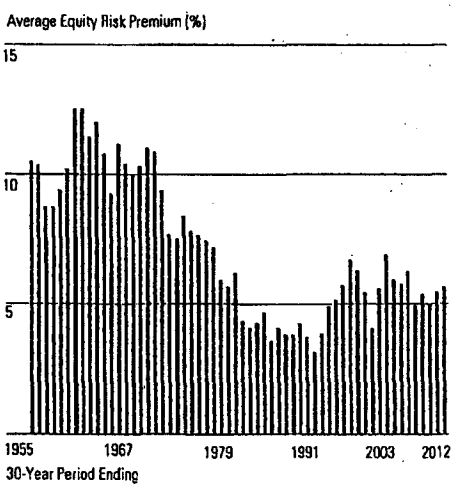
The impact of adding one additional year of data to a historical average is lessened the greater the initial time period of measurement. Short-term averages can be affected considerably by one or more unique observations. On the other hand, long-term averages produce more stable results. A series of graphs looking at the realized equity risk premium will illustrate this effect. Graph 5-5 shows the average (arithmetic mean) realized long-horizon equity risk premium starting in 1926. Each additional point on the graph represents the addition of another year to the average. Although the graph is extremely volatile in the beginning periods, the stability of the long-term average is quite remarkable. Again, the "unique" periods of time will not be weighted heavily in a long-term average, resulting in a more stable estimate.

Graph 5-5: Equity Risk Premium Using Different Ending Dates



Data from 1926–2012.

Graph 5-6: Equity Risk Premium Over 30-Year Periods



Data from 1926–2012.

Some practitioners argue for a shorter historical time period, such as 30 years, as a basis for the equity risk premium estimation. The logic for the use of a shorter period is that historical events and economic scenarios present before this time are unlikely to be repeated. Graph 5-6 shows the equity risk premium measured over 30-year periods, and it appears from the graph that the premium has been trending downwards. The 30-year equity risk premium remained close to 4 percent for several years in the 1980s and 1990s. However, it has fallen and then risen in the most recent 30-year periods.

The key to understanding this result lies again in the years 1973 and 1974. The oil embargo during this period had a tremendous effect on the market. The equity risk premium for these years alone was -21 and -34 percent, respectively. Periods that include the years 1973 and 1974 result in average equity risk premia as low as 3.2 percent. The 2000s have also had an enormous effect on the equity risk premium.

It is difficult to justify such a large divergence in estimates of return over such a short period of time. This does not suggest, however, that the years 1973 and 1974 should be excluded from any estimate of the equity risk premium; rather, it emphasizes the importance of using a long historical period when measuring the equity risk premium in order to obtain a reliable average that is not overly influenced by short-term returns. The same holds true when analyzing the poor performance of the early 2000s and 2008.

Does the Equity Risk Premium Represent Minority or Controlling Interest?

There is quite a bit of confusion among valuation practitioners regarding the use of publicly traded company data to derive the equity risk premium. Is a minority discount implicit in this data? Recall that the equity risk premium is typically derived from the returns of a market index: the S&P 500, the New York Stock Exchange (NYSE), or the NYSE Deciles 1–2. (The size premia that are covered in Chapter 7 are derived from the returns of companies traded on the NYSE, in addition to those on the NYSE Amex and NASDAQ). Both the S&P 500 and the NYSE include a preponderance of companies that are minority held. Does this imply that an equity risk premium (or size premium) derived from these data represents a minority interest premium? This is a critical issue that must be addressed by the valuation professional, since applying a minority discount or a control premium can have a material impact on the ultimate value derived in an appraisal.

Since most companies in the S&P 500 and the NYSE are minority held, some assume that the risk premia derived from these return data represent minority returns and therefore have a minority discount implicit within them. However, this assumption is not correct. The returns that are generated by the S&P 500 and the NYSE represent returns to equity holders. While most of these companies are minority held, there is no evidence that higher rates of return could be earned if these companies were suddenly acquired by majority shareholders. The equity risk premium represents expected premiums that holders of securities of a similar nature can expect to achieve on average into the future. There is no distinction between minority owners and controlling owners.

The discount rate is meant to represent the underlying risk of being in a particular industry or line of business. There are instances when a majority shareholder can acquire a company and improve the cash flows generated by that company. However, this does not necessarily have an impact on the general risk level of the cash flows generated by the company.

When performing discounted cash flow analysis, adjustments for minority or controlling interest value may be more suitably made to the projected cash flows than to the discount rate. Adjusting the expected future cash flows better measures the potential impact a controlling party may have while not overstating or understating the actual risk associated with a particular line of business.

Appraisers need to note the distinction between a publicly traded value and a minority interest value. Most public companies have no majority or controlling owner. There is thus no distinction between owners in this setting. One cannot assume that publicly held companies with no controlling owner have the same characteristics as privately held companies with both a controlling interest owner and a minority interest owner.

Other Equity Risk Premium Issues

There are a number of other issues that are commonly brought up regarding the equity risk premium that, if correct, would reduce its size. These issues include:

1. Survivorship bias in the measurement of the equity risk premium
2. Utility theory models of estimating the equity risk premium
3. Reconciling the discounted cash flow approach to the equity risk premium
4. Over-valuation effects of the market
5. Changes in investor attitudes toward market conditions
6. Supply side models of estimating the equity risk premium

In this section, we will examine each of these issues.

Survivorship

One common problem in working with financial data is properly accounting for survivorship. In working with company-specific historical data, it is important for researchers to include data from companies that failed as well as companies that succeeded before drawing conclusions from elements of that data.

The same argument can be made regarding markets as a whole. The equity risk premium data outlined in this book represent data on the United States stock market. The United States has arguably been the most successful stock market of the twentieth century. That being the case, might equity risk premium statistics based only on U.S. data overstate the returns of equities as a whole because they only focus on one successful market?

In a recent paper, Goetzmann and Jorion study this question by looking at returns from a number of world equity markets over the past century.[6] The Goetzmann-Jorion paper looks at the survivorship bias from several different perspectives. They conclude that once survivorship is taken into consideration the U.S. equity risk premium is overstated by approximately 60 basis points.[7] The non-U.S. equity risk premium was found to contain significantly more survivorship bias.

While the survivorship bias evidence may be compelling on a worldwide basis, one can question its relevance to a purely U.S. analysis. If the entity being valued is a U.S. company, then the relevant data set should be the performance of equities in the U.S. market.

Equity Risk Premium Puzzle

In 1985, Mehra and Prescott published a paper that discussed the equity risk premium from a utility theory perspective. The point that Mehra and Prescott make is that under existing economic theory, economists cannot justify the magnitude of the equity risk premium. The utility theory model employed was incapable of obtaining values consistent with those observed in the market.

This is an interesting point and may be worthy of further study, but it does not do anything to prove that the equity risk premium is too high. It may, on the other hand, indicate that theoretical economic models require further refinement to adequately explain market behavior.

Discounted Cash Flow versus Capital Asset Pricing Model

Two of the most commonly used cost of equity models are the discounted cash flow model and the capital asset pricing model. We should be able to reconcile the two models. In its basic form, the discounted cash flow model states that the expected return on equities is the dividend yield plus the expected long-term growth rate. The capital asset pricing model states that the expected return on equities is the risk-free rate plus the equity risk premium.[8]

For the discounted cash flow model we can obtain an estimate of the long-term growth rate for the entire economy by looking at its component parts. Real Gross Domestic Product growth has averaged approximately three percent over long periods of time. Long-term expected inflation is currently in the range of two percent. Combining these two numbers produces an expected long-term growth rate of about five percent. Dividend yields have been between two percent and three percent historically. The discounted cash flow expected equity return is thus between seven percent and eight percent using these assumptions.

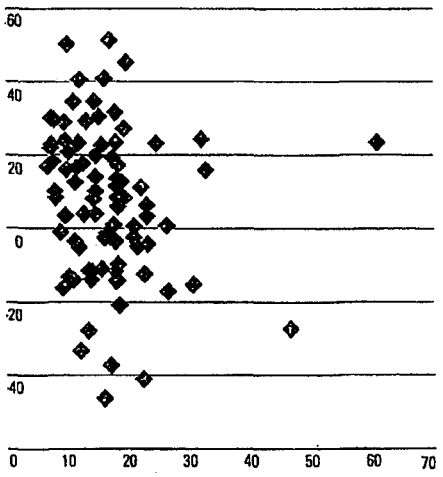
If we try to reconcile this expected equity return with that found using the capital asset pricing model, we find a significant discrepancy. The yield on government bonds has averaged around five percent historically. If the two models are to reconcile, the equity risk premium must be in the two to three percent range instead of the seven to eight percent range we have observed historically.

It is not easy to explain why these two models are so difficult to reconcile. While it is possible to modify the assumptions slightly, doing so still does not produce the desired results. One explanation might be that one or both of the models are too simplistic and therefore lack the ability to resolve this inconsistency.

Market Bubbles

Another criticism of using the historical equity risk premium is that the market is overvalued. This argument is often offered after stock prices have seen a sustained increase. The logic of the argument is that abnormally high market returns drive the historical equity risk premium higher while at the same time driving the expected equity risk premium lower. As evidence of the market being overvalued, one can look at the price/earnings multiple of the market. Graph 5-7 attempts to demonstrate the relationship between the price/earnings multiple and the subsequent period's equity risk premium. If the above argument held, one would expect to find a low equity risk premium associated with a high price/earnings multiple from the prior period. One would also expect a high equity risk premium to be associated with a low price/earnings multiple in the prior period. From the graph there does not seem to be a clear indication of the market being overvalued or undervalued with respect to the next period's realized equity risk premium.

Graph 5-7: Price-Earnings Multiple versus Subsequent Year's Realized Equity Risk Premium



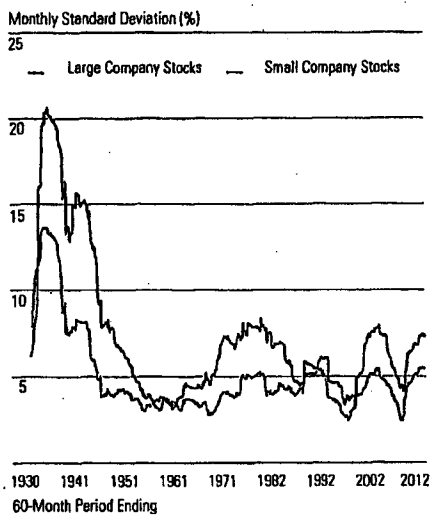
Data from 1926–2012. Source: Historical price/earnings ratios from Standard & Poor's Security Price Index Record and Compustat database.

There are yet other problems with this theory. First, the equity risk premium is measured over a long historical time period. Several years of strong market returns have a relatively small impact on the ultimate equity risk premium estimate. Second, we are attempting to forecast a long-term equity risk premium. Even if the market were to underperform over several consecutive time periods, this should not have a significant impact on expected long-term returns. Finally, one ratio does not necessarily tell the whole story. The price/earnings ratio shows the current stock price divided by the historical earnings per share. Stock prices should, on the other hand, incorporate expectations of future earnings growth. A high market price/earnings ratio may indicate that investors expect significant future earnings growth.

Change in Investor Attitudes

There is no law that states that investor attitudes must remain constant over time. With the advent of 401(k) investing and the increase in education of the investing public, the market may have changed. In fact, stock returns have become less volatile over time. Graph 5-8 demonstrates a relative decline in the rolling 60-month standard deviation of both large and small stocks. (Standard deviation is a measure of the returns' volatility or risk.) This may suggest that we have moved into a new market regime in which stocks are less volatile and therefore require a lower risk premium than in the past.[9]

Graph 5-8: Rolling 60-Month Standard Deviation for Large and Small Stocks



Data from January 1926–December 2012.

There are two arguments against this rationale. First, it could easily be argued that we have moved through a series of market regimes during the 87-year history of the equity risk premium calculation window used in this book. Given that markets and investor attitudes have changed over time and the equity risk premium has remained relatively constant, there is no reason to believe that a new market regime will have any greater or lesser impact than any other time period.

A second argument relates to the demand for investments. If investors are more comfortable with the market and with stock investing, they will probably place more money into the market. This influx of funds will increase the demand for stocks, which will ultimately increase, not decrease, the equity risk premium.

Supply Model

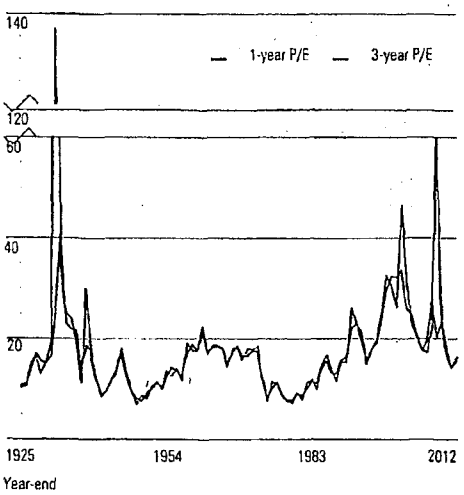
Long-term expected equity returns can be forecasted by the use of supply side models. The supply of stock market returns is generated by the productivity of the corporations in the real economy. Investors should not expect a much higher or lower return than that produced by the companies in the real economy. Thus, over the long run, equity returns should be close to the long-run supply estimate.

Roger G. Ibbotson and Peng Chen forecast the equity risk premium through a supply side model using historical data.[10] They utilized an earnings model as the basis for their supply side estimate; historically, the growth in corporate earnings has been in line with the growth of overall economic productivity. The earnings model breaks historical returns into four pieces, with only three historically being supplied by companies: inflation, income return, and growth in real earnings per share. The growth in the P/E ratio, the fourth piece, is a reflection of investors' changing prediction of future earnings growth. The past supply of corporate growth is forecasted to continue; however, a change in investors' predictions is not. P/E rose dramatically from 1980 through 2001 because people believed that corporate earnings were going to grow faster in the future. This growth of P/E drove a small portion of the rise in equity returns over the same period.

Graph 5-9 illustrates the price-to-earnings ratio calculated using one-year and three-year average earnings from 1926 to 2012. The P/E ratio, using one-year average earnings, was 10.22 at the beginning of 1926 and ended the year 2012 at 16.37—an average increase of 0.54 percent per year. The highest P/E was 136.55 recorded in 1932, while the lowest was 7.07 recorded in 1948.

Ibbotson Associates revised the calculation of the P/E ratio from a one-year to a three-year average earnings for use in equity forecasting. This is because reported earnings are affected not only by the long-term productivity, but also by "one-time" items that do not necessarily have the same consistent impact year after year. The three-year average is more reflective of the long-term trend than the year-by-year numbers. The P/E ratio calculated using the three-year average of earnings had an increase of 0.44 percent per year.

Graph 5-9: Large Company Stocks P/E Ratio



Data from 1926-2012.

The historical P/E growth factor using three-year earnings of 0.44 percent per year is subtracted from the forecast because it is not believed that P/E will continue to increase in the future. The market serves as the cue. The current P/E ratio is the market's best guess for the future of corporate earnings and there is no reason to believe, at this time, that the market will change its mind.

Thus, the supply of equity returns only includes inflation, the growth in real earnings per share, and income return:

$$SR = [(1+CPI)\times(1+g_{REPS})-1]+Inc+Rinv$$

$$9.39^{*} = [(1+2.97\%)\times(1+2.07\%)-1]+4.06\%+0.21\%$$

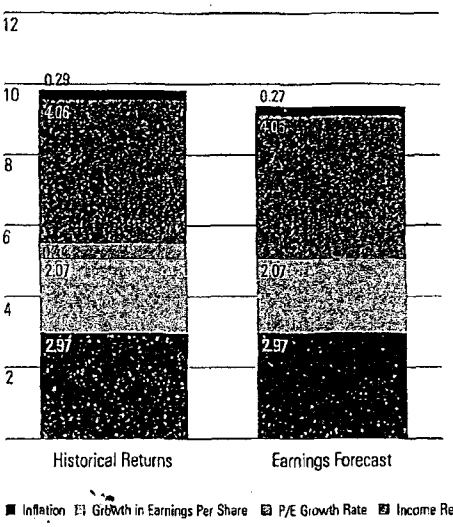
*difference due to rounding

where:

SR = the supply of the equity return;
CPI = Consumer Price Index (inflation);
g_{REPS} = the growth in real earning per share;
Inc = the income return;
Rinv = the reinvestment return.

The forward-looking earnings model calculates the long-term supply of U.S. equity returns to be 9.39 percent.

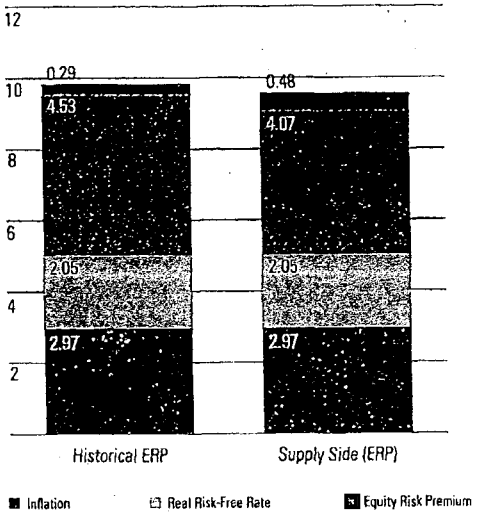
Graph 5-10: Historical and Forecast Equity Returns Based on Earnings Model



Data from 1926–2012. Results add up geometrically, not arithmetically. The darkest shade in the graph represents reinvested returns and an interaction factor between the return components.

Graph 5-10 illustrates the decomposition of historical equity returns from 1926–2012. It also illustrates the historical components that are supplied by companies: inflation, income return, and growth in real earnings per share. Once again the main difference between the historical and forecast equity returns is the exclusion of growth in P/E ratio in the forecasted earnings model.

Graph 5-11: Historical and Supply-Side Equity Risk Premium



Data from 1926–2012. Results add up geometrically, not arithmetically. The darkest shade in the graph represents reinvested returns and an interaction factor between the return components.

Table 5-6: Supply-Side and Historical Equity Risk Premium Over Time

Period Length (Yrs.)	Period Dates	g(P/E)	Arithmetic Average Supply Side Equity Risk Premium (%)	Arithmetic Average Historical Equity Risk Premium (%)
87	1926–2012	0.44*	6.11	6.70
86	1926–2011	0.34*	6.08	6.62
85	1926–2010	0.59	5.97	6.72
84	1926–2009	0.94	5.57	6.67
83	1926–2008	0.79	5.53	6.47
82	1926–2007	1.15	5.74	7.06
81	1926–2006	0.75	6.22	7.13
80	1926–2005	0.65	6.29	7.08
79	1926–2004	0.83	6.18	7.17
78	1926–2003	1.09	5.94	7.19
77	1926–2002	1.17	5.65	6.97
76	1926–2001	1.53	5.71	7.43
75	1926–2000	1.49	6.06	7.76
74	1926–1999	1.52	6.32	8.07
73	1926–1998	1.40	6.35	7.97
72	1926–1997	1.20	6.37	7.77
71	1926–1996	0.87	6.46	7.50
70	1926–1995	0.74	6.47	7.37
69	1926–1994	0.59	6.32	7.04
68	1926–1993	0.90	6.17	7.22
67	1926–1992	1.15	5.98	7.29
66	1926–1991	1.12	6.12	7.39
65	1926–1990	0.67	6.36	7.16
64	1926–1989	0.60	6.72	7.45
63	1926–1988	0.32	6.78	7.21

Data from 1926–2012. *Contains earnings estimate(s).

The supply-side equity risk premium is calculated to be 4.09 percent on a geometric basis.

$$SERP = \frac{(1+SR)}{(1+CPI)\times(1+RRf)} - 1$$

$$4.09\%^{*} = \frac{1+9.39\%}{(1+2.97\%)\times(1+2.05\%)} - 1$$

*difference due to rounding

where:

SERP = the supply-side equity risk premium;
SR = the supply of the equity return;
CPI = Consumer Price Index (inflation); and,
RRf = the real risk-free rate.

Graph 5-11 compares the historical equity risk premium, which includes the P/E ratio, to the supply-side equity risk premium calculated from 1926 to 2012 on a geometric basis. Contrary to several recent studies on equity risk premium that declare the forward-looking equity risk premium to be close to zero, or even negative, Ibbotson and Chen have found the long-term supply of equity risk premium to be only slightly lower than the straight historical estimate.

The supply-side equity risk premium calculated earlier is a geometric calculation. An arithmetic calculation, as mentioned earlier in the chapter, is most appropriate when discounting future cash flows. For use as the expected equity risk premium in either the CAPM or the buildup approach, the arithmetic calculation is the relevant number. There are several ways to convert the geometric average into an arithmetic average. One method is to assume the returns are independently lognormally distributed over time, where the arithmetic and geometric averages roughly follow the following relationship:

$$R_A = R_G + \frac{\sigma^2}{2}$$

$$6.13\%^{*} = 4.09\% + \frac{20.18\%^2}{2}$$

where:

R_A = the arithmetic average;
R_G = the geometric average;
σ = the standard deviation of equity returns.

As stated in IRS Ruling 59-60, although valuation is a forward-looking process, it must be based on facts available as of the required date of appraisal. Therefore, Ibbotson provides data critical to the valuation process as far back as 1926, such as the historical equity risk premium and size premium presented in Appendix A of this book. Similarly, Table 5-6 presents the supply side equity risk premium, on an arithmetic basis, beginning in 1926 and ending in each of the last 25 years.

As mentioned earlier, one of the key findings of the Ibbotson and Chen study is that P/E increases account for only a small portion of the total return of equity. The reason we present supply side equity risk premium going back only 25 years is because the P/E ratio rose dramatically over this time period, which caused the growth rate in the P/E ratio calculated from 1926 to be relatively high. The subtraction of the P/E growth factor from equity returns has been responsible for the downward adjustment in the supply side equity risk premium compared to the historical estimate. Beyond the last 25 years, the growth factor in the P/E ratio has not been dramatic enough to require an adjustment.

This section has briefly reviewed some of the more common arguments that seek to reduce the equity risk premium. While some of these theories are compelling in an academic framework, most do little to prove that the equity risk premium is too high. When examining these theories, it is important to remember that the equity risk premium data outlined in this book (both the historical and supply side estimates) are from actual market statistics over a long historical time period.

Considerations in Application

The supply-side equity risk premium has gained in popularity since its mainstream publication in 2003, but there have been many questions surrounding the model and its proper application. Any forward-looking model makes assumptions, and the supply model is no different. This section will draw from a more-exhaustive article by Magdalena Mroczek to help address some of the issues that commonly arise.[11]

The Meaning of "Supply Side"

Contrary to popular belief, the supply model does not refer to the economic supply and demand equilibrium of the market. In fact, it is termed the supply-side because it only takes into account company-generated, or company-supplied, returns. While the words "supply" and "demand" might portray images of economic equilibrium, they are really referring to a buildup of total-return components.

Stability of the Supply Model

As stated on Page 67, the supply-side equity risk premium uses a three-year average of earnings in calculating the P/E ratio as opposed to one-year earnings. In order to keep the three-year average earnings consistent with the current year's S&P 500 price, the earnings should be anchored around the same year as price. The average is composed of the prior year (t_{-1}), current year (t_0), and future year (t_{+1}) earnings, creating a price to three-year average earnings (P/3E) ratio.

Since both the current- and future-year earnings are estimates in each initial supply-side calculation, it takes two years of publications for the two earnings to actualize (all estimates are provided by Standard & Poors). For example, when calculating the 2012 supply-side equity risk premium, the earnings for 2012 (t_0) and 2013 (t_{+1}) are estimates. The 2012 supply-side equity risk premium will permanently stabilize in the 2015 Valuation Yearbook when actual earnings will be available for both 2012 and 2013. Therefore, the supply-side equity risk premium should change every year for two years and remain constant going forward.

Size Premium and Industry Risk Premium

The supply-side equity risk premium can be used alongside the size premium and industry risk premium calculated using the traditional historical equity risk premium as an input.

Some may think that the size premium needs to be recalculated as a supply model in order to use it with the supply-side equity risk premium. One way to arrive at this size premium would be to replace the historical equity risk premium with a supply-side equity risk premium when computing the expected returns for each decile. As explained in Chapter 7, size premium is calculated as the difference between a decile's actual return and its CAPM expected return. If the decile's actual return is measured using total returns and the CAPM expected return, as calculated using a supply-side equity risk premium, is in terms of supplied equity returns, then the resulting size premium would overcompensate for this mismatch. These different types of returns can cause high and unreasonable size premia.

One way to overcome the mismatch in return types and overstatement of size premium would be to remove historical P/E growth from each decile size category before computing excess returns based on size. Unfortunately, this, too, has its problems. One of the limitations to the supply model is that it relies on P/E growth measured over a defined starting and ending point. Subtracting P/E growth from each decile would be much more problematic, however, since the deciles are at their smallest membership and thinnest industry composition in 1926, the date when the P/E would be initialized. P/E growth simply cannot be removed from the individual deciles with the same confidence than it can from the overall market.

Computing industry risk premia with a supply-side equity risk premium input suffers from the same return mismatch issue as the size premium; the full information beta is calculated using total returns and the supply-side equity risk premium uses company-supplied returns. The full information beta is a 60-month beta and therefore uses too short of a time span to adjust for growth of P/E in the returns.[12] The supply-side equity risk premium calls for an annual P/E growth adjustment that incorporates three-year average earnings to normalize volatility, but this would not be appropriate to integrate into an industry risk premia calculation.

While it is internally inconsistent to apply a supply-side equity risk premium in a buildup model alongside a traditional size premium and industry premium, it is still the most practical way to apply this forward-looking adjustment to the cost of equity. The adjustment reflects the assumption that the historical P/E growth beginning in the 1980s was unsustainable and is not expected to repeat.

Supply-Side Relative to Historical Equity Risk Premium
A common belief in the industry is that the supply-side model always creates an equity risk premium lower than the historical model, but this is not the case. If investors foresee a future decline in earnings, price would drop in anticipation with no current change in earnings. The P/3E would need to drop below the 1926 P/3E level of 10.65 in order for the supply-side equity risk premium to be greater than the historical model. Looking back at the 87-year history, we can see this occurred 16 times. The supply-side equity risk premium was consistently greater than the historical model between 1977 and 1982 as well as throughout almost half of the 1940s and 1950s. In 1949, the difference between the two peaked when supply-side equity risk premium was 1.52 percent greater than the historical.

This unsustainable P/E growth, which began in the 1980s, is expected to return to historic levels in the future. Therefore, the historical and supply-side equity risk premiums are expected to converge over time.

Taxes and Equity Risk Premium Calculations
All of the risk premium statistics included in this publication are derived from market returns earned by an investor. The investor receives dividends and realizes price appreciation after the corporation has paid its taxes. Therefore, it is implicit that the market return data represents returns after corporate taxes but before personal taxes.

When performing a discounted cash flow analysis, both the discount rate and the cash flows should be on the same tax basis. Most valuation settings rely on after-tax cash flows; the use of an after-tax discount rate would thus be appropriate in most cases. However, there are some instances (usually because of regulatory or legal statute reasons) in which it is necessary to calculate a pre-tax value. In these cases, a pre-tax cost of capital or discount rate should be employed. There is no easy way, however, to accurately modify the return on a market index to a pre-tax basis. This modification would require estimating pre-tax returns for all of the publicly traded companies that comprise the market benchmark.

This presents a problem when a pre-tax discounted cash flow analysis is required. Although not completely correct, the easiest way to convert an after-tax discount rate to a pre-tax discount rate is to divide the after-tax rate by (1 minus the tax rate). This adjustment should be made to the entire discount rate and not to its component parts (i.e., the equity risk premium). Take note that this is a "quick and dirty" way to approximate pre-tax discount rates.

The tax rate to use in this "quick and dirty" method presents yet another problem. As seen in the discussion of the weighted average cost of capital in Chapter 1, companies do not always pay the top marginal tax rate. New research has shown some progress in quantifying the expected future tax rates. See Chapter 1 for more detail. ■

Endnotes

[1] Ibbotson, Roger G., Jeffrey J. Diermeier, and Laurence B. Siegel. "The Demand for Capital Market Returns: A New Equilibrium Theory," *Financial Analysts Journal*, January/February, vol. 40, no. 1, 1984, pp. 22-33.
Mehra, Rajnish and Edward Prescott. "The Equity Premium: A Puzzle," *Journal of Monetary Economics*, vol. 15, no. 2, 1985, pp. 145–161.

[2] Please note that the appropriate forward-looking measure of the riskless rate is the yield to maturity on the appropriate-horizon government bond. This differs from the riskless rate used to measure the realized equity risk premium historically. Chapter 4 includes a thorough discussion of riskless rate selection in this context.

[3] Fama, Eugene F., and Kenneth R. French."Permanent and Temporary Components of Stock Prices,"*Journal of Political Economy*, April 1988, pp. 246–273.
Poterba, James M., and Lawrence H. Summers. "Mean Reversion in Stock Prices," *Journal of Financial Economics*, October 1988, pp. 27–59.
Lo, Andrew W., and A. Craig MacKinlay. "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test," *The Review of Financial Studies*, Spring 1988, pp. 41–66.
Finnerty, John D., and Dean Leistikow. "The Behavior of Equity and Debt Risk Premiums: Are They Mean Reverting and Downward-Trending?" *The Journal of Portfolio Management*, Summer 1993, pp. 73–84.
Ibbotson, Roger G., and Scott L. Lummer. "The Behavior of Equity and Debt Risk Premiums: Comment," *The Journal of Portfolio Management*, Summer 1994, pp. 98–100.
Finnerty, John D., and Dean Leistikow. "The Behavior of Equity and Debt Risk Premiums: Reply to Comment," *The Journal of Portfolio Management*, Summer 1994, pp. 101–102.

[4] Though the study performed by Finnerty and Leistikow demonstrates that the traditional equity risk premium exhibits no mean reversion or drift, they conclude that, "the processes generating these risk premiums are generally mean-reverting."This conclusion is completely unrelated to their statistical findings and has received some criticism. In addition to examining the traditional equity risk premia, Finnerty and Leistikow include analyses on "real" risk premia as well as separate risk premia for income and capital gains. In their comments on the study, Ibbotson and Lummer show that these "real" risk premia adjust for inflation twice,"creating variables with no economic content." In addition, separating income and capital gains does not shed light on the behavior of the risk premia as a whole.

[5] This assertion is further corroborated by data presented in *Global Investing: The Professional's Guide to the World of Capital Markets* (by Roger G. Ibbotson and Gary P. Brinson and published by McGraw-Hill, New York). Ibbotson and Brinson constructed a stock market total return series back to 1790. Even with some uncertainty about the accuracy of the data before the mid-nineteenth century, the results are remarkable. The real (adjusted for inflation) returns that investors received during the three 50-year periods and one 51-year period between 1790 and 1990 did not differ greatly from one another (that is, in a statistically significant amount). Nor did the real returns differ greatly from the overall 201-year average. This finding implies that because real stock market returns have been reasonably consistent over time, investors can use these past returns as reasonable bases for forming their expectations of future returns.

[6] Goetzmann, William, and Philippe Jorion. "A Century of Global Stock Markets," Working Paper 5901, National Bureau of Economic Research, 1997.

[7] Note that the equity risk premium referred to in the Goetzmann and Jorion paper is not the same as the equity risk premium covered in this publication. Among other differences, their equity risk premium is based on a longer history of data and does not take dividend income or reinvestment into account.

[8] The discounted cash flow model is a modification of the Gordon Growth model, which states that: where P_0 is the price of the security today, D_1 is the dividend from next period, k is the cost of equity, and g is the expected growth rate in dividends. The capital asset pricing model is stated as $k_i = \beta_i$ (ERP) $+ r_f$ where k_i is the cost of equity for company i, βi is the beta for company i, ERP is the equity risk premium, and r_f is the risk-free rate. For the market as a whole, the capital asset pricing model can be written as $k = ERP + r_f$ because the market beta, by definition, is 1. For more information on these models, see Chapter 4.

[9] Note that the recent increase in market volatility, particularly in 1998, may also place into question the validity of this argument.

[10] Ibbotson, Roger G., and Peng Chen."Long-Run Stock Returns: Participating in the Real Economy," *Financial Analysts Journal*, January/February, vol. 59, no.1, 2003, pp. 88–98.

[11] Mroczek, Magdalena. "Unraveling the Supply-Side Equity Risk Premum," The Value Examiner, The National Association of Certified Valuators and Analysts, January/February 2012, pp. 19-24.

[12] For more information on full information betas, see Chapter 6.

Chaparral City Water Company
RUCO Witness Parcell's CAPM Cost Rates
Corrected to Reflect a Prospective Risk-Free Rate. Prospective Market Equity Risk Premium and
Properly Calculated Historical Market Equity Risk Premium

	Traditional Capital Asset Pricing Model (1)				ECAPM Results	Average of Traditional CAPM & ECAPM Results
	1	2	3	4	5	6
Company	Risk-Free Rate (2)	Beta (3)	Market Premium (4)	CAPM Rates	ECAPM Rates	
Ruco Witness Parcell's Water Utilities						
American States Water Co.	4.43%	0.70	7.24%	9.50%	10.04%	9.77%
Ameican Water Works Co., Inc.	4.43%	0.65	7.24%	9.14%	9.50%	9.32%
Aqua America, Inc.	4.43%	0.60	7.24%	8.77%	9.50%	9.14%
Artesian Resources Corp.	4.43%	0.60	7.24%	8.77%	9.50%	9.14%
California Water Service Group	4.43%	0.65	7.24%	9.14%	9.77%	9.46%
Connecticut Water Service, Inc.	4.43%	0.75	7.24%	9.86%	10.31%	10.09%
Middlesex Water Company	4.43%	0.70	7.24%	9.50%	10.04%	9.77%
SJW Corporation	4.43%	0.85	7.24%	10.58%	10.86%	10.72%
York Water Company	4.43%	0.70	7.24%	9.50%	10.04%	9.77%
Mean				9.42%	9.98%	9.70%
Median				9.50%	10.04%	9.77%

Notes: (1) Derived using the formula shown in note 3 on page 24 of Schedule 11 of this exhibit.
(2) Derived in note 2 on page 24 ofSchedule 11 of this exhibit.
(3) From page 23 of Schedule 11 of this exhibit.
(4) As derived in note 1 on page 24 of Schedule 11 of this exhibit.

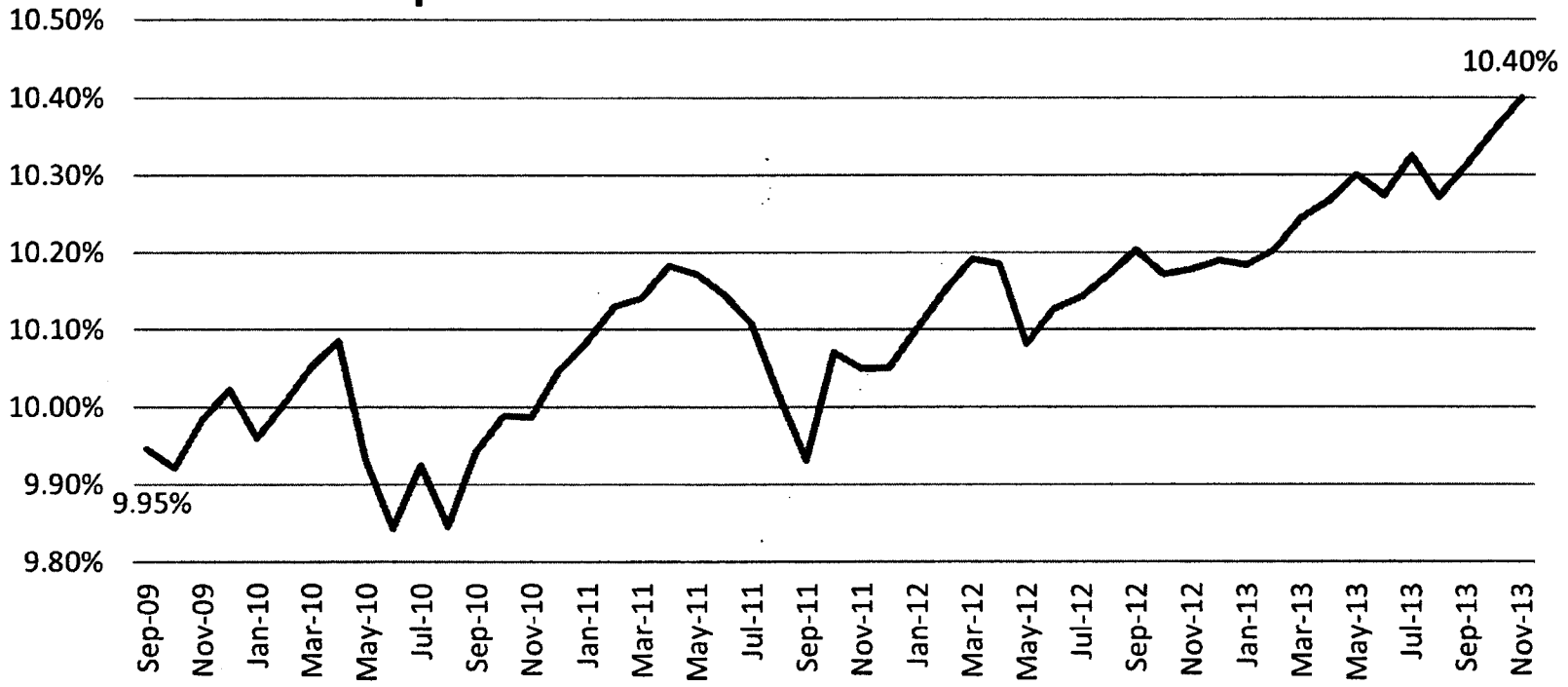
Chaparral City Water Company
RUCO Witness Parcell's CAPM Cost Rates
Corrected to Reflect a Prospective Risk-Free Rate. Prospective Market Equity Risk Premium and
Properly Calculated Historical Market Equity Risk Premium

Empirical Capital Asset Pricing Model (1)

	1	2	3	4
Company	Risk-Free Rate (2)	Beta (3)	Market Premium (4)	CAPM Rates
Ruco Witness Parcell's Water Utilities				
American States Water Co.	4.43%	0.70	7.24%	10.04%
American Water Works Co., Inc.	4.43%	0.65	7.24%	9.77%
Aqua America, Inc.	4.43%	0.60	7.24%	9.50%
Artesian Resources Corp.	4.43%	0.60	7.24%	9.50%
California Water Service Group	4.43%	0.65	7.24%	9.77%
Connecticut Water Service, Inc.	4.43%	0.75	7.24%	10.31%
Middlesex Water Company	4.43%	0.70	7.24%	10.04%
SJW Corporation	4.43%	0.85	7.24%	10.86%
York Water Company	4.43%	0.70	7.24%	10.04%
Mean				9.98%
Median				10.04%

Notes:
(1) Derived using the formula shown in note 4 on page 24 of Schedule 11 of thi exhibit.
(2) Derived in note 2 on page 24 ofSchedule 11 of this exhibi
(3) From page 23 of Schedule 11 of this exhibit.
(4) As derived in note 1 on page 24 of Schedule 11 of this exhibi

Predicted Market Equity Risk Premium from September 2009 to November 2013



Source of Information: 2013® Ibbotson® Market Report

Market Equity Risk Premiums for 1926-2019, 1926-2010, 1926-2011 and 1926-2012

	Geometric Mean		Arithmetic Mean	
1926-2012				
Large Company Stock Total Returns	9.80%		11.80%	
Long-Term Government Bonds				
Total Returns	5.70%		6.10%	
Income Return		5.10%		5.20%
Market Equity Risk Premium	4.10%	4.70%	5.70%	6.60%
1926-2011				
Large Company Stock Total Returns	9.90%		11.90%	
Long-Term Government Bonds				
Total Returns	5.50%		5.90%	
Income Return		5.10%		5.20%
Market Equity Risk Premium	4.40%	4.80%	6.00%	6.70%
1926-2010				
Large Company Stock Total Returns	9.80%		11.80%	
Long-Term Government Bonds				
Total Returns	5.40%		5.80%	
Income Return		5.10%		5.20%
Market Equity Risk Premium	4.40%	4.70%	6.00%	6.60%
1926-2009				
Large Company Stock Total Returns	9.60%		11.70%	
Long-Term Government Bonds				
Total Returns	5.70%		6.10%	
Income Return		5.20%		5.20%
Market Equity Risk Premium	3.90%	4.40%	5.60%	6.50%

Source of Information: Ibbotson® SBBI® 2010, 2011, & 2012 Valuation Yearbooks and 2013 Ibbotson® SBBI® Risk Premia Over Time Report, Morningstar®, Inc., ©2010, 2011, 2012, & 2013

Exhibit PMA-2
Schedule 10R

Market-to-Book Ratios, Earnings / Book Ratios and Inflation for Standard & Poor's Industrial Index and the Standard & Poor's 500 Composite Index
from 1947 through 2012

Year	Market-to-Book Ratio (1)		Earnings/ Book Ratio (2)				
	S&P Industrial Index (3)	S&P 500 Composite Index (3)	S&P Industrial Index (3)	S&P 500 Composite Index (3)	Inflation (4)	Earnings / Book Ratio - Net of Inflation	
1947	1.23	NA	13.0 %	NA	9.0 %	4.0 %	NA
1948	1.13	NA	17.3	NA	2.7	14.6	NA
1949	1.00	NA	16.3	NA	(1.8)	18.1	NA
1950	1.16	NA	18.3	NA	5.8	12.5	NA
1951	1.27	NA	14.4	NA	5.9	8.5	NA
1952	1.29	NA	12.7	NA	0.9	11.8	NA
1953	1.21	NA	12.7	NA	0.6	12.1	NA
1954	1.45	NA	13.5	NA	(0.5)	14.0	NA
1955	1.81	NA	16.0	NA	0.4	15.6	NA
1956	1.92	NA	13.7	NA	2.9	10.8	NA
1957	1.71	NA	12.5	NA	3.0	9.5	NA
1958	1.70	NA	9.8	NA	1.8	8.0	NA
1959	1.94	NA	11.2	NA	1.5	9.7	NA
1960	1.82	NA	10.3	NA	1.5	8.8	NA
1961	2.01	NA	9.8	NA	0.7	9.1	NA
1962	1.83	NA	10.9	NA	1.2	9.7	NA
1963	1.94	NA	11.4	NA	1.7	9.7	NA
1964	2.18	NA	12.3	NA	1.2	11.1	NA
1965	2.21	NA	13.2	NA	1.9	11.3	NA
1966	2.00	NA	13.2	NA	3.4	9.8	NA
1967	2.05	NA	12.1	NA	3.0	9.1	NA
1968	2.17	NA	12.6	NA	4.7	7.9	NA
1969	2.10	NA	12.1	NA	6.1	6.0	NA
1970	1.71	NA	10.4	NA	5.5	4.9	NA
1971	1.99	NA	11.2	NA	3.4	7.8	NA
1972	2.16	NA	12.0	NA	3.4	8.6	NA
1973	1.96	NA	14.6	NA	8.8	5.8	NA
1974	1.39	NA	14.8	NA	12.2	2.6	NA
1975	1.34	NA	12.3	NA	7.0	5.3	NA
1976	1.51	NA	14.5	NA	4.8	9.7	NA
1977	1.38	NA	14.6	NA	6.8	7.8	NA
1978	1.25	NA	15.3	NA	9.0	6.3	NA
1979	1.23	NA	17.2	NA	13.3	3.9	NA
1980	1.31	NA	15.6	NA	12.4	3.2	NA
1981	1.24	NA	14.9	NA	8.9	6.0	NA
1982	1.17	NA	11.3	NA	3.9	7.4	NA
1983	1.45	NA	12.2	NA	3.8	8.4	NA
1984	1.46	NA	14.6	NA	4.0	10.6	NA
1985	1.67	NA	12.2	NA	3.8	8.4	NA
1986	2.02	NA	11.5	NA	1.1	10.4	NA
1987	2.50	NA	15.7	NA	4.4	11.3	NA
1988	2.13	NA	19.0	NA	4.4	14.6	NA
1989	2.56	NA	18.5	NA	4.7	13.8	NA
1990	2.63	NA	16.3	NA	6.1	10.2	NA
1991	2.77	NA	10.8	NA	3.1	7.7	NA
1992	3.29	NA	13.0	NA	2.9	10.1	NA
1993	3.72	NA	15.7	NA	2.8	12.9	NA
1994	3.73	NA	23.0	NA	2.7	20.3	NA
1995	4.06	2.64	22.9	16.0 %	2.5	20.4	13.5 %
1996	4.79	3.00	24.8	16.8	3.3	21.5	13.5
1997	5.88	3.53	24.6	16.3	1.7	22.9	14.6
1998	7.13	4.16	21.3	14.5	1.6	19.7	12.9
1999	8.27	4.76	25.2	17.1	2.7	22.5	14.4
2000	7.51	4.51	23.9	16.2	3.4	20.5	12.8
2001	NA	3.50	NA	7.4	1.6	NA	5.8
2002	NA	2.93	NA	8.3	2.4	NA	5.9
2003	NA	2.78	NA	14.1	1.9	NA	12.2
2004	NA	2.91	NA	15.3	3.3	NA	12.0
2005	NA	2.78	NA	16.4	3.4	NA	13.0
2006	NA	2.75 (5)	NA	17.2	2.5	NA	14.7
2007	NA	2.77 (5)	NA	12.8	4.1	NA	8.7
2008	NA	2.02 (5)	NA	2.7	0.1	NA	2.6
2009	NA	1.63 (5)	NA	9.2	2.7	NA	6.5
2010	NA	1.92 (5)	NA	13.0	1.5	NA	11.5
2011	NA	1.89 (5)	NA	13.4	3.0	NA	10.4
2012	NA	1.93 (5)	NA	12.2	1.7	NA	10.5
Average	2.34	2.91	14.9 %	13.3 %	3.7 %	10.9 %	10.9 %

Notes: (1) Market-to-Book Ratio equals average of the high and low market price for the year divided by the average book value.

(2) Earnings/Book equals earnings per share for the year divided by the average book value.

(3) On January 2, 2001 Standard & Poor's released Global Industry Classification Standard (GICS) price indexes for all Standard & Poor's U.S. indexes. As a result, all S&P Indexes have been calculated with a common base of 100 at a start date of December 31, 1994. Also, the GICS industrial sector is not comparable to the former S&P Industrial Index and data for the former S&P Industrial Index was discontinued.

(4) As measured by the Consumer Price Index (CPI).

(5) Ratios are based upon estimated book values using the actual average price and the estimated book value calculated by adding the annual earnings per share to the average book value per share and then subtracting the average dividends per share as provided by Standard & Poor's Statistical Record - Current Statistics.

Source of Information: Standard & Poor's Security Price Index Record, 2000 Edition, p. 40
Standard & Poor's Statistical Service, Current Statistics, March 2013, p. 30
Standard & Poor's Compustat Services, Inc. PC Plus Research Insight Database
Ibbotson SBBI 2013 Valuation Yearbook

Chaparral City Water Company
Brief Summary of Common Equity Cost Rate

No.	Principal Methods	Proxy Group of Nine Water Companies
1.	Discounted Cash Flow Model (DCF) (1)	8.24 %
2.	Risk Premium Model (RPM) (2)	11.44
3.	Capital Asset Pricing Model (CAPM) (3)	9.77
5.	Indicated Common Equity Cost Rate before Adjustment for Business Risks	9.80 %
6.	Credit Risk Adjustment (4)	0.32
7	Business Risk Adjustment (5)	0.40
8.	Indicated Common Equity Cost Rate	10.52 %
9.	Recommended Common Equity Cost Rate	10.50 %

Notes:
(1) From page 2 of this schedule.
(2) From page 13 of this schedule.
(3) From page 23 of this schedule.
(4) Credit risk adjustment to reflect the increased credit risk of CCWC's likely bond rating relative to the proxy group as detailed in Ms. Ahern's testimony.
(5) Business risk adjustment to reflect Chaparral City Water Company's greater business risk due to its small size relative to the proxy group as detailed in Ms. Ahern's testimony.

Chaparral City Water Company
Indicated Common Equity Cost Rate Using the Discounted Cash Flow Model for
the Proxy Group of Nine Water Companies

Proxy Group of Nine Water Companies	1 Average Dividend Yield (1)	2 *Value Line* Projected Five Year Growth in EPS (2)	3 *Reuters Mean* Consensus Projected Five Year Growth Rate in EPS	4 *Zack's Five* Year Projected Growth Rate in EPS	5 Yahoo! *Finance* Projected Five Year Growth in EPS	6 Average Projected Five Year Growth in EPS (3)	7 Adjusted Dividend Yield (4)	8 Indicated Common Equity Cost Rate (5)
American States Water Co.	2.88 %	6.00 %	1.00 %	2.00 %	1.00 %	2.50 %	2.92 %	5.42 %
American Water Works Co., Inc.	2.67	10.00	9.00	7.30	8.05	8.59	2.78	11.37
Aqua America, Inc.	2.50	8.00	7.40	5.60	5.80	6.70	2.58	9.28
Artesian Resources Corp.	3.66	NA	N/A	NA	4.00	4.00	3.73	7.73
California Water Service Group	2.93	6.50	N/A	6.00	6.00	6.17	3.02	9.19
Connecticut Water Service, Inc.	2.99	5.50	N/A	5.00	5.00	5.17	3.07	8.24
Middlesex Water Company	3.57	4.00	N/A	NA	2.70	3.35	3.63	6.98
SJW Corporation	2.58	7.50	N/A	NA	14.00	10.75	2.72	13.47
York Water Company	2.66	4.00	N/A	NA	4.90	4.45	2.72	7.17
Average								8.76 %
Median								8.24 %

NA= Not Available
NMF = Not Meaningful Figure

Notes:

(1) *Indicated dividend at 12/31/2013 divided by the average closing price of the last 60 trading days ending 12/31/2013 for each company.*
(2) From pages 4 through 12 of this Schedule.
(3) Average of columns 2 through 5 excluding negative growth rates.
(4) This reflects a growth rate component equal to one-half the conclusion of growth rate (from column 6) x column 1 to reflect the periodic payment of dividends (Gordon Model) as opposed to the continuous payment. Thus, for American States Water Co. , 2.88% x (1+(1/2 x 2.50%)) = 2.92%.
(5) Column 6 + column 7.

Source of Information:

Value Line Investment Survey
www.reuters.com Downloaded on 01/02/2014
www.zacks.com Downloaded on 01/02/2014
www.yahoo.com Downloaded on 01/02/2014

Chaparral City Water Company
Example of the Inadequacy of
DCF Return Rate Related to Book Value
When Market Value Exceeds Book Value

Line No.		Based on the Proxy Group of Nine Water Companies (1) Market Value	Based on the Proxy Group of Nine Water Companies (2) Book Value
1.	Per Share	$ 27.530 (1)	$ 13.574 (2)
2.	DCF Cost Rate (3)	8.76%	8.76%
3.	Return in Dollars	$ 2.412	$ 1.189
4.	Dividends	$ 0.831 (4)	$ 0.831 (4)
5.	Growth in Dollars	$ 1.581	$ 0.358
6.	Return on Market Value (5)	8.76%	4.32%
7.	Rate of Growth on Market Value (6)	5.74%	1.30%

Notes:

(1) Average market price of Ms. Ahern's proxy group of water companies as shown in column 4 on page 26 of this Schedule.

(2) Average book value of Ms. Ahern's proxy group of water companies as shown in column 2 on page 26 of this Schedule.

(3) From page 1 of this Schedule.

(4) Dividends per share based upon a 3.02% adjusted dividend yield. $0.831 = $27.530 • 3.02%.

(5) Line 3 / market value per share (line 1 column (a)).

(6) Line 6 - average dividend yield from page 2 of this Schedule.

AMER. STATES WATER NYSE-AWR

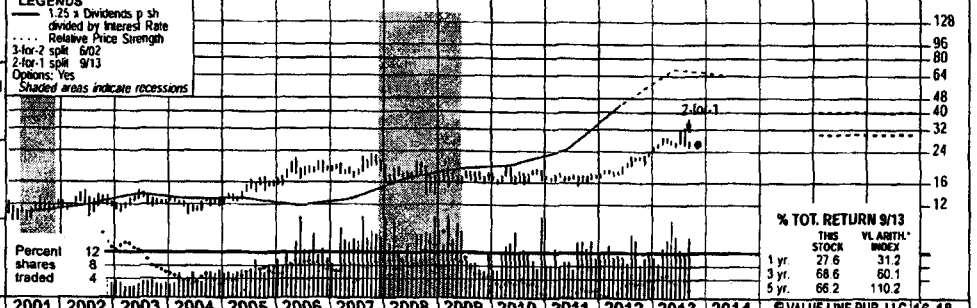
RECENT PRICE 26.48 | P/E RATIO 17.9 (Trailing: 17.4 Median: 22.0) | RELATIVE P/E RATIO 1.02 | DIV'D YLD 3.1% | VALUE LINE

TIMELINESS 3 Lowered 8/16/13
SAFETY 2 Raised 7/20/12
TECHNICAL 3 Raised 8/23/13
BETA .70 (1.00 = Market)

High:	14.5	14.5	13.4	17.3	21.9	23.1	21.0	19.4	19.8	18.2	24.1	33.1				
Low:	10.1	10.8	10.4	12.2	15.1	16.8	13.5	14.9	15.6	15.3	17.0	24.0				

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.25 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
3-for-2 split 6/02
2-for-1 split 9/13
Options: Yes
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	40	(+50%)	14%
Low	30	(+15%)	7%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	1	0	0	0	0	2	1	0
Options	1	1	1	0	0	1	4	4	0
to Sell	2	3	1	0	0	0	5	5	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	77	93	98
to Sell	64	59	70
Hld's(000)	24066	24964	24268

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	27.6	31.2
3 yr.	68.6	60.1
5 yr.	66.2	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
5.72	5.51	6.45	6.08	6.53	6.89	6.99	6.81	7.03	7.88	8.75	9.21	9.74	10.71	11.12	12.12	*12.30*	*12.50*	Revenues per sh	*12.75*
.92	1.02	1.13	1.10	1.26	1.27	1.04	1.11	1.32	1.45	1.65	1.69	1.70	2.11	2.13	2.48	*2.60*	*2.65*	"Cash Flow" per sh	*3.20*
.52	.54	.60	.64	.67	.67	.39	.53	.66	.67	.81	.78	.81	1.11	1.12	1.41	*1.50*	*1.55*	Earnings per sh A	*1.70*
.42	.42	.43	.43	.43	.44	.44	.44	.45	.46	.48	.50	.51	.52	.55	.64	*.76*	*.83*	Div'd Decl'd per sh B■	*.95*
1.29	1.56	2.15	1.51	1.59	1.34	1.88	2.51	2.12	1.95	1.45	2.23	2.09	2.12	2.13	1.77	*2.15*	*2.20*	Cap'l Spending per sh	*2.10*
5.62	5.74	5.91	6.37	6.61	7.02	6.98	7.51	7.86	8.32	8.77	8.97	9.70	10.13	10.84	11.80	*11.85*	*12.50*	Book Value per sh	*14.25*
26.87	26.87	26.87	30.24	30.24	30.36	30.42	33.50	33.60	34.10	34.46	34.60	37.06	37.26	37.70	38.53	*39.00*	*40.00*	Common Shs Outst'g C	*44.00*
14.5	15.5	17.1	15.9	16.7	18.3	31.9	23.2	21.9	27.7	24.0	22.6	21.2	15.7	15.4	14.3	*Bold figures are*		Avg Ann'l P/E Ratio	*19.5*
.84	.81	.97	1.03	.86	1.00	1.82	1.23	1.17	1.50	1.27	1.36	1.41	1.00	.97	.91	*Value Line*		Relative P/E Ratio	*1.30*
5.5%	5.0%	4.2%	4.2%	3.9%	3.6%	3.5%	3.6%	3.1%	2.5%	2.5%	2.9%	2.9%	3.0%	3.2%	3.1%	*estimates*		Avg Ann'l Div'd Yield	*3.1%*

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
212.7	228.0	236.2	268.6	301.4	318.7	361.0	398.9	419.3	466.9	*480*	*500*	Revenues ($mill)	*560*
11.9	16.5	22.5	23.1	28.0	26.8	29.5	41.4	42.0	54.1	*58.0*	*60.0*	Net Profit ($mill)	*73.0*
43.5%	37.4%	47.0%	40.5%	42.6%	37.8%	38.9%	43.2%	41.7%	39.9%	*40.0%*	*40.0%*	Income Tax Rate	*40.0%*
--	--	--	12.2%	8.5%	8.9%	3.2%	5.8%	2.0%	2.5%	*2.5%*	*2.5%*	AFUDC % to Net Profit	*2.5%*
52.0%	47.7%	50.4%	48.8%	46.8%	46.2%	45.9%	44.3%	45.4%	42.2%	*43.0%*	*43.0%*	Long-Term Debt Ratio	*43.0%*
48.0%	52.3%	49.6%	51.4%	53.1%	53.8%	54.1%	55.7%	54.6%	57.8%	*57.0%*	*57.0%*	Common Equity Ratio	*57.0%*
442.3	480.4	532.5	551.6	569.4	577.0	665.0	677.4	749.1	787.0	*805*	*875*	Total Capital ($mill)	*1025*
602.3	664.2	713.2	750.6	776.4	825.3	866.4	855.0	896.5	917.8	*940*	*985*	Net Plant ($mill)	*1100*
4.6%	5.2%	5.4%	6.0%	6.7%	6.4%	5.9%	7.6%	7.1%	8.3%	*7.0%*	*7.0%*	Return on Total Cap'l	*6.5%*
5.6%	6.6%	8.5%	8.1%	9.3%	8.6%	8.2%	11.0%	10.3%	11.9%	*12.5%*	*12.0%*	Return on Shr. Equity	*11.5%*
5.6%	6.6%	8.5%	8.1%	9.3%	8.6%	8.2%	11.0%	10.3%	11.9%	*12.5%*	*12.0%*	Return on Com Equity	*11.5%*
NMF	1.0%	2.8%	2.7%	3.9%	3.1%	3.2%	5.8%	5.3%	6.6%	*6.0%*	*6.0%*	Retained to Com Eq	*5.0%*
113%	84%	67%	67%	58%	64%	61%	47%	49%	45%	*51%*	*54%*	All Div'ds to Net Prof	*56%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $335.8 mill. Due in 5 Yrs $10.6 mill.
LT Debt $332.4 mill. LT Interest $8.0 mill.
(LT interest earned: 5.2x: total interest coverage: 4.9x) (42% of Cap'l)
Leases, Uncapitalized: Annual rentals $3.0 mill.
Pension Assets-12/12 $107.6 mill. Oblig. $163.2 mill.
Pfd Stock None.
Common Stock 38,688,804 shs. as of 8/6/13 *(Reflects 2-for-1 stock split paid 9/3/13.)*
MARKET CAP: $1.0 billion (Mid Cap)

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	1.3	23.5	8.5
Other	164.3	160.5	172.6
Current Assets	165.6	184.0	181.1
Accts Payable	37.9	40.6	55.2
Debt Due	.3	3.3	3.4
Other	66.2	49.8	43.8
Current Liab.	104.4	93.7	102.4
Fix. Chg. Cov.	401%	442%	450%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	5.5%	7.5%	*2.0%*
"Cash Flow"	6.5%	9.0%	*6.0%*
Earnings	6.5%	11.5%	*6.0%*
Dividends	3.0%	4.5%	*9.0%*
Book Value	5.0%	5.5%	*2.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	88.4	95.5	111.3	103.7	398.9
2011	94.3	109.8	119.9	95.3	419.3
2012	107.6	114.3	133.5	111.5	466.9
2013	110.5	120.7	*135*	*113.8*	*480*
2014	*115*	*125*	*140*	*120*	*500*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.23	.24	.31	.33	1.11
2011	.19	.34	.42	.17	1.12
2012	.27	.40	.49	.26	1.41
2013	.35	.43	*.48*	*.24*	*1.50*
2014	*.33*	*.42*	*.55*	*.30*	*1.60*

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.125	.125	.125	.13	.51
2010	.13	.13	.13	.13	.52
2011	.13	.14	.14	.14	.55
2012	.14	.14	.178	.178	.64
2013	.178	.178	.203		

BUSINESS: American States Water Co. operates as a holding company. Through its principal subsidiary, Golden State Water Company, it supplies water to more than 250,000 customers in 75 communities in 10 counties. Service areas include the greater metropolitan areas of Los Angeles and Orange Counties. The company also provides electric utility services to nearly 23,250 customers in the city of Big Bear Lake and in areas of San Bernardino County. Sold Chaparral City Water of Arizona (6/11). Has 728 employees. Officers & directors own 2.9% of common stock (4/12 Proxy). Chairman: Lloyd Ross. President & CEO: Robert J. Sprowls. Inc: CA. Addr: 630 East Foothill Boulevard, San Dimas, CA 91773. Tel: 909-394-3600. Internet: www.aswater.com.

Nonutility operations are a key component of American States Water. Last year, its nonregulated subsidiary, American States Utilities Services (ASUS), accounted for $0.39 a share, or 28% of the company's share net. This percentage was easily the highest among the eight water utilities that *Value Line* follows.

Estimating future profits from these businesses will be more difficult in the years ahead. The core of the ASUS profits has come from operating and maintaining water services at eight U.S. military bases. Some analysts on Wall Street believe that 2012 was perhaps the peak earnings year for ASUS, but we think that these projections are conservative. True, the company's backlog of new projects isn't large. However, with a substantial number of military facilities yet to be privatized, we believe that ASUS' good reputation with the Department of Defense will greatly help it win a fair share of future contracts. Thus, we think earnings of between $0.40 a share and $0.50 a share from this segment are attainable to the 2016-2018 pull. Since winning contracts is less predictable than its core business, American States earnings might experience greater swings than in the past.

Meanwhile, core regulated operations are doing fine. Due mostly TO a recent rate increase granted to Golden State Water (the main water utility), earnings growth should be somewhere in the 5%-7% range. Indeed,

We're raising our earnings projections again. For the second straight quarter, American States share net exceeded expectations in the June period. As a result, we are nudging the company's earnings-per-share estimates higher by $0.05 in 2013, and $0.10 in 2014, respectively. *(Please note that all figures on the page have been changed to reflect the two-for-one stock split paid on September 3rd.)*

American States' shares offer slightly better-than-average potential long-term returns for a water utility. The current yield is typical for the industry, but dividend growth prospects are higher than the group norm. Moreover, the company is the third-largest water utility we follow, and is the only one that rates an A Financial Strength Rating.

James A. Flood *October 18, 2013*

(A) Primary earnings. Excludes nonrecurring gains/(losses): '04, 7¢; '05, 13¢; '06, 3¢; '08, (14¢); '10, (23¢) '11, 10¢. Next earnings report due early November. Quarterly egs. may not add due to rounding.
(B) Dividends historically paid in early March, June, September, and December. ■ Div'd reinvestment plan available.
(C) In millions, adjusted for splits.

Company's Financial Strength	A
Stock's Price Stability	90
Price Growth Persistence	75
Earnings Predictability	90

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AMERICAN WATER NYSE-AWK

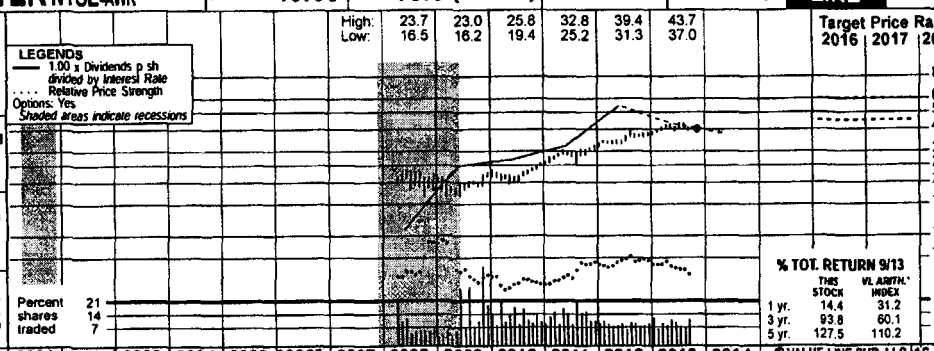
RECENT PRICE 40.09 | P/E RATIO 18.0 (Trailing: 19.5 Median: NMF) | RELATIVE P/E RATIO 1.02 | DIV'D YLD 2.9% | VALUE LINE

TIMELINESS 3 Raised 10/4/13
SAFETY 3 New 7/25/08
TECHNICAL 3 Lowered 8/9/13
BETA .65 (1.00 = Market)

	2008	2009	2010	2011	2012	2013
High:	23.7	23.0	25.8	32.8	39.4	43.7
Low:	16.5	16.2	19.4	25.2	31.3	37.0

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.00 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
Options: Yes
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	60	(+50%)	13%
Low	45	(+10%)	6%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	4	0	0	0	8	0	3	0	0
to Sell	4	0	0	0	8	0	3	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	188	191	165
to Sell	175	186	209
Hld's(000)	146609	145912	144834

Percent shares traded 21 14 7

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	14.4	31.2
3 yr.	93.8	60.1
5 yr.	127.5	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006E	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
--	--	--	--	--	--	--	--	--	13.08	13.84	14.61	13.98	15.49	15.18	16.25	16.60	17.50	Revenues per sh	20.25
--	--	--	--	--	--	--	--	--	.65	d.47	2.87	2.89	3.56	3.73	4.27	4.45	4.70	"Cash Flow" per sh	5.25
--	--	--	--	--	--	--	--	--	d.97	d2.14	1.10	1.25	1.53	1.72	2.11	2.20	2.40	Earnings per sh A	2.90
--	--	--	--	--	--	--	--	--	--	--	.40	.82	.86	.91	.96	1.06	1.20	Div'd Decl'd per sh B■	1.40
--	--	--	--	--	--	--	--	--	4.31	4.74	6.31	4.50	4.38	5.27	5.25	5.35	5.35	Cap'l Spending per sh	5.50
--	--	--	--	--	--	--	--	--	23.86	28.39	25.64	22.91	23.59	24.11	25.10	26.40	27.50	Book Value per sh D	30.00
--	--	--	--	--	--	--	--	--	160.00	160.00	160.00	174.63	175.00	175.66	176.99	178.50	180.00	Common Shs Outst'g g C	185.00
--	--	--	--	--	--	--	--	--	--	--	18.9	15.6	14.6	16.8	16.7	Bold figures are		Avg Ann'l P/E Ratio	18.5
--	--	--	--	--	--	--	--	--	--	--	1.14	1.04	.93	1.05	1.07	Value Line		Relative P/E Ratio	1.25
--	--	--	--	--	--	--	--	--	--	--	1.9%	4.2%	3.8%	3.1%	2.7%	estimates		Avg Ann'l Div'd Yield	2.7%
						--	--	--	2093.1	2214.2	2336.9	2440.7	2710.7	2666.2	2876.9	2960	3150	Revenues ($mill)	3750
						--	--	--	d155.8	d342.3	187.2	209.9	267.8	304.9	375.0	390	430	Net Profit ($mill)	535
						--	--	--	--	--	37.4%	37.9%	40.4%	39.5%	40.7%	40.0%	40.0%	Income Tax Rate	40.0%
						--	--	--	--	--	--	--	--	12.5%	6.2%	8.0%	10.0%	AFUDC % to Net Profit	12.0%
						--	--	--	56.1%	50.9%	53.1%	56.9%	56.8%	55.7%	53.8%	54.0%	54.0%	Long-Term Debt Ratio	54.5%
						--	--	--	43.9%	49.1%	46.9%	43.1%	43.2%	44.2%	46.0%	46.0%	46.0%	Common Equity Ratio	45.5%
						--	--	--	8692.8	9245.7	8750.2	9289.0	9561.3	9580.3	9652.7	10300	10800	Total Capital ($mill)	11800
						--	--	--	8720.8	9318.0	9991.8	10524	11059	11021	11739	12300	12800	Net Plant ($mill)	14200
						--	--	--	NMF	NMF	3.7%	3.8%	4.4%	4.8%	5.5%	5.5%	5.5%	Return on Total Cap'l	6.0%
						--	--	--	NMF	NMF	4.6%	5.2%	6.5%	7.2%	8.4%	8.0%	8.5%	Return on Shr. Equity	9.5%
						--	--	--	NMF	NMF	4.6%	5.2%	6.5%	7.2%	8.4%	8.0%	8.5%	Return on Com Equity	9.5%
						--	--	--	NMF	NMF	3.0%	1.8%	2.8%	3.5%	4.6%	4.5%	4.5%	Retained to Com Eq	4.5%
						--	--	--	--	--	34%	65%	56%	52%	45%	48%	50%	All Div'ds to Net Prof	50%

CAPITAL STRUCTURE as of 6/30/13
Total Debt $5761.0 mil. Due in 5 Yrs $1034.0 mil.
LT Debt $5180.7 mil. LT Interest $301.0 mil.
(Total interest coverage: 4.4x) (53% of Cap'l)

Leases, Uncapitalized: Annual rentals $28.1 mill.
Pension Assets $1157.7 mill
Oblig. $1621.2 mill.
Pfd Stock $17.6 mill. Pfd Div'd $.7 mill

Common Stock 177,964,133 shs.
as of 8/1/13

MARKET CAP: $7.1 billion (Large Cap)

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	14.2	24.4	20.4
Other	1383.5	475.0	525.4
Current Assets	1397.7	499.4	545.8
Accts Payable	243.7	279.6	178.4
Debt Due	543.9	385.9	580.3
Other	701.5	329.3	290.6
Current Liab.	1489.1	994.8	1049.3
Fix. Chg. Cov.	256%	292%	300%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	--	3.0%	5.0%
"Cash Flow"	--	NMF	8.5%
Earnings	--	--	10.0%
Dividends	--	--	9.0%
Book Value	--	-1.5%	4.5%

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	588.1	671.2	786.9	664.5	2710.7
2011	596.7	668.8	760.9	639.8	2666.2
2012	618.7	745.6	831.8	680.8	2876.9
2013	636.1	724.3	890	709.6	2960
2014	670	775	945	760	3150

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.18	.42	.71	.23	1.53
2011	.23	.42	.73	.32	1.72
2012	.28	.66	.87	.30	2.11
2013	.32	.57	.90	.41	2.20
2014	.35	.65	1.00	.40	2.40

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.20	.20	.21	.21	.82
2010	.21	.21	.22	.22	.86
2011	.22	.23	.23	.23	.91
2012	.23	.23	.25	.25	.96
2013	.25	.25	.28		

BUSINESS: American Water Works Company, Inc. is the largest investor-owned water and wastewater utility in the U.S., providing services to over 14 million people in over 30 states and Canada. It's nonregulated business assists municipalities and military bases with the maintenance and upkeep as well. Regulated operations made up 89.1% of 2012 revenues. New Jersey is its biggest market accounting for 22.2% of revenues. Has roughly 7,000 employees. Depreciation rate, 2.6% in '12. BlackRock, Inc., owns 10.3% of the common stock outstanding. Off. & dir. own less than 1% (3/13 Proxy). President & CEO; Jeffry Sterba. Chairman; George Mackenzie. Address: 1025 Laurel Oak Road, Voorhees, NJ 08043. Telephone: 856-346-8200. Internet: www.amwater.com.

American Water Works continues to do a good job of staying on the right side of regulators. The company must contend with 30 different state regulatory commissions in order to recoup the large sums that it is investing in its individual water systems located throughout the country. The utility's basic formula for success in dealing with regulators has been to keep costs low. This feat has been achieved by improving operating margins and continually reducing expense ratios, a trend we expect to continue. Indeed, effective cost containment makes it much more difficult for state commissions to deny much needed rate increases.

Expansion via acquisitions will remain a key element to American Water's long-term growth. The company should continue to scoop up some of the small water utilities that cash-strapped municipalities are willing to sell. Sixteen purchases were made last year and 10 have already been completed so far in 2013. It is American Water's expertise in integrating these new entities into its existing operations and reducing overhead that is behind its leaner cost structure.

American Water's construction budget should be large but manageable. Capital expenditures will probably be close to $1 billion a year over the next 3- to 5-year period, due to the need to upgrade and repair the company's aging infrastructure. Internally generated funds will probably cover only about 75% of the outlays over this time frame. As a result, American Water will most likely have to issue more debt to make up the difference.

American Water's earnings and dividend growth prospects are good. The combination of efficient operations, inorganic growth, and greater contributions from nonutility businesses should enable annual earnings and dividend increases in the 7% to 10% range (versus about 5% for the industry) for the foreseeable future.

Long-term, income-oriented investors might like these shares. The yield on AWK's stock is close to the industry norm, yet its dividend growth prospects are well above-average. So, even though the stock is currently not timely, it still holds more appeal than most water utilities to the pull to 2016-2018.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Excludes nonrecurring losses: '08, $4.62; '09, $2.63; '11, $0.07. Discontinued operations: '06, (4¢); '11, 3¢; '12, (10¢). Next earnings report due late October. Quarterly earnings may not sum due to rounding. (B) Dividends paid in March, June, September, and December. ■ Div. reinvestment available. (C) In millions. (D) Includes intangibles. In 2012: $1.207 billion, $6.82/share. (E) Pro forma numbers for '06 & '07.

Company's Financial Strength	B+
Stock's Price Stability	95
Price Growth Persistence	90
Earnings Predictability	20

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AQUA AMERICA NYSE-WTR

RECENT PRICE 23.97 | P/E RATIO 20.3 (Trailing: 22.7 Median: 24.0) | RELATIVE P/E RATIO 1.15 | DIV'D YLD 2.6% | VALUE LINE

TIMELINESS 3 Lowered 5/24/13
SAFETY 2 Raised 4/20/12
TECHNICAL 3 Raised 9/13/13
BETA .60 (1.00 = Market)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
High:	12.0	13.4	14.8	23.4	23.8	21.3	17.6	17.2	18.4	19.0	21.5	28.1
Low:	7.7	9.5	11.3	14.0	16.1	15.1	9.8	12.3	13.2	15.4	16.8	20.6

2016-18 PROJECTIONS

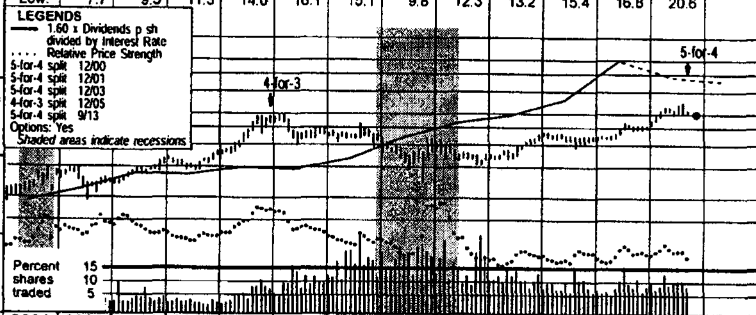
	Price	Gain	Ann'l Total Return
High	40	(+65%)	19%
Low	25	(+5%)	4%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	1	3	2	2	0	0	1	3
to Sell	0	0	2	0	0	0	0	2	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	118	136	141
to Sell	117	116	130
Hld's(000)	83977	82403	82501



Target Price Range 2016 | 2017 | 2018
64 48 40 32 24 20 16 12 8 6

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	27.9	31.2
3 yr.	64.3	60.1
5 yr.	100.7	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
1.61	1.67	1.93	1.97	2.16	2.28	2.38	2.78	3.08	3.23	3.61	3.71	3.93	4.21	4.10	4.32	4.45	4.60	Revenues per sh	4.95
.45	.49	.58	.61	.69	.76	.77	.87	.97	1.01	1.10	1.14	1.29	1.42	1.45	1.51	1.60	1.70	"Cash Flow" per sh	1.85
.27	.32	.33	.37	.41	.43	.46	.51	.57	.56	.57	.58	.62	.72	.83	.87	1.15	1.25	Earnings per sh A	1.45
.19	.20	.22	.23	.24	.26	.28	.29	.32	.35	.38	.41	.44	.47	.50	.54	.58	.64	Div'd Decl'd per sh B■	.85
.46	.65	.72	.93	.87	.96	1.06	1.23	1.47	1.64	1.43	1.58	1.66	1.89	1.90	1.98	2.15	2.15	Cap'l Spending per sh	2.15
2.27	2.57	2.74	3.08	3.32	3.49	4.27	4.71	5.04	5.57	5.85	6.26	6.50	6.81	7.21	7.90	8.90	9.60	Book Value per sh	11.50
84.33	90.25	133.50	139.78	142.47	141.49	154.31	158.97	161.21	165.41	166.75	169.21	170.61	172.46	173.60	175.43	177.50	179.50	Common Shs Outst'g C	184.00
17.8	22.5	21.2	18.2	23.6	23.6	24.5	25.1	31.8	34.7	32.0	24.9	23.1	21.1	21.3	21.9	Bold figures are		Avg Ann'l P/E Ratio	22.5
1.03	1.17	1.21	1.18	1.21	1.29	1.40	1.33	1.69	1.87	1.70	1.50	1.54	1.34	1.34	1.40	Value Line		Relative P/E Ratio	1.50
3.9%	2.9%	3.0%	3.3%	2.5%	2.5%	2.5%	2.3%	1.8%	1.8%	2.1%	2.8%	3.1%	3.1%	2.8%	2.8%	estimates		Avg Ann'l Div'd Yield	2.6%
						367.2	442.0	496.8	533.5	602.5	627.0	670.5	726.1	712.0	757.8	790	830	Revenues ($mill)	915
						67.3	80.0	91.2	92.0	95.0	97.9	104.4	124.0	144.8	153.1	205	225	Net Profit ($mill)	265
						39.3%	39.4%	38.4%	39.6%	38.9%	39.7%	39.4%	39.2%	32.9%	39.0%	40.0%	40.0%	Income Tax Rate	40.0%
						--	--	--	--	--	--	--	--	2.9%	3.1%	3.0%	3.0%	AFUDC % to Net Profit	2.0%
						51.4%	50.0%	52.0%	51.6%	55.4%	54.1%	55.6%	56.6%	52.7%	52.7%	50.0%	50.0%	Long-Term Debt Ratio	50.0%
						48.6%	50.0%	48.0%	48.4%	44.6%	45.9%	44.4%	43.4%	47.3%	47.3%	50.0%	50.0%	Common Equity Ratio	50.0%
						1355.7	1497.3	1690.4	1904.4	2191.4	2306.6	2495.5	2706.2	2646.8	2929.7	3150	3450	Total-Capital ($mill)	4230
						1824.3	2069.8	2280.0	2506.0	2792.8	2997.4	3227.3	3469.3	3612.9	3936.2	4150	4350	Net Plant ($mill)	4900
						6.4%	6.7%	6.9%	6.4%	5.9%	5.7%	5.6%	5.9%	6.9%	6.6%	6.0%	6.0%	Return on Total Cap'l	6.5%
						10.2%	10.7%	11.2%	10.0%	9.7%	9.3%	9.4%	10.6%	11.6%	11.0%	12.0%	12.0%	Return on Shr. Equity	12.5%
						10.2%	10.7%	11.2%	10.0%	9.7%	9.3%	9.4%	10.6%	11.6%	11.0%	12.0%	12.0%	Return on Com Equity	12.5%
						4.2%	4.6%	4.9%	3.7%	3.2%	2.8%	2.7%	3.7%	4.6%	4.3%	6.0%	6.0%	Retained to Com Eq	5.0%
						59%	57%	56%	63%	67%	70%	72%	65%	60%	61%	52%	52%	All Div'ds to Net Prof	59%

CAPITAL STRUCTURE as of 6/30/13
Total Debt $1648.4 mill. **Due in 5 Yrs** $368.3 mill.
LT Debt $1489.8 mill. **LT Interest** $60.0 mill.
(LT interest earned: 5.0x; total interest coverage: 4.1x) (51% of Cap'l)
Pension Assets-12/12 $190.1 mill. **Oblig.** $303.1 mill.
Pfd Stock None
Common Stock 176,463,469 shares as of 7/26/13 *(Reflects 5-for-4 stock split paid 9/1/13.)*
MARKET CAP: $4.2 billion (Mid Cap)

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	8.2	5.5	4.3
Receivables	81.1	92.9	98.3
Inventory (AvgCst)	11.2	11.8	12.5
Other	220.0	150.7	106.5
Current Assets	320.5	260.9	221.6
Accts Payable	68.3	55.5	47.0
Debt Due	80.4	125.4	158.6
Other	277.0	93.3	101.1
Current Liab.	425.7	274.2	306.7
Fix. Chg. Cov.	367%	398%	398%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	8.0%	7.5%	3.5%
"Cash Flow"	8.5%	8.0%	4.5%
Earnings	6.5%	4.5%	8.0%
Dividends	7.5%	8.0%	8.0%
Book Value	9.0%	7.0%	6.5%

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	160.5	178.5	207.8	179.3	726.1
2011	163.6	178.3	197.3	172.7	712.0
2012	164.0	191.7	214.6	187.5	757.8
2013	180.0	195.7	219.3	195	790
2014	190	215	225	200	830

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	.13	.18	.26	.15	.72
2011	.18	.22	.24	.19	.83
2012	.15	.24	.29	.19	.87
2013	.26	.30	.34	.25	1.15
2014	.25	.32	.40	.28	1.25

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.108	.108	.108	.116	.44
2010	.116	.116	.116	.124	.47
2011	.124	.124	.124	.132	.50
2012	.132	.132	.132	.14	.54
2013	.14	.14	.152		

BUSINESS: Aqua America, Inc. is the holding company for water and wastewater utilities that serve approximately three million residents in Pennsylvania, Ohio, North Carolina, Illinois, Texas, New Jersey, Florida, Indiana, and five other states. Acquired AquaSource, 7/03; Consumers Water, 4/99; and others. Water supply revenues '12: residential, 60.5%; commercial, 16.1%; industrial & other, 23.4%. Officers and directors own 1.4% of the common stock; Blackrock, Inc, 6.3%; State Street Capital Corp., 5.7%; Vanguard Group 5.6% (4/13 Proxy). Chairman & Chief Executive Officer: Nicholas DeBenedictis. Incorporated: Pennsylvania. Address: 762 West Lancaster Avenue, Bryn Mawr, Pennsylvania 19010. Telephone: 610-525-1400. Internet: www.aquaamerica.com.

Aqua America's main long-term strategy is to grow through acquisitions. The United States is filled with thousands of small water utilities that are run by local municipalities. Due to the lack of proper maintenance, many of the facilities are in terrible shape. Since a large number of local governments are financially strapped, they find it more advantageous to sell their water systems to entities that have both greater managerial experience and the financial wherewithal to invest the funds required for the systems to operate properly. Aqua America bought 18 new companies last year and should add a similar number of new utilities in 2013.

Aqua America has been successful driving synergies through acquisitions. Historically, many of the operational benefits promised to shareholders of companies involved in acquisitions never take place. However, Aqua America has proven that it can purchase other water utilities and slash redundant overhead costs to improve operating margins.

Dividend growth prospects are excellent. Last quarter's 9% hike in the quarterly payout (all of our numbers have been adjusted for the recent five-for-four stock split) was much higher than that of a typical utility. Thanks in part to the company's low payout ratio, we estimate that the annual dividend hike will average about 10% for the foreseeable future.

Nonutility operations will play a larger role in the company's future. Aqua America recently completed another extension of its water pipeline in Pennsylvania. The pipeline is used to supply water to natural gas producers drilling in the Marcellus Shale. We expect the company to become much more involved in constructing pipelines because this is a more efficient way of providing the water needed for drilling than by using trucks.

Investors have to pay a slight premium for these shares. The average yield for a water utility is close to 3%. Thus, WTR's payout is about 40 basis points lower than the industry norm. We believe that this is a very reasonable price to pay for the company's robust dividend growth prospects, which should provide better-than-average total returns for a water utility over the pull to 2016-2018.

James A. Flood *October 18, 2013*

(A) Diluted egs. Excl. nonrec. gains (losses): '99, (9¢); '00, 2¢; '01, 2¢; '02, 4¢; '03, 3¢; '12, 18¢. Excl. gain from disc. operations: '12, 7¢; '13, 3¢. May not sum due to rounding. Next earnings report due late October.
(B) Dividends historically paid in early March, June, Sept. & Dec. ■ Div'd. reinvestment plan available (5% discount).
(C) In millions, adjusted for stock splits.

Company's Financial Strength	B++
Stock's Price Stability	100
Price Growth Persistence	70
Earnings Predictability	100

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ARTESIAN RES. CORP. NDQ–ARTNA

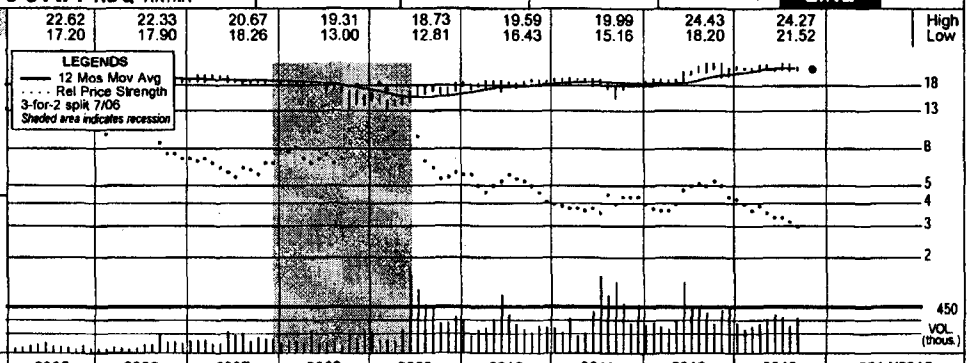
RECENT PRICE	TRAILING P/E RATIO	RELATIVE P/E RATIO	DIV'D YLD	
22.18	22.2	1.15	3.7%	VALUE LINE

RANKS

PERFORMANCE	2	Above Average
Technical	2	Above Average
SAFETY	3	Average
BETA .60		(1.00 = Market)

Financial Strength	B
Price Stability	95
Price Growth Persistence	60
Earnings Predictability	85

	22.62	22.33	20.67	19.31	18.73	19.59	19.99	24.43	24.27	High
	17.20	17.90	18.26	13.00	12.81	16.43	15.16	18.20	21.52	Low



© VALUE LINE PUBLISHING LLC	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014/2015
SALES PER SH	7.52	7.77	7.20	7.59	8.11	8.48	7.56	8.10	--	
"CASH FLOW" PER SH	1.56	1.75	1.57	1.65	1.84	1.92	1.64	2.04	--	
EARNINGS PER SH	.81	.97	.90	.86	.97	1.00	.83	1.13	***1.05*** [A,B]	***1.23*** [C]***/NA***
DIV'DS DECL'D PER SH	.58	.61	.66	.71	.72	.75	.76	.79	--	
CAP'L SPENDING PER SH	3.35	5.08	3.66	6.09	2.32	2.57	1.83	2.36	--	
BOOK VALUE PER SH	9.60	10.15	11.66	11.86	12.15	12.44	13.12	13.57	--	
COMMON SHS OUTST'G (MILL)	6.02	6.09	7.30	7.40	7.51	7.65	8.61	8.71	--	
AVG ANN'L P/E RATIO	24.2	20.3	21.5	20.1	16.4	18.2	22.5	18.3	***21.1***	***18.0/NA***
RELATIVE P/E RATIO	1.28	1.10	1.14	1.21	1.09	1.16	1.41	1.17	--	
AVG ANN'L DIV'D YIELD	2.9%	3.1%	3.4%	4.1%	4.5%	4.1%	4.1%	3.8%	--	
SALES ($MILL)	45.3	47.3	52.5	56.2	60.9	64.9	65.1	70.6	--	***Bold figures***
OPERATING MARGIN	100.0%	45.6%	45.6%	45.1%	46.9%	46.5%	45.5%	48.7%	--	***are consensus***
DEPRECIATION ($MILL)	4.4	4.6	5.2	5.8	6.6	7.0	7.4	7.9	--	***earnings***
NET PROFIT ($MILL)	5.0	6.1	6.3	6.4	7.3	7.6	6.7	9.8	--	***estimates***
INCOME TAX RATE	39.9%	39.0%	39.8%	40.8%	40.1%	40.0%	40.8%	40.2%	--	***and, using the***
NET PROFIT MARGIN	11.1%	12.8%	11.9%	11.4%	11.9%	11.7%	10.4%	14.0%	--	***recent prices,***
WORKING CAP'L ($MILL)	d1.8	d8.8	2.5	d20.9	d23.3	d27.9	d11.4	d11.4	--	***P/E ratios.***
LONG-TERM DEBT ($MILL)	92.4	92.1	91.8	107.6	106.0	105.1	106.5	106.3	--	
SHR. EQUITY ($MILL)	57.8	61.8	85.1	87.8	91.2	95.1	113.0	118.2	--	
RETURN ON TOTAL CAP'L	5.3%	5.8%	5.3%	4.7%	5.2%	5.6%	4.6%	5.9%	--	
RETURN ON SHR. EQUITY	8.7%	9.8%	7.4%	7.3%	8.0%	8.0%	6.0%	8.3%	--	
RETAINED TO COM EQ	2.7%	3.8%	2.1%	1.4%	2.1%	2.0%	.5%	2.5%	--	
ALL DIV'DS TO NET PROF	69%	61%	71%	81%	74%	75%	92%	70%	--	

[A] *No. of analysts changing earn. est. in last 4 days: 0 up, 0 down, consensus 5-year earnings growth not available.* [B] *Based upon 4 analysts' estimates.* [C] *Based upon 4 analysts' estimates.*

ANNUAL RATES

of change (per share)	5 Yrs.	1 Yr.
Sales	1.5%	7.0%
"Cash Flow"	3.0%	24.0%
Earnings	2.0%	36.0%
Dividends	4.5%	4.0%
Book Value	4.5%	3.5%

Fiscal Year	QUARTERLY SALES ($mill.) 1Q	2Q	3Q	4Q	Full Year
12/31/11	14.8	16.5	17.7	16.1	65.1
12/31/12	16.7	17.9	19.0	17.0	70.6
12/31/13	16.3	17.8			
12/31/14					

Fiscal Year	EARNINGS PER SHARE 1Q	2Q	3Q	4Q	Full Year
12/31/10	.22	.24	.38	.16	1.00
12/31/11	.14	.23	.26	.20	.83
12/31/12	.28	.32	.33	.20	1.13
12/31/13	.19	.28	***.34***	***.25***	
12/31/14	***.20***				

Cal-endar	QUARTERLY DIVIDENDS PAID 1Q	2Q	3Q	4Q	Full Year
2010	.187	.188	.188	.189	.75
2011	.19	.19	.19	.193	.76
2012	.193	.198	.198	.203	.79
2013	.203	.206	.206	.209	

INSTITUTIONAL DECISIONS

	4Q'12	1Q'13	2Q'13
to Buy	28	32	31
to Sell	32	26	30
Hld's(000)	3052	3036	3029

ASSETS ($mill.)	2011	2012	6/30/13
Cash Assets	.3	.6	.5
Receivables	8.6	8.7	9.1
Inventory	1.5	1.4	1.5
Other	2.9	2.8	1.2
Current Assets	13.3	13.5	12.3
Property, Plant & Equip. at cost	435.0	454.4	--
Accum Depreciation	77.4	83.8	--
Net Property	357.6	370.6	374.8
Other	7.8	7.6	7.6
Total Assets	378.7	391.7	394.7
LIABILITIES ($mill.)			
Accts Payable	2.8	3.5	1.9
Debt Due	13.8	12.6	10.7
Other	8.1	8.8	9.2
Current Liab	24.7	24.9	21.8

LONG-TERM DEBT AND EQUITY as of 6/30/13

Total Debt $116.8 mill. **Due in 5 Yrs.** NA
LT Debt $106.1 mill.
Including Cap. Leases NA (47% of Cap'l)
Leases, Uncapitalized Annual rentals NA

Pension Liability $.4 mill. in '12 vs. $.5 mill. in '11

Pfd Stock None **Pfd Div'd Paid** None

Common Stock 8,781,642 shares (53% of Cap'l)

INDUSTRY: Water Utility

BUSINESS: Artesian Resources Corporation, through its subsidiaries, provides water, wastewater, and other services on the Delmarva Peninsula. It distributes and sells water to residential, commercial, industrial, municipal, and utility customers in Delaware, Maryland, and Pennsylvania. The company also offers water for public and private fire protection to customers in its service territories. In addition, it provides contract water and wastewater services, water and sewer service line protection plans, and wastewater management services, as well as design, construction, and engineering services. As of December 31, 2012, the company served approximately 79,000 metered water customers through 1,162 miles of transmission and distribution mains. Has 229 employees. Chairman, C.E.O. & President: Dian C. Taylor. Address: 664 Churchmans Rd., Newark, DE 19702. Tel.: (302) 453-6900. Internet: http://www.artesianwater.com.

J.V.

October 18, 2013

TOTAL SHAREHOLDER RETURN

Dividends plus appreciation as of 9/30/2013

3 Mos.	6 Mos.	1 Yr.	3 Yrs.	5 Yrs.
0.79%	0.84%	-0.68%	31.05%	63.01%

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CALIFORNIA WATER NYSE-CWT

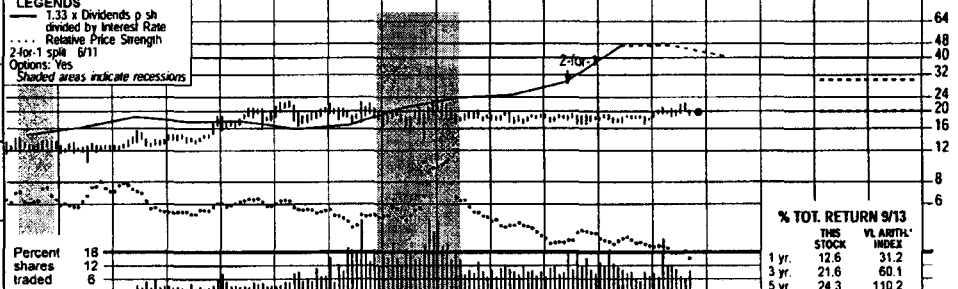
RECENT PRICE 19.73 | P/E RATIO 22.4 (Trailing: 21.2 Median: 21.0) | RELATIVE P/E RATIO 1.27 | DIV'D YLD 3.4% | VALUE LINE

TIMELINESS 4 Lowered 10/4/13
SAFETY 3 Lowered 7/27/07
TECHNICAL 3 Lowered 8/23/13
BETA .65 (1.00 = Market)

High:	13.4	15.7	19.0	21.1	22.9	22.7	23.3	24.1	19.8	19.4	19.3	22.3		
Low:	10.2	11.8	13.0	15.6	16.4	17.1	13.8	16.7	16.9	16.7	16.8	18.4		

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.33 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
2-for-1 split 6/11
Options: Yes
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	30	(+50%)	13%
Low	20	(Nil)	4%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	20	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	54	86	61
to Sell	63	39	57
Hld's(000)	22078	26409	26677

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	12.6	31.2
3 yr.	21.6	60.1
5 yr.	24.3	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
7.74	7.38	7.98	8.08	8.13	8.67	8.18	8.59	8.72	8.10	8.88	9.90	10.82	11.05	12.00	13.34	*12.55*	*14.15*	Revenues per sh	*16.00*
1.46	1.30	1.37	1.26	1.10	1.32	1.26	1.42	1.52	1.36	1.56	1.86	1.93	1.93	2.07	2.32	*2.05*	*2.25*	"Cash Flow" per sh	*2.75*
.92	.73	.77	.66	.47	.63	.61	.73	.74	.67	.75	.95	.98	.91	.86	1.02	*.80*	*1.05*	Earnings per sh A	*1.35*
.53	.54	.54	.55	.56	.56	.56	.57	.57	.58	.58	.59	.59	.60	.62	.63	*.64*	*.68*	Div'd Decl'd per sh B ■	*.90*
1.30	1.37	1.72	1.23	2.04	2.91	2.19	1.87	2.01	2.14	1.84	2.41	2.66	2.97	2.83	3.04	*2.65*	*2.90*	Cap'l Spending per sh	*3.00*
6.50	6.69	6.71	6.45	6.48	6.56	7.22	7.83	7.90	9.07	9.25	9.72	10.13	10.45	10.76	11.28	*13.40*	*13.85*	Book Value per sh C	*15.00*
25.24	25.24	25.87	30.29	30.36	30.36	33.86	36.73	36.78	41.31	41.33	41.45	41.53	41.67	41.82	41.98	*47.75*	*48.00*	Common Shs Outst'g D	*50.0*
12.6	17.8	17.8	19.6	27.1	19.8	22.1	20.1	24.9	29.2	26.1	19.8	19.7	20.3	21.3	17.9	*Bold figures are*		Avg Ann'l P/E Ratio	*19.0*
.73	.93	1.01	1.27	1.39	1.08	1.26	1.06	1.33	1.58	1.39	1.19	1.31	1.29	1.34	1.14	*Value Line*		Relative P/E Ratio	*1.25*
4.6%	4.2%	4.0%	4.3%	4.4%	4.5%	4.2%	3.9%	3.1%	2.9%	3.0%	3.1%	3.1%	3.2%	3.4%	3.5%	*estimates*		Avg Ann'l Div'd Yield	*3.6%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $507.6 mill. Due in 5 Yrs $65.3 mill.
LT Debt $430.7 mill. LT Interest $29.5 mill.
(LT interest earned: 6.7x; total int. cov.: 6.0x)
(43% of Cap'l)
Pension Assets-12/12 $202.9 mill. Oblig. $402.9 mill.
Pfd Stock None
Common Stock 47,734,035 shs. as of 8/1/13
MARKET CAP: $950 million (Small Cap)

2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
	277.1	315.6	320.7	334.7	367.1	410.3	449.4	460.4	501.8	560.0	*590*	*650*	Revenues ($mill) E	*800*
	19.4	26.0	27.2	25.6	31.2	39.8	40.6	37.7	36.1	42.6	*40.0*	*53.0*	Net Profit ($mill)	*67.0*
	39.9%	39.6%	42.4%	37.4%	39.9%	37.7%	40.3%	39.5%	40.5%	37.5%	*34.0%*	*39.0%*	Income Tax Rate	*39.0%*
	10.3%	3.2%	3.3%	10.6%	8.3%	8.6%	7.6%	4.2%	7.6%	8.0%	*8.0%*	*8.5%*	AFUDC % to Net Profit	*10.0%*
	50.2%	48.6%	48.3%	43.5%	42.9%	41.6%	47.1%	52.4%	51.7%	47.8%	*42.0%*	*46.5%*	Long-Term Debt Ratio	*50.0%*
	49.1%	50.8%	51.1%	55.9%	56.6%	58.4%	52.9%	47.6%	48.3%	52.2%	*58.0%*	*53.5%*	Common Equity Ratio	*50.0%*
	498.4	565.9	568.1	670.1	674.9	690.4	794.9	914.7	931.5	908.2	*1050*	*1125*	Total Capital ($mill)	*1400*
	759.5	800.3	862.7	941.5	1010.2	1112.4	1198.1	1294.3	1381.1	1457.1	*1510*	*1575*	Net Plant ($mill)	*1825*
	5.6%	6.1%	6.3%	5.2%	5.9%	7.1%	6.5%	5.5%	5.5%	6.3%	*5.5%*	*6.0%*	Return on Total Cap'l	*6.5%*
	7.8%	8.9%	9.3%	6.8%	8.1%	9.9%	9.6%	8.6%	8.0%	9.0%	*7.0%*	*8.0%*	Return on Shr. Equity	*9.5%*
	7.9%	9.0%	9.3%	6.8%	8.1%	9.9%	9.6%	8.6%	8.0%	9.0%	*7.0%*	*8.0%*	Return on Com Equity	*9.5%*
	.7%	2.1%	2.1%	1.0%	1.8%	3.8%	3.8%	3.0%	2.3%	3.4%	*1.5%*	*3.0%*	Retained to Com Eq	*3.0%*
	91%	77%	78%	86%	77%	61%	60%	66%	71%	62%	*75%*	*62%*	All Div'ds to Net Prof	*67%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	27.2	38.8	38.8
Other	86.7	107.8	125.4
Current Assets	113.9	146.6	164.1
Accts Payable	48.9	46.8	46.7
Debt Due	53.7	136.3	76.9
Other	49.3	59.7	72.6
Current Liab.	151.9	242.8	196.2
Fix. Chg. Cov.	278%	297%	*325%*

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	4.0%	7.0%	*4.5%*
"Cash Flow"	5.5%	7.5%	*4.5%*
Earnings	5.0%	5.5%	*6.5%*
Dividends	1.0%	1.5%	*6.5%*
Book Value	5.0%	4.5%	*5.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.)E Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	90.3	118.3	146.3	105.5	460.4
2011	98.1	131.4	169.3	103.0	501.8
2012	116.8	143.6	178.1	121.5	560.0
2013	111.4	154.6	*190*	*134*	*590*
2014	*135*	*165*	*210*	*140*	*650*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2010	.05	.25	.49	.12	.91
2011	.03	.29	.50	.04	.86
2012	.03	.31	.56	.12	1.02
2013	d.03	.28	*.50*	*.05*	*.80*
2014	*.05*	*.30*	*.55*	*.15*	*1.05*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.148	.148	.148	.148	.59
2010	.149	.149	.149	.149	.60
2011	.154	.154	.154	.154	.62
2012	.1575	.1575	.1575	.1575	.63
2013	.16	.16	.16		

BUSINESS: California Water Service Group provides regulated and nonregulated water service to roughly 471,900 customers in 83 communities in California, Washington, New Mexico, and Hawaii. Main service areas: San Francisco Bay area, Sacramento Valley, Salinas Valley, San Joaquin Valley & parts of Los Angeles. Acquired Rio Grande Corp; West Hawaii Utilities (9/08). Revenue breakdown, '12: residential, 66%; business, 18%; public authorities, 4%; industrial, 4%; other 8%. '12 reported depreciation rate: 2.8%. Has 1,131 employees. President, Chairman, and Chief Executive Officer: Peter C. Nelson. Inc.: Delaware. Address: 1720 North First Street, San Jose, California 95112-4598. Telephone: 408-367-8200. Internet: www.calwatergroup.com.

This will not be an easy year for the California Water Service Group. As expected, the utility posted its second-consecutive year-over-year negative earnings comparison in the June-ended period. What's more, we expect this trend to continue for the second half of the year.

What's behind the bad earnings? In California, utilities run on three-year regulatory cycles. This means that they can only seek rate relief every third year. Quite often, by the final year of the cycle, expenses have outpaced the higher revenues that were originally permitted.

A major rate case is close to being settled. In mid-2012, California filed a petition with the California Public Utility Commission (CPUC) seeking to raise its rates by 20%. The utility has been in negotiations with the CPUC for months, and it now believes that 95% of the matters involved are resolved. Even though many of California Water's expenses were prudently spent on improving its infrastructure, that doesn't mean that its request will be automatically approved. There is a tremendous amount of political pressure brought upon regulators to keep water customers (i.e. voters) rates low. On balance, we estimate the final decision will be fairly reasonable. The allowed return on equity will most likely be low on a relative basis, but the utility will at least have a good chance of earning it.

All told, earnings should decline sharply in 2013, but rebound in 2014. Due to the aforementioned reasons, we think that California Water's share net will plunge 22% this year. Next year, due mostly to rate relief, we expect the bottom line to snap back, by $0.25, to $1.05 a share.

We think that there are other stocks in the water utility industry that hold greater appeal than California Water. On the plus side, these shares have a yield that is nearly 70 basis points greater than certain of its peers. Moreover, as a result of a large stock issuance earlier this year, the company's finances have improved significantly. However, the utility's subpar dividend growth potential over the next several years and the equity's Below Average Timeliness rank more than offset these positives, in our opinion.

James A. Flood *October 18, 2013*

(A) Basic EPS. Excl. nonrecurring gain (loss): '00, (4¢); '01, 2¢; '02, 4¢; '11, 4¢. Next earnings report due mid-August.
(B) Dividends historically paid in late Feb., May, Aug., and Nov. ■ Div'd reinvestment plan available.
(C) Incl. intangible assets. In '12: $18.8 mill., $0.44/sh.
(D) In millions, adjusted for splits.
(E) Excludes non-reg. rev.

Company's Financial Strength	B++
Stock's Price Stability	100
Price Growth Persistence	50
Earnings Predictability	90

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CONNECTICUT WATER NDQ-CTWS

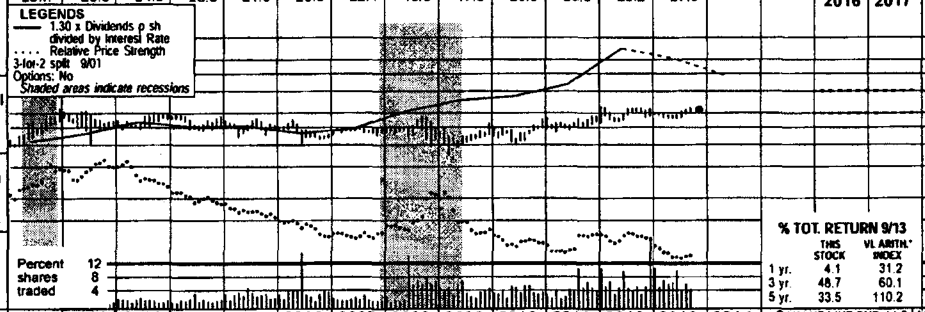
RECENT PRICE 31.35 | P/E RATIO 18.9 (Trailing: 21.5 Median: 23.0) | RELATIVE P/E RATIO 1.07 | DIV'D YLD 3.2% | VALUE LINE

TIMELINESS 4 Lowered 3/29/13
SAFETY 3 New 1/18/13
TECHNICAL 3 Lowered 10/11/13
BETA .75 (1.00 = Market)

High:	31.1	30.4	29.8	28.2	27.7	25.6	29.0	26.4	27.9	29.1	32.8	32.4
Low:	20.3	24.0	23.8	21.9	20.3	22.4	19.3	17.3	20.0	23.3	26.2	27.8

LEGENDS
— 1.30 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
3-for-2 split 9/01
Options: No
Shaded areas indicate recessions

Target Price Range 2016 | 2017 | 2018



Percent shares traded 12 8 4

2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	40	(+30%)	*10%*
Low	30	(-5%)	*3%*

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	2	0	0	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	48	52	39
to Sell	16	21	39
Hld's(000)	4069	4336	4492

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	4.1	31.2
3 yr.	48.7	60.1
5 yr.	33.5	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
5.67	5.58	5.87	5.70	5.93	5.77	5.91	6.04	5.81	5.68	7.05	7.24	6.93	7.65	7.93	7.63	*8.65*	*8.90*	Revenues per sh	*11.25*
1.51	1.59	1.65	1.73	1.78	1.78	1.89	1.91	1.62	1.52	1.90	1.95	1.93	2.04	2.11	2.10	*2.55*	*2.65*	"Cash Flow" per sh	*2.75*
1.00	1.02	1.03	1.09	1.13	1.12	1.15	1.16	.88	.81	1.05	1.11	1.19	1.13	1.13	1.53	*1.60*	*1.70*	Earnings per sh A	*1.80*
.77	.78	.79	.79	.80	.81	.83	.84	.85	.86	.87	.88	.90	.92	.94	.96	*.98*	*1.01*	Div'd Decl'd per sh B ■	*1.11*
1.99	1.12	1.42	1.43	1.86	1.98	1.49	1.58	1.96	1.96	2.24	2.44	3.28	3.06	2.61	2.34	*2.75*	*2.85*	Cap'l Spending per sh	*2.90*
8.26	8.52	8.61	8.92	9.25	10.06	10.46	10.94	11.52	11.60	11.95	12.23	12.67	13.05	13.50	16.89	*17.25*	*17.80*	Book Value per sh D	*20.40*
6.79	6.80	7.26	7.28	7.65	7.94	7.97	8.04	8.17	8.27	8.38	8.46	8.57	8.68	8.76	10.97	*11.10*	*11.25*	Common Shs Outst'g C	*12.00*
12.9	15.5	18.2	18.2	21.5	24.3	23.5	22.9	28.6	29.0	23.0	22.2	18.4	20.7	23.0	19.4	*Bold figures are Value Line estimates*		Avg Ann'l P/E Ratio	*20.0*
.74	.81	1.04	1.18	1.10	1.33	1.34	1.21	1.52	1.57	1.22	1.34	1.23	1.32	1.44	1.24			Relative P/E Ratio	*1.35*
6.0%	4.9%	4.2%	4.0%	3.3%	3.0%	3.0%	3.1%	3.4%	3.6%	3.6%	3.6%	4.1%	3.9%	3.6%	3.2%			Avg Ann'l Div'd Yield	*3.4%*

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
47.1	48.5	47.5	46.9	59.0	61.3	59.4	66.4	69.4	83.8	*95.0*	*100*	Revenues ($mill)	*135*
9.2	9.4	7.2	6.7	8.8	9.4	10.2	9.8	9.9	13.6	*17.5*	*19.0*	Net Profit ($mill)	*21.0*
17.9%	22.9%	--	23.5%	32.4%	27.2%	19.5%	35.2%	41.3%	32.0%	*32.0%*	*33.0%*	Income Tax Rate	*35%*
--	--	--	--	--	1.7%	--	--	1.8%	1.7%	*2.0%*	*2.0%*	AFUDC % to Net Profit	*3.0%*
43.5%	42.8%	44.9%	44.4%	47.8%	46.9%	50.6%	49.5%	53.2%	49.0%	*49.5%*	*49.5%*	Long-Term Debt Ratio	*48.5%*
55.9%	56.7%	54.6%	55.1%	51.8%	52.7%	49.1%	50.2%	46.5%	50.8%	*50.5%*	*50.5%*	Common Equity Ratio	*51.5%*
148.9	155.1	172.3	174.1	193.2	196.5	221.3	225.6	254.2	364.6	*375*	*395*	Total Capital ($mill)	*475*
238.9	246.1	247.7	268.1	284.3	302.3	325.2	344.2	362.4	447.9	*470*	*490*	Net Plant ($mill)	*550*
7.5%	7.0%	5.0%	4.9%	5.5%	5.9%	5.5%	5.4%	4.9%	4.8%	*5.5%*	*5.0%*	Return on Total Cap'l	*5.5%*
10.9%	10.6%	7.5%	6.9%	8.7%	9.0%	9.3%	8.6%	8.3%	7.3%	*9.0%*	*9.5%*	Return on Shr. Equity	*8.5%*
11.0%	10.6%	7.6%	7.0%	8.7%	9.1%	9.4%	8.7%	8.3%	7.3%	*9.0%*	*9.5%*	Return on Com Equity	*8.5%*
3.2%	3.1%	.3%	NMF	1.6%	1.9%	2.3%	1.6%	1.4%	2.7%	*3.5%*	*3.5%*	Retained to Com Eq	*3.0%*
71%	71%	95%	105%	82%	79%	76%	81%	83%	62%	*62%*	*59%*	All Div'ds to Net Prof	*62%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $180.2 mill. **Due in 5 Yrs** $14.8 mill.
LT Debt $178.7 mill. **LT Interest** $7.6 mill.
(Total interest coverage: 8.8x)
(49% of Cap'l)
Leases, Uncapitalized: *Annual rentals $.2 mill.*
Pension Assets $45.4 mill.
Oblig. $66.5 mill.

Pfd Stock $0.8 mill. **Pfd Divd** NMF

Common Stock 11,003,512 shs.
as of 7/31/13
MARKET CAP: $350 million (Small Cap)

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	1.0	13.2	7.5
Accounts Receivable	14.9	11.5	12.1
Other	3.0	11.7	13.5
Current Assets	18.9	36.4	33.1
Accts Payable	7.2	10.0	7.3
Debt Due	--	3.0	1.5
Other	23.2	2.9	3.1
Current Liab.	30.4	15.9	11.9
Fix. Chg. Cov.	419%	455%	*460%*

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	3.5%	6.0%	*6.5%*
"Cash Flow"	2.5%	6.0%	*4.5%*
Earnings	1.5%	6.5%	*5.5%*
Dividends	1.5%	2.0%	*3.5%*
Book Value	5.5%	6.5%	*6.0%*

Calendar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	13.8	15.9	21.0	15.7	66.4
2011	16.0	17.4	20.6	15.4	69.4
2012	18.5	21.3	24.5	19.5	83.8
2013	21.5	22.5	*27.0*	*24.0*	*95.0*
2014	*22.0*	*24.0*	*30.0*	*24.0*	*100*

Calendar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.12	.27	.54	.20	1.13
2011	.26	.37	.39	.11	1.13
2012	.22	.47	.67	.16	1.53
2013	.24	.39	*.68*	*.29*	*1.60*
2014	*.30*	*.47*	*.68*	*.25*	*1.70*

Calendar	QUARTERLY DIVIDENDS PAID B Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.222	.222	.228	.228	.90
2010	.228	.228	.233	.233	.922
2011	.233	.233	.238	.238	.942
2012	.238	.238	.2425	.2425	.962
2013	.2425	.2425	.2475		

BUSINESS: Connecticut Water Service, Inc. is a non-operating holding company, whose income is derived from earnings of its wholly-owned subsidiary companies (regulated water utilities). Its largest subsidiary, Connecticut Water, accounted for about 85% of the holding company's net income in 2012, and provides water services to 400,000 people in 55 towns throughout Connecticut and Maine. Acquired The Maine Water Co., 1/12; Biddeford and Saco Water, 12/12. Inc.: CT. Has about 260 employees. Chairman/President/CEO: Eric W. Thornburg. Officers and directors own 2.2% of the common stock; BlackRock, Inc. 6.7%; The Vanguard Group, 5.3%. Address: 93 West Main Street, Clinton, CT 06413. Telephone: (860) 669-8636. Internet: www.ctwater.com.

Connecticut Water Service has finally reached a definitive deal with all of the state's regulators. In September, the Connecticut Public Regulatory Authority (PURA) agreed to a deal that had been reached earlier among Connecticut Water and the state's Attorney General and Consumer Council. PURA was the final hurdle in the approval process, and it didn't alter the agreement in any meaningful way.

Ratepayers will benefit from the settlement. Customers will see their water bills decline over the next two years as Connecticut Water will pass along to them a tax refund it was granted by the IRS for the 2010-2012 period. In addition, the utility agreed not to seek higher rates before October, 2015.

Connecticut Water will benefit too. Permission was granted for the company to establish a Revenue Adjustment Mechanism, which will allow it to keep the tax benefit from the IRS refund going forward. These funds will be allowed to flow through to shareholders until the next time the company seeks higher rates.

The earnings picture looks brighter. Following four static years of earnings, the company enjoyed strong results in 2012, as share net rose 35%. With the new arrangement with regulators in place, we think that Connecticut Water's bottom line will increase close to 5%, both this year and next. Moreover, the company will earn close to its allowed return on equity.

The recent dividend hike was somewhat disappointing. Over the past five- and 10-year periods, Connecticut Water's dividend growth rate averaged only 2.0%, and 1.5%, respectively. Both percentages were among the lowest in the water utility industry. Following the company's solid profits in 2012, along with its improved earning prospects, we had hoped that the most recent quarterly payout to shareholders would have been more generous than the 2% increase declared in August.

We can't find too many reasons to recommend these shares at this juncture. While the stock's yield is slightly higher than the average of its peers, its dividend growth prospects to 2016-2018 are subpar for the group. Furthermore, this equity carries a 4 (Below Average) rank for Timeliness.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Next earnings report due mid-November. Quarterly earnings do no add in '12 due to rounding.
(B) Dividends historically paid in mid-March, June, September, and December. ■ Div'd reinvestment plan available.
(C) In millions, adjusted for split.
(D) Includes intangibles. In '12: $31.7 million/$2.89 a share.

Company's Financial Strength	B+
Stock's Price Stability	90
Price Growth Persistence	50
Earnings Predictability	80

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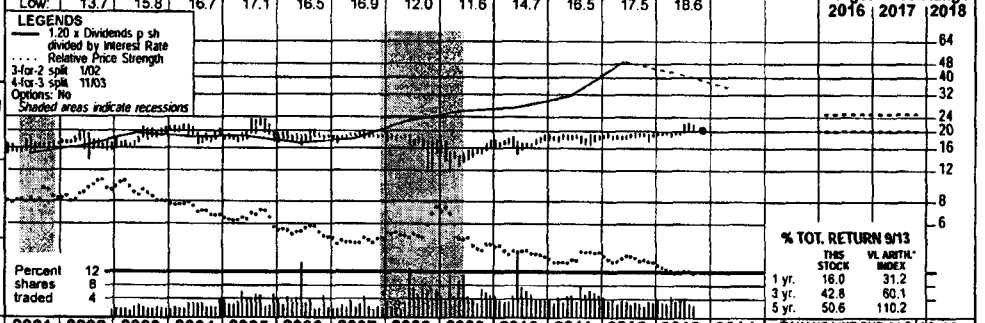
MIDDLESEX WATER NDQ-MSEX

RECENT PRICE 20.31 | P/E RATIO 20.9 (Trailing: 19.7 Median: 22.0) | RELATIVE P/E RATIO 1.19 | DIV'D YLD 3.7% | VALUE LINE

TIMELINESS 2 Raised 6/7/13
SAFETY 2 New 10/21/11
TECHNICAL 3 Lowered 10/18/13
BETA .70 (1.00 = Market)

High:	20.0	21.2	21.8	23.5	20.5	20.2	19.8	17.9	19.3	19.4	19.6	22.5			Target Price Range		
Low:	13.7	15.8	16.7	17.1	16.5	16.9	12.0	11.6	14.7	16.5	17.5	18.6			2016	2017	2018



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	25	(+25%)	9%
Low	20	(Nil)	4%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	1	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	1

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	38	38	37
to Sell	28	30	35
Hld's(000)	6696	6579	6489

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	16.0	31.2
3 yr.	42.8	60.1
5 yr.	50.6	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
4.72	4.39	5.35	5.39	5.87	5.98	6.12	6.25	6.44	6.16	6.50	6.79	6.75	6.60	6.50	6.98	*7.50*	*7.70*	Revenues per sh	*9.10*
1.02	1.02	1.19	.99	1.18	1.20	1.15	1.28	1.33	1.33	1.49	1.53	1.40	1.55	1.46	1.56	*1.65*	*1.85*	"Cash Flow" per sh	*2.30*
.67	.71	.76	.51	.66	.73	.61	.73	.71	.82	.87	.89	.72	.96	.84	.90	*1.00*	*1.05*	Earnings per sh A	*1.15*
.57	.58	.60	.61	.62	.63	.65	.66	.67	.68	.69	.70	.71	.72	.73	.74	*.75*	*.76*	Div'd Decl'd per sh B■	*.80*
1.20	2.68	2.33	1.32	1.25	1.59	1.87	2.54	2.18	2.31	1.66	2.12	1.49	1.90	1.50	1.36	*1.50*	*1.65*	Cap'l Spending per sh	*2.00*
6.00	6.80	6.95	6.98	7.11	7.39	7.60	8.02	8.26	9.52	10.05	10.03	10.33	11.13	11.27	11.48	*11.75*	*12.10*	Book Value per sh D	*12.90*
8.54	9.82	10.00	10.11	10.17	10.36	10.48	11.36	11.58	13.17	13.25	13.40	13.52	15.57	15.70	15.82	*16.00*	*16.25*	Common Shs Outst'g C	*17.00*
13.4	15.2	17.6	28.7	24.6	23.5	30.0	26.4	27.4	22.7	21.6	19.8	21.0	17.8	21.7	20.8	*Bold figures are*		Avg Ann'l P/E Ratio	*20.0*
.77	.79	1.00	1.87	1.26	1.28	1.71	1.39	1.46	1.23	1.15	1.19	1.40	1.13	1.36	1.33	*Value Line*		Relative P/E Ratio	*1.35*
6.3%	5.4%	4.4%	4.2%	3.8%	3.7%	3.5%	3.4%	3.5%	3.7%	3.7%	4.0%	4.7%	4.2%	4.0%	4.0%	*estimates*		Avg Ann'l Div'd Yield	*3.6%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $166.7 mill. Due in 5 Yrs $60.0 mill.
LT Debt $133.5 mill. LT Interest $7.0 mill.
(LT interest coverage: 4.1x)
(42% of Cap'l)

Pension Assets-12/12 $37.9 mill.
Oblig. $62.8 mill.
Pfd Stock $3.4 mill. Pfd Div'd: $.2 mill.

Common Stock 15,847,729 shs.
as of 7/31/13

MARKET CAP: $325 million (Small Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
64.1	71.0	74.6	81.1	86.1	91.0	91.2	102.7	102.1	110.4	*120*	*125*	Revenues ($mill)	*155*
6.6	8.4	8.5	10.0	11.8	12.2	10.0	14.3	13.4	14.4	*15.5*	*17.0*	Net Profit ($mill)	*20.0*
32.8%	31.1%	27.6%	33.4%	32.6%	33.2%	34.1%	32.1%	32.7%	33.9%	*34.0%*	*34.0%*	Income Tax Rate	*34.0%*
--	--	--	--	--	--	--	6.8%	6.1%	3.4%	*4.5%*	*4.5%*	AFUDC % to Net Profit	*5.0%*
53.8%	53.8%	55.3%	49.5%	49.0%	45.6%	46.6%	43.1%	42.3%	41.5%	*43.0%*	*43.0%*	Long-Term Debt Ratio	*43.0%*
44.0%	42.5%	41.3%	47.5%	49.6%	51.8%	52.1%	55.8%	56.6%	57.4%	*57.0%*	*57.0%*	Common Equity Ratio	*57.0%*
181.1	214.5	231.7	264.0	268.8	259.4	267.9	310.5	312.5	316.5	*330*	*345*	Total Capital ($mill)	*400*
230.9	262.9	288.0	317.1	333.9	366.3	376.5	405.9	422.2	435.2	*440*	*450*	Net Plant ($mill)	*510*
5.0%	5.1%	5.0%	5.1%	5.6%	5.8%	5.0%	5.7%	5.2%	5.4%	*4.5%*	*5.0%*	Return on Total Cap'l	*5.5%*
7.9%	8.5%	8.2%	7.5%	8.6%	8.6%	7.0%	8.1%	7.5%	7.8%	*8.0%*	*8.5%*	Return on Shr. Equity	*9.0%*
8.0%	9.0%	8.6%	7.8%	8.7%	8.9%	7.0%	8.2%	7.5%	7.8%	*8.0%*	*8.5%*	Return on Com Equity	*9.0%*
NMF	.9%	.6%	1.3%	1.8%	2.0%	.1%	2.1%	1.0%	1.4%	*2.0%*	*2.5%*	Retained to Com Eq	*3.0%*
106%	90%	94%	84%	79%	78%	98%	75%	87%	83%	*80%*	*73%*	All Div'ds to Net Prof	*70%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	3.1	3.0	3.0
Other	19.8	21.6	23.1
Current Assets	22.9	24.6	26.1
Accts Payable	5.7	3.8	5.1
Debt Due	4.6	11.1	33.2
Other	36.4	41.1	17.6
Current Liab.	46.7	56.0	55.9
Fix. Chg. Cov.	380%	410%	*415%*

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	1.5%	1.0%	*5.5%*
"Cash Flow"	3.0%	2.0%	*7.0%*
Earnings	3.5%	2.5%	*4.0%*
Dividends	1.5%	1.5%	*1.5%*
Book Value	4.5%	4.0%	*2.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	21.6	26.5	29.6	25.0	102.7
2011	24.0	26.1	28.7	23.3	102.1
2012	23.5	27.4	32.3	27.1	110.4
2013	27.0	29.1	*34.0*	*29.9*	*120*
2014	*30.0*	*30.0*	*35.0*	*30.0*	*125*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.11	.31	.37	.17	.96
2011	.17	.23	.32	.12	.84
2012	.11	.23	.38	.17	.90
2013	.20	.28	*.35*	*.17*	*1.00*
2014	*.17*	*.28*	*.40*	*.20*	*1.05*

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.178	.178	.178	.180	.71
2010	.180	.180	.180	.183	.72
2011	.183	.183	.183	.185	.73
2012	.185	.185	.185	.1875	.74
2013	.1875	.1875	.1875		

BUSINESS: Middlesex Water Company engages in the ownership and operation of regulated water utility systems in New Jersey, Delaware, and Pennsylvania. It also operates water and wastewater systems under contract on behalf of municipal and private clients in NJ and DE. Its Middlesex System provides water services to 60,000 retail customers, primarily in Middlesex County, New Jersey. In 2012, the Middlesex System accounted for 65% of total revenues. At 12/31/12, the company had 279 employees. Incorporated: NJ. President, CEO, and Chairman: Dennis W. Doll. Officers/directors own 3.1% of the common stock; BlackRock, 6.3%; The Vanguard Group, 5.7% (4/13 proxy). Address: 1500 Ronson Road, Iselin, NJ 08830. Tel.: 732-634-1500. Internet: www.middlesexwater.com.

Historically, Middlesex Water's dividend increases have been incredibly consistent. Over the past nine years, (from 2003 to 2012), the utility has raised its annual payout by $0.01 a share.

Sometimes predictability isn't a positive. Over the past five and 10 years, respectively, the average dividend hike has been a meager 1.5%. This ranks near the bottom when compared to the other seven water utilities that *Value Line* covers.

Could Middlesex finally break its streak this quarter? Late October is usually the time when the company implements its annual dividend rate hike. With decent earnings comparisons, it's possible that Middlesex could go against convention and raise the payout by more than the traditional one-quarter of a cent per share. We are taking a show-me approach, with our figures representing the usual quarterly increase.

The utility's earnings have been improving. In the June period, Middlesex experienced its fourth-consecutive positive earnings comparison. This was mostly due to the implementation of higher rates in mid-2012, as well a better contract with the borough of Avalon, NJ, a wholesale client.

Performance in the industrial markets has impaired Middlesex. The utility lost a contract to supply water to the borough of Sayreville, NJ this past August. Another setback was the closure of a Hess oil refinery earlier in the year.

The company is targeting the residential market. Despite recently winning a contract to privatize the water system at the Dover Air Force Base in Delaware, Middlesex has budgeted $25 million a year over the next three years to improve the infrastructure of its residential business. We agree with this strategy as the residential market is both more predictable and profitable.

Middlesex shares are ranked to outperform the market in the year ahead. Some investors may also be attracted to the stock's high current yield. Those with a long-term horizon, however, can find other water utilities with higher total-return potential through the pull to 2016-2018.

James A. Flood *October 18, 2013*

(A) Diluted earnings. May not sum due to rounding. Next earnings report due early November.
(B) Dividends historically paid in mid-Feb., May, Aug., and November.■ Div'd reinvestment plan available.
(C) In millions, adjusted for splits.
(D) Intangible assets in 2012: $9.2 million, $0.58 a share.

Company's Financial Strength	B++
Stock's Price Stability	95
Price Growth Persistence	40
Earnings Predictability	80

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SJW CORP. NYSE-SJW

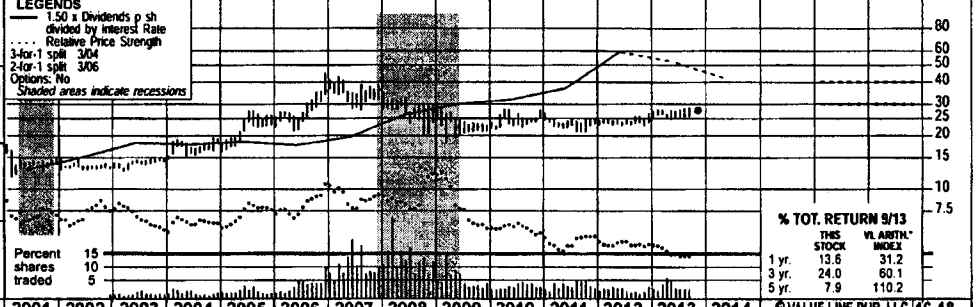
RECENT PRICE 27.72 | P/E RATIO 20.8 (Trailing: 21.7 / Median: 23.0) | RELATIVE P/E RATIO 1.18 | DIV'D YLD 2.7% | VALUE LINE

TIMELINESS 1 Raised 8/9/13
SAFETY 3 New 4/22/11
TECHNICAL 4 Lowered 10/18/13
BETA .85 (1.00 = Market)

High:	15.1	15.0	19.6	27.8	45.3	43.0	35.1	30.4	28.2	26.8	26.9	28.9
Low:	12.7	12.6	14.6	16.1	21.2	27.7	20.0	18.2	21.6	20.9	22.6	24.5

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.50 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
3-for-1 split 3/04
2-for-1 split 3/06
Options: No
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	40	(+45%)	12%
Low	30	(+10%)	5%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	4	0	0	0	0	0	0	0	0
Options	0	1	0	0	0	0	0	0	0
to Sell	0	1	0	0	0	0	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	34	46	47
to Sell	30	20	28
Hld's(000)	9043	10000	10629

Percent shares traded 15 10 5

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	13.6	31.2
3 yr.	24.0	60.1
5 yr.	7.9	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
5.79	5.58	6.40	6.74	7.45	7.97	8.20	9.14	9.86	10.35	11.25	12.12	11.68	11.62	12.85	14.01	*14.05*	*14.75*	Revenues per sh	*16.30*
1.27	1.26	1.43	1.23	1.49	1.55	1.75	1.89	2.21	2.38	2.30	2.44	2.21	2.38	2.80	2.97	*3.25*	*3.50*	"Cash Flow" per sh	*3.65*
.80	.76	.87	.58	.77	.78	.91	.87	1.12	1.19	1.04	1.08	.81	.84	1.11	1.18	*1.30*	*1.40*	Earnings per sh A	*1.60*
.38	.39	.40	.41	.43	.46	.49	.51	.53	.57	.61	.65	.66	.68	.69	.71	*.73*	*.75*	Div'd Decl'd per sh B■	*.90*
1.27	1.81	1.77	1.89	2.63	2.06	3.41	2.31	2.83	3.87	6.62	3.79	3.17	5.65	3.75	5.67	*5.25*	*5.20*	Cap'l Spending per sh	*4.85*
7.02	7.53	7.88	7.90	8.17	8.40	9.11	10.11	10.72	12.48	12.90	13.99	13.66	13.75	14.20	14.71	*15.40*	*16.40*	Book Value per sh	*19.15*
19.02	19.01	18.27	18.27	18.27	18.27	18.27	18.27	18.27	18.28	18.36	18.18	18.50	18.55	18.59	18.67	*20.25*	*21.00*	Common Shs Outst'g C	*23.00*
11.2	13.1	15.5	33.1	18.5	17.3	15.4	19.6	19.7	23.5	33.4	26.2	28.7	29.1	21.2	20.4	*Bold figures are*		Avg Ann'l P/E Ratio	*22.0*
.65	.68	.88	2.15	.95	.94	.88	1.04	1.05	1.27	1.77	1.58	1.91	1.85	1.33	1.30	*Value Line*		Relative P/E Ratio	*1.45*
4.3%	3.9%	3.0%	2.1%	3.0%	3.4%	3.5%	3.0%	2.4%	2.0%	1.7%	2.3%	2.8%	2.8%	2.9%	3.0%	*estimates*		Avg Ann'l Div'd Yield	*2.6%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $335.8 mill. Due in 5 Yrs $21.2 mill.
LT Debt $335.3 mill. LT Interest $18.6 mill.
(Total interest coverage: 4.6x) (52% of Cap'l)

Leases, Uncapitalized: Annual rentals $4.7 mill.

Pension Assets $75.5 mill. Oblig. $141.0 mill.

Pfd Stock None.

Common Stock 20,137,197 shs. as of 7/26/13

MARKET CAP: $660 million (Small Cap)

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014		16-18
149.7	166.9	180.1	189.2	206.6	220.3	216.1	215.6	239.0	261.5	*285*	*310*	Revenues ($mill)	*375*
16.7	16.0	20.7	22.2	19.3	20.2	15.2	15.8	20.9	22.3	*26.0*	*29.0*	Net Profit ($mill)	*37.0*
36.2%	42.1%	41.6%	40.8%	39.4%	39.5%	40.4%	38.8%	41.1%	41.1%	*41.0%*	*40.0%*	Income Tax Rate	*40.0%*
1.6%	2.1%	1.6%	2.1%	2.7%	2.3%	2.0%	--	2.0%	2.0%	*3.0%*	*4.0%*	AFUDC % to Net Profit	*5.0%*
45.6%	43.7%	42.6%	41.8%	47.7%	46.0%	49.4%	53.7%	56.6%	55.0%	*54.5%*	*54.0%*	Long-Term Debt Ratio	*51.0%*
54.4%	56.3%	57.4%	58.2%	52.3%	54.0%	50.6%	46.3%	43.4%	45.0%	*45.5%*	*46.0%*	Common Equity Ratio	*49.0%*
306.0	328.3	341.2	391.8	453.2	470.9	499.6	550.7	607.9	610.2	*685*	*745*	Total Capital ($mill)	*900*
428.5	456.8	484.8	541.7	645.5	684.2	718.5	785.5	756.2	831.6	*890*	*950*	Net Plant ($mill)	*1150*
6.9%	6.5%	7.6%	7.0%	5.7%	5.8%	4.4%	4.3%	4.9%	5.0%	*5.0%*	*5.0%*	Return on Total Cap'l	*6.0%*
10.0%	8.7%	10.6%	9.7%	8.2%	8.0%	6.0%	6.2%	7.9%	8.1%	*8.5%*	*8.5%*	Return on Shr. Equity	*8.5%*
10.0%	8.7%	10.6%	9.7%	8.2%	8.0%	6.0%	6.2%	7.9%	8.1%	*8.5%*	*8.5%*	Return on Com Equity	*8.5%*
4.7%	3.6%	5.6%	5.2%	3.5%	3.3%	1.2%	1.2%	3.1%	3.3%	*3.5%*	*4.0%*	Retained to Com Eq	*3.5%*
53%	58%	47%	46%	57%	59%	80%	80%	61%	59%	*56%*	*54%*	All Div'ds to Net Prof	*56%*

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	26.7	2.5	4.0
Other	42.2	40.4	44.2
Current Assets	68.9	42.9	48.2
Accts Payable	7.4	8.5	15.9
Debt Due	.8	20.7	.5
Other	20.1	19.9	28.8
Current Liab.	28.3	49.1	45.2
Fix. Chg. Cov.	276%	247%	231%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	5.5%	4.0%	*4.0%*
"Cash Flow"	6.5%	3.5%	*5.0%*
Earnings	4.0%	-1.5%	*7.5%*
Dividends	5.0%	4.0%	*4.5%*
Book Value	5.5%	3.5%	*5.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	40.4	54.1	70.3	50.8	215.6
2011	43.7	59.0	73.9	62.4	239.0
2012	51.1	65.6	82.4	62.4	261.5
2013	50.1	74.2	*90.7*	*70.0*	*285*
2014	*60.0*	*75.0*	*100*	*75.0*	*310*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.055	.24	.44	.11	.84
2011	.03	.29	.44	.35	1.11
2012	.06	.28	.53	.31	1.18
2013	.07	.37	*.54*	*.32*	*1.30*
2014	*.10*	*.35*	*.60*	*.35*	*1.40*

Cal-endar	QUARTERLY DIVIDENDS PAID B■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.165	.165	.165	.165	.66
2010	.17	.17	.17	.17	.68
2011	.173	.173	.173	.173	.69
2012	.1775	.1775	.1775	.1775	.71
2013	.1825	.1825	.1825		

BUSINESS: SJW Corporation engages in the production, purchase, storage, purification, distribution, and retail sale of water. It provides water service to approximately 227,000 connections that serve a population of approximately one million people in the San Jose area and 8,700 connections that serve approximately 36,000 residents in a service area in the region between San Antonio and Austin, Texas. The company offers nonregulated water-related services, including water system operations, cash remittances, and maintenance contract services. SJW also owns and operates commercial real estate investments. Has about 375 employees. Chrm.: Charles J. Toeniskoetter. Inc.: CA. Address: 110 W. Taylor Street, San Jose, CA 95110. Tel.: (408) 279-7800. Int: www.sjwater.com.

A final decision on SJW's pending rate case will be delayed. The California Public Utility Commission (CPUC) has had to divert much of its resources to investigate the San Bruno gas pipeline explosion, which killed eight people in 2010.

Meanwhile, 2013 is benefiting from interim rate relief. SJW is seeking substantial rate increases of 21.5% for 2013, 4.9% in 2014, and 12.6% in 2016. Until a final decision is reached on this request, the utility has been allowed to raise rates on an interim basis. Though earnings comparisons won't be impressive in the second half of the year, we still think that the utility's share net can increase 10%, to $1.30

SJW's future is in the hands of regulators. While this statement is true for all utilities, SJW is more vulnerable than most. This is due to the enormous size of the rate hikes that it has petitioned for. Even though we view the company's expenditures as essential to the operations of its system, the sheer size of the requests puts the CPUC in a difficult position. It is politically very hard to raise rate payers' bills by such a large extent without a significant amount of political blow-back.

Therefore, our 2014 profit estimate for the company is pretty tenuous. Earnings should be fine as long as the interim rate relief is in place. Once the CPUC makes a final decision, things could change for the worse. In any case, we should point out that California regulators have been reasonable in the past, and hopefully some sort of deal that satisfies both sides can be reached.

We expect SJW to tap the external markets in the years ahead. The company estimates that it will have to invest $100 million annually through 2016-2018 in order to upgrade its aging infrastructure. Internal cash flow will fall well short of generating sufficient funds to meet these outlays. Thus, there will be dilutive equity offerings and costly debt issuance. Both of these moves will impair the company's earnings growth.

SJW shares now carry our Highest rank (1) for Timeliness. Momentum investors may find this stock of interest, others might be scared off by the possibility of a harsh regulatory decision.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Excludes nonrecurring losses: '03, $1.97; '04, $3.78; '05, $1.09; '06, $16.36; '08, $1.22; '10, 46¢. Next earnings report due late October. Quarterly egs. may not add due to rounding.
(B) Dividends historically paid in early March, June, September, and December. ■ Div'd reinvestment plan available.
(C) In millions, adjusted for stock splits.

Company's Financial Strength	B+
Stock's Price Stability	80
Price Growth Persistence	50
Earnings Predictability	80

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YORK WATER NDQ-YORW

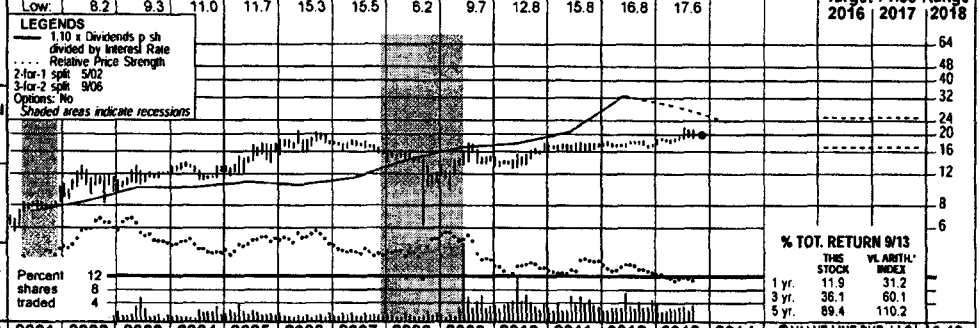
RECENT PRICE 19.90 | P/E RATIO 25.8 (Trailing: 26.5 Median: 25.0) | RELATIVE P/E RATIO 1.47 | DIV'D YLD 2.9% | VALUE LINE

TIMELINESS 4 Lowered 10/4/13
SAFETY 2 New 7/19/13
TECHNICAL 3 Lowered 8/2/13
BETA .70 (1.00 = Market)

High:	13.4	13.5	14.0	17.9	21.0	18.5	16.5	18.0	18.0	18.1	18.5	22.0
Low:	8.2	9.3	11.0	11.7	15.3	15.5	6.2	9.7	12.8	15.8	16.8	17.6

Target Price Range 2016 | 2017 | 2018

LEGENDS
— 1.10 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
2-for-1 split 5/02
3-for-2 split 9/06
Options: No
Shaded areas indicate recessions



2016-18 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	25	(+25%)	8%
Low	17	(-15%)	Nil

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	4	0	0	4	0	1	5
Options	0	0	0	0	0	0	0	0	0
to Sell	0	1	0	0	0	1	0	0	0

Institutional Decisions

	4Q2012	1Q2013	2Q2013
to Buy	26	33	32
to Sell	27	21	26
Hld's(000)	3178	3375	3346

% TOT. RETURN 9/13

	THIS STOCK	VL ARITH.* INDEX
1 yr.	11.9	31.2
3 yr.	36.1	60.1
5 yr.	89.4	110.2

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	© VALUE LINE PUB. LLC	16-18
--	--	--	--	2.05	2.05	2.17	2.18	2.58	2.56	2.79	2.89	2.95	3.07	3.18	3.21	*3.40*	*3.50*	Revenues per sh	*3.55*
--	--	--	--	.59	.57	.65	.65	.79	.77	.86	.88	.95	1.07	1.09	1.12	*1.20*	*1.30*	"Cash Flow" per sh	*1.40*
--	--	--	--	.43	.40	.47	.49	.56	.58	.57	.57	.64	.71	.71	.72	*.75*	*.85*	Earnings per sh A	*.90*
--	--	--	--	.34	.35	.37	.39	.42	.45	.48	.49	.51	.52	.53	.54	*.55*	*.57*	Div'd Decl'd per sh B	*.65*
--	--	--	--	.75	.66	1.07	2.50	1.69	1.85	1.69	2.17	1.18	.83	.74	.94	*.90*	*.80*	Cap'l Spending per sh	*.90*
--	--	--	--	3.79	3.90	4.06	4.65	4.85	5.84	5.97	6.14	6.92	7.19	7.45	7.73	*8.05*	*8.35*	Book Value per sh	*8.60*
--	--	--	--	9.46	9.55	9.63	10.33	10.40	11.20	11.27	11.37	12.56	12.69	12.79	12.92	*13.00*	*13.20*	Common Shs Outst'g C	*14.00*
--	--	--	--	17.8	26.9	24.5	25.7	26.3	31.2	30.3	24.6	21.9	20.7	23.9	24.4	*Bold figures are*		Avg Ann'l P/E Ratio	*22.5*
--	--	--	--	.91	1.47	1.40	1.36	1.40	1.68	1.61	1.48	1.46	1.32	1.50	1.55	*Value Line*		Relative P/E Ratio	*1.50*
--	--	--	--	4.4%	3.3%	3.2%	3.1%	2.9%	2.5%	2.8%	3.5%	3.6%	3.5%	3.1%	3.1%	*estimates*		Avg Ann'l Div'd Yield	*3.2%*
						20.9	22.5	26.8	28.7	31.4	32.8	37.0	39.0	40.6	41.4	*43.0*	*46.0*	Revenues ($mill)	*50.0*
						4.4	4.8	5.8	6.1	6.4	6.4	7.5	8.9	9.1	9.3	*10.2*	*11.3*	Net Profit ($mill)	*12.6*
						34.8%	36.7%	36.7%	34.4%	36.5%	36.1%	37.9%	38.5%	35.3%	37.6%	*36.0%*	*36.0%*	Income Tax Rate	*36.0%*
						--	--	--	7.2%	3.6%	10.1%	--	1.2%	1.1%	1.1%	*1.0%*	*1.0%*	AFUDC % to Net Profit	*1.0%*
						43.4%	42.5%	44.1%	48.3%	46.5%	54.5%	45.7%	48.3%	47.1%	46.0%	*45.0%*	*45.0%*	Long-Term Debt Ratio	*43.0%*
						56.6%	57.5%	55.9%	51.7%	53.5%	45.5%	54.3%	51.7%	52.9%	54.0%	*55.0%*	*55.0%*	Common Equity Ratio	*57.0%*
						69.0	83.6	90.3	126.5	125.7	153.4	160.1	176.4	180.2	184.8	*190*	*197*	Total Capital ($mill)	*220*
						116.5	140.0	155.3	174.4	191.6	211.4	222.0	228.4	233.0	240.3	*245*	*250*	Net Plant ($mill)	*265*
						8.5%	7.8%	8.4%	6.2%	6.7%	5.7%	6.2%	6.5%	6.4%	6.4%	*6.5%*	*7.0%*	Return on Total Cap'l	*7.0%*
						11.4%	10.0%	11.6%	9.3%	9.5%	9.2%	8.6%	9.8%	9.5%	9.3%	*9.5%*	*10.0%*	Return on Shr. Equity	*10.0%*
						11.4%	10.0%	11.6%	9.3%	9.5%	9.2%	8.6%	9.8%	9.5%	9.3%	*9.5%*	*10.0%*	Return on Com Equity	*10.0%*
						2.6%	2.1%	3.0%	2.2%	1.7%	1.4%	1.9%	2.7%	2.5%	2.4%	*3.0%*	*3.0%*	Retained to Com Eq	*3.0%*
						77%	79%	74%	77%	82%	85%	78%	72%	73%	74%	*71%*	*67%*	All Div'ds to Net Prof	*72%*

CAPITAL STRUCTURE as of 6/30/13
Total Debt $84.9 mill. Due in 5 Yrs $19.5 mill.
LT Debt $84.9 mill. LT Interest $5.2 mill.
(Total interest coverage: 2.9x)
(46% of Cap'l)

Pension Assets 12/12 $22.7 mill. Oblig. $34.7 mill.

Pfd Stock None

Common Stock 12,912,243 shs. as of 8/6/13

MARKET CAP: $250 million (Small Cap)

CURRENT POSITION ($MILL.)	2011	2012	6/30/13
Cash Assets	4.0	4.0	4.2
Accounts Receivable	6.0	6.4	4.0
Other	1.4	1.2	4.0
Current Assets	11.4	11.6	12.2
Accts Payable	1.1	1.1	1.5
Debt Due	.1	.1	--
Other	4.1	4.3	4.0
Current Liab.	5.3	5.5	5.5
Fix. Chg. Cov.	160%	156%	154%

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '10-'12 to '16-'18
Revenues	4.5%	3.5%	*2.0%*
"Cash Flow"	6.5%	6.5%	*4.0%*
Earnings	5.5%	4.5%	*4.0%*
Dividends	1.5%	3.0%	*3.5%*
Book Value	7.0%	6.0%	*2.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	9.0	9.7	10.5	9.8	39.0
2011	9.6	10.5	10.5	10.0	40.6
2012	9.6	10.4	11.0	10.4	41.4
2013	10.1	10.7	*11.2*	*11.0*	*43.0*
2014	*10.5*	*11.5*	*12.2*	*11.8*	*46.0*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun. 30	Sep. 30	Dec. 31	Full Year
2010	.15	.18	.21	.17	.71
2011	.17	.19	.19	.16	.71
2012	.15	.17	.22	.18	.72
2013	.17	.18	*.21*	*.19*	*.75*
2014	*.19*	*.21*	*.23*	*.22*	*.85*

Cal-endar	QUARTERLY DIVIDENDS PAID B Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2009	.126	.126	.126	.126	.504
2010	.128	.128	.128	.128	.512
2011	.131	.131	.131	.131	.524
2012	.134	.134	.134	.134	.535
2013	.138	.138	.138	.138	

BUSINESS: The York Water Company is the oldest investor-owned regulated water utility in the United States. It has operated continuously since 1816. As of December 31, 2012, the company's average daily availability was 35.0 million gallons and its service territory had an estimated population of 189,000. Has more than 63,000 customers. Residential customers accounted for 63% of 2012 revenues; commercial and industrial (29%); other (8%). It also provides sewer billing services. Incorporated: PA. York had 103 full-time employees at 12/31/12. President/CEO: Jeffrey R. Hines. Officers/directors own 1.2% of the common stock (3/13 proxy). Address: 130 East Market Street York, Pennsylvania 17401. Telephone: (717) 845-3601. Internet: www.yorkwater.com.

There have been very few surprises at The York Water Company in the recent past. From 2010 through 2012, the company's annual share earnings varied by only $0.01 a share. The dividend was also very predictable, as it rose by just $0.01 a share annually during the same time span.

York is awaiting the outcome of a major rate case. Last May, the utility petitioned Pennsylvania regulators for a 17% rate increase (about $7.1 million in revenues a year). The request was to recoup the $49 million that York has spent since 2010 to modernize and update its aging infrastructure. In addition, along with the help of a large rate increase for wastewater customers, the added funds will help the utility replace 30 miles of pipeline and reduce water leakage for the 190,000 people it services.

We think that the outcome will be relatively reasonable. There is no doubt that the current and projected expenditures by York are essential to keeping the system operating efficiently. However, we should point out that no matter how justified utility spending is, regulators face strong political pressure not to implement significant rate hikes.

Dividend growth should remain relatively modest in the years ahead. Though we think that the company will raise its annual payout by $0.02 a share in 2014, the growth rate over the next three- to five-year period will be slightly on the low side for a water utility.

Finances are in decent shape. The equity-to-total capital ratio is healthy at a solid 54%. Still, our Financial Strength rating for York is an average B+. This metric would be higher if the company's capital base was more substantial.

There is nothing particularly noteworthy about York Water's shares. Both the equity's current yield and dividend growth prospects are in line with those of most of its peers. Moreover, the stock has performed fairly well of late and is now trading at over 25 times our 12 month share-earnings estimate. And finally, according to our proprietary Timeliness Ranking System, York shares should underperform the market averages in the upcoming six- to 12-month period.

James A. Flood *October 18, 2013*

(A) Diluted earnings. Next earnings report due early November.
(B) Dividends historically paid in mid-January, April, July, and October.
(C) In millions, adjusted for splits.

Company's Financial Strength	B+
Stock's Price Stability	90
Price Growth Persistence	75
Earnings Predictability	100

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Chaparral City Water Company
Summary of Risk Premium Models for the
Proxy Group of Nine Water Companies

	Proxy Group of Nine Water Companies
Predictive Risk Premium Model ™ (PRPM™) (1)	11.96 %
Risk Premium Using an Adjusted Market Approach (2)	9.88 %
Average	11.44 %

Notes:
(1) From page 14 of this Schedule.
(2) From page 15 of this Schedule.

Chaparral City Water Company
Derivation of Common Equity Cost Rate
Using the Predictive Risk Premium Model ™ (PRPM ™)
Proxy Group of Nine Water Companies (1)

	American States Water Co.	American Water Works Co., Inc.	Aqua America, Inc.	Artesian Resources Corp.	California Water Service Group	Connecticut Water Service, Inc.	Middlesex Water Company	SJW Corporation	York Water Company
GARCH Coefficient (2)	1.54967044	4.672366633	2.209364726	2.215679502	1.829335805	1.787131195	1.991386732	1.331057125	2.057023898
Average Variance (2)	0.39%	0.34%	0.48%	0.30%	0.31%	0.28%	0.27%	0.42%	0.46%
PRPM™ Derived Risk Premium (2)	7.53%	21.08%	13.40%	8.37%	7.10%	6.27%	6.62%	6.91%	12.00%
Risk-Free Rate (3)	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%	4.43%
Indicated Cost of Common Equity	11.96%	25.51%	17.83%	12.80%	11.53%	10.70%	11.05%	11.34%	16.43%
								Average	14.35%
								Median	11.96%

Notes:
(1) PRPM™ calculated from first available trading month through November 2013.
(2) Based upon data from CRSP(R) Data © 2012, Center For Research in Security Prices (CRSP(R)). The University of Chicago Booth School of Business.
(3) From note 3 on page 23 of this Schedule.

Chaparral City Water Company
Indicated Common Equity Cost Rate
Through Use of a Risk Premium Model
Using an Adjusted Total Market Approach

Line No.		Proxy Group of Nine Water Companies
1.	Prospective Yield on Aaa Rated Corporate Bonds (1)	5.20 %
2.	Adjustment to Reflect Yield Spread Between Aaa Rated Corporate Bonds and A Rated Public Utility Bonds	0.16 (2)
3.	Adjusted Prospective Yield on A Rated Public Utility Bonds	5.36 %
4.	Adjustment to Reflect Bond Rating Difference of Proxy Group	(0.04) (3)
5.	Adjusted Prospective Bond Yield	5.32 %
6.	Equity Risk Premium (4)	4.56
7.	Risk Premium Derived Common Equity Cost Rate	9.88 %

Notes:
(1) From note 3 on page 19 of this Schedule.
(2) The average yield spread of A rated public utility bonds over Aaa rated corporate bonds of 0.16% from page 17 of this Schedule.
(3) Adjustment to reflect the A1/A2 Moody's bond rating of the proxy group of nine water companies as shown on page 17 of this Schedule. The 4 basis point adjustment is derived by taking 1/6 of the spread between Aa2 and A2 Public Utility Bonds of 0.22% as shown on page 17 of this Schedule. (1/6 * 0.22% = 0.04%).
(4) From page 18 of this Schedule.

Chaparral City Water Company
Comparison of Bond Ratings, Business Risk and Financial Risk Profiles for the
Proxy Group of Nine Water Companies

	Moody's Bond Rating January 2014		Standard & Poor's Bond Rating January 2014	
Proxy Group of Nine Water Companies	Bond Rating	Numerical Weighting (1)	Bond Rating	Numerical Weighting (1)
American States Water Co. (2)	A2	6.0	A+	5.0
American Water Works Co., Inc. (3)	A1	5.0	A+	5.0
Aqua America, Inc. (4)	NR	- -	AA-	4.0
Artesian Resources Corp.	NR	- -	NR	- -
California Water Service Group (5)	NR	- -	AA-	4.0
Connecticut Water Service, Inc. (6)	NR	- -	A/A-	6.5
Middlesex Water Company	NR	- -	A	6.0
SJW Corporation (7)	NR	- -	A	6.0
York Water Company	NR	- -	A-	7.0
Average	A1/A2	5.5	A+	5.4

Notes:
(1) From Schedule 8, page 5 of Exhibit PMA-1.
(2) Ratings are those of Golden State Water Company.
(3) Ratings are those of Pennsylvania and New Jersey American Water.
(4) Ratings are those of Aqua Pennsylvania, Inc.
(5) Ratings are those of California Water Service Co.
(6) Ratings are those of Connecticut Water Company.
(7) Ratings are those of San Jose Water Co.

Source Information:
Moody's Investors Service
Standard & Poor's Global Utilities Rating Service

Moody's
Comparison of Interest Rate Trends
for the Three Months Ending November 2013 (1)

Months	Corporate Bonds	Public Utility Bonds			Spread - Corporate v. Public Utility Bonds			Spread - Public Utility Bonds	
	Aaa Rated	Aa Rated	A Rated	Baa Rated	Aa (Pub. Util.) over Aaa (Corp.)	A (Pub. Util.) over Aaa (Corp.)	Baa (Pub. Util.) over Aaa (Corp.)	A over Aa	Baa over A
November-13	4.63 %	4.56 %	4.77 %	5.24 %					
October-13	4.53	4.48	4.70	5.17					
September-13	4.64	4.58	4.80	5.31					
Average of Last 3 Months	4.60 %	4.54 %	4.76 %	5.24 %	(0.06) %	0.16 %	0.64 %	0.22 %	0.48 %

Notes: (1) All yields are distributed yields.

Source of Information: Mergent Bond Record, December 2013, Vol. 80, No. 12.

Chaparral City Water Company
Judgment of Equity Risk Premium for
the Proxy Group of Nine Water Companies

Line No.		Proxy Group of Nine Water Companies
1.	Calculated equity risk premium based on the total market using the beta approach (1)	4.41 %
2.	Mean equity risk premium based on a study using the holding period returns of public utilities with A rated bonds (2)	4.70
3.	Average equity risk premium	4.56 %

Notes: (1) From page 19 of this Schedule.
(2) From page 22 of this Schedule.

Chaparral City Water Company
Derivation of Equity Risk Premium Based on the Total Market Approach
Using the Beta for
the Proxy Group of Nine Water Companies

Line No.		Proxy Group of Nine Water Companies
	Based on SBBI Valuation Yearbook Data:	
1.	Ibbotson Equity Risk Premium (1)	5.60 %
2.	Ibbotson Equity Risk Premium based on PRPM™ (2)	9.30
	Based on Value Line Summary and Index:	
3.	Equity Risk Premium Based on Value Line Summary and Index (3)	4.01
4.	Conclusion of Equity Risk Premium (4)	6.30 %
5.	Adjusted Value Line Beta (5)	0.70
6	Beta Adjusted Equity Risk Premium	4.41 %

Notes:
(1) Based on the arithmetic mean historical monthly returns on large company common stocks from Ibbotson® SBBI® 2013 Valuation Yearbook - Market Results for Stocks, Bonds, Bills, and Inflation minus the arithmetic mean monthly yield of Moody's Aaa and Aa corporate bonds from 1926 - 2012. (11.83% - 6.23% = 5.60%).
(2) The Predictive Risk Premium Model (PRPM™) is discussed in Ms. Ahern's accompanying direct testimony. The Ibbotson equity risk premium based on the PRPM™ is derived by applying the PRPM™ to the monthly risk premiums between Ibbotson large company common stock monthly returns minus the average Aaa and Aa corporate monthly bond yields, from January 1928 through November 2013.
(3) The equity risk premium based on the Value Line Summary and Index is derived from taking the average 3-5 year estimated median total annual market return of 9.21% (described fully in note 1 of page 24 of this Schedule) and subtracting the average consensus forecast of Aaa corporate bonds of 5.20%, as derived below. (9.21% - 5.20% = 4.01%).

First Quarter 2014	4.70
Second Quarter 2014	4.80
Third Quarter 2014	4.90
Fourth Quarter 2014	5.00
First Quarter 2015	5.10
Second Quarter 2015	5.20
2015-2019	5.70
2020-2024	6.20
	5.20

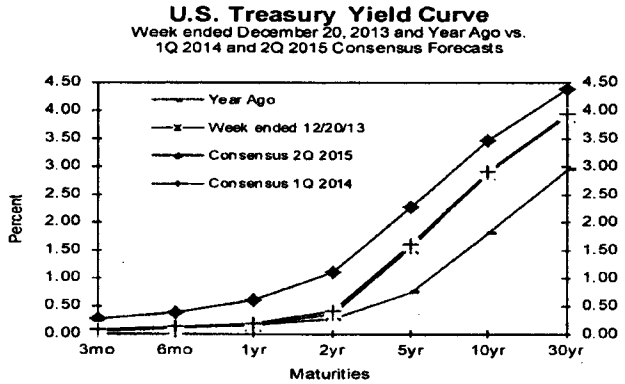
(4) Average of Lines 1, 2, & 3.
(5) Median beta derived from page 23 of this Schedule.

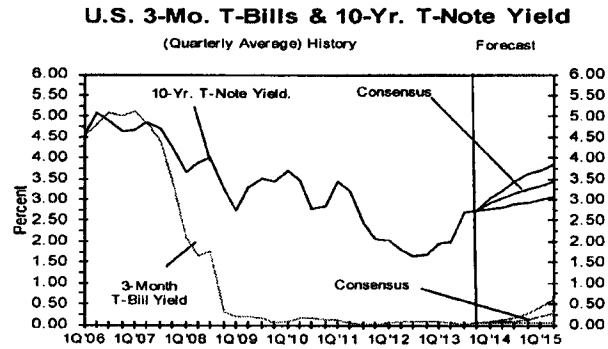
Sources of Information:
Ibbotson® SBBI® 2012 Valuation Yearbook - Market Results for Stocks, Bonds, Bills,
Industrial Manual and Mergent Bond Record Monthly Update.
Value Line Summary and Index
Blue Chip Financial Forecasts, December 1, 2013 and January 1, 2014

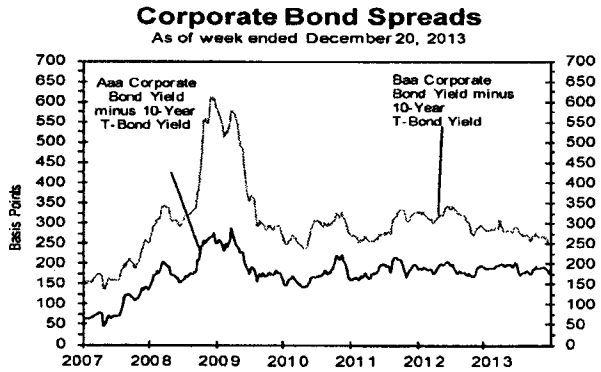
Consensus Forecasts Of U.S. Interest Rates And Key Assumptions[1]

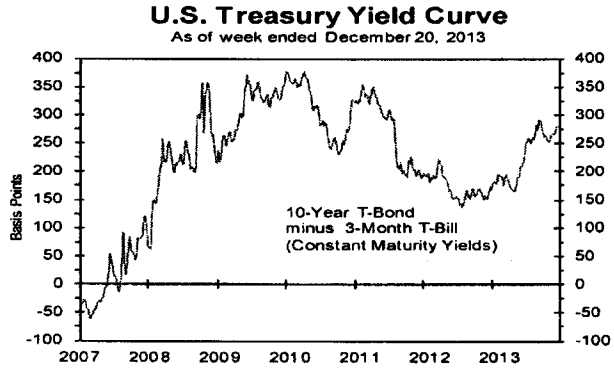
	History								Consensus Forecasts-Quarterly Avg.					
	Average For Week Ending				Average For Month			*Latest Q**	1Q	2Q	3Q	4Q	1Q	2Q
Interest Rates	Dec. 20	Dec. 13	Dec. 6	Nov. 29	Nov.	Oct.	Sep.	*4Q 2013*	2014	2014	2014	2014	2015	2015
Federal Funds Rate	0.09	0.09	0.08	0.09	0.08	0.09	0.08	*0.09*	0.1	0.1	0.2	0.2	0.2	0.3
Prime Rate	3.25	3.25	3.25	3.25	3.25	3.25	3.25	*3.25*	3.3	3.3	3.3	3.3	3.3	3.4
LIBOR, 3-mo.	0.24	0.24	0.24	0.24	0.24	0.24	0.25	*0.24*	0.3	0.3	0.3	0.4	0.4	0.5
Commercial Paper, 1-mo.	0.07	0.08	0.05	0.06	0.05	0.07	0.05	*0.06*	0.1	0.1	0.1	0.2	0.2	0.3
Treasury bill, 3-mo.	0.07	0.07	0.06	0.07	0.07	0.05	0.02	*0.06*	0.1	0.1	0.1	0.1	0.2	0.3
Treasury bill, 6-mo.	0.09	0.10	0.10	0.11	0.10	0.08	0.04	*0.09*	0.1	0.1	0.2	0.2	0.3	0.4
Treasury bill, 1 yr.	0.14	0.14	0.13	0.13	0.12	0.12	0.12	*0.13*	0.2	0.2	0.3	0.3	0.5	0.6
Treasury note, 2 yr.	0.34	0.32	0.30	0.29	0.30	0.34	0.40	*0.32*	0.4	0.5	0.6	0.8	0.9	1.1
Treasury note, 5 yr.	1.54	1.51	1.46	1.36	1.37	1.37	1.60	*1.41*	1.6	1.7	1.8	2.0	2.1	2.3
Treasury note, 10 yr.	2.88	2.86	2.84	2.74	2.72	2.62	2.81	*2.73*	2.9	3.0	3.1	3.3	3.3	3.4
Treasury note, 30 yr.	3.89	3.87	3.88	3.82	3.80	3.68	3.79	*3.79*	3.9	4.0	4.1	4.2	4.3	4.4
Corporate Aaa bond	4.64	4.66	4.69	4.62	4.63	4.53	4.64	*4.61*	4.7	4.8	4.9	5.0	5.1	5.2
Corporate Baa bond	5.39	5.40	5.44	5.37	5.38	5.31	5.47	*5.37*	5.5	5.6	5.7	5.8	5.9	6.0
State & Local bonds	4.73	4.74	4.70	4.61	4.60	4.56	4.79	*4.63*	4.7	4.8	4.8	4.9	4.9	5.0
Home mortgage rate	4.47	4.42	4.46	4.29	4.26	4.19	4.49	*4.30*	4.6	4.7	4.8	4.9	5.0	5.1
	History								Consensus Forecasts-Quarterly					
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	*4Q**	1Q	2Q	3Q	4Q	1Q	2Q
Key Assumptions	2012	2012	2012	2012	2013	2013	2013	*2013*	2014	2014	2014	2014	2015	2015
Major Currency Index	72.9	73.9	74.0	73.2	74.7	76.4	76.7	*76.4*	76.4	76.8	77.1	77.4	77.5	77.5
Real GDP	3.7	1.2	2.8	0.1	1.1	2.5	4.1	*1.9*	2.5	2.7	2.8	2.9	3.0	3.0
GDP Price Index	2.0	1.8	2.3	1.1	1.3	0.6	2.0	*1.4*	1.7	1.8	1.9	1.9	2.0	2.0
Consumer Price Index	2.3	1.0	2.1	2.2	1.4	0.0	2.6	*0.9*	1.7	1.9	2.1	2.0	2.1	2.1

Forecasts for interest rates and the Federal Reserve's Major Currency Index represent averages for the quarter. Forecasts for Real GDP, GDP Price Index and Consumer Price Index are seasonally-adjusted annual rates of change (saar). Individual panel members' forecasts are on pages 4 through 9. Historical data for interest rates except LIBOR is from Federal Reserve Release (FRSR) H.15. LIBOR quotes available from *The Wall Street Journal*. Interest rate definitions are same as those in FRSR H.15. Treasury yields are reported on a constant maturity basis. Historical data for Fed's Major Currency Index is from FRSR H.10 and G.5. Historical data for Real GDP and GDP Chained Price Index are from the Bureau of Economic Analysis (BEA). Consumer Price Index (CPI) history is from the Department of Labor's Bureau of Labor Statistics (BLS). **Interest rate data for 4Q 2014 based on historical data through the week ended December 20th. *Data for 4Q 2013 Major Currency Index is based on data through week ended December 20th. Figures for 4Q 2013 Real GDP, GDP Chained Price Index and Consumer Price Index are consensus forecasts based on a special question asked of the panelists' this month*









Long-Range Estimates:

The table below contains results of our semi-annual long-range CONSENSUS survey. There are also Top 10 and Bottom 10 averages for each variable. Shown are estimates for the years 2015 through 2019 and averages for the five-year periods 2015-2019 and 2020-2024. Apply these projections cautiously. Few economic, demographic and political forces can be evaluated accurately over such long time spans.

		Average For The Year					Five-Year Averages	
Interest Rates		**2015**	**2016**	**2017**	**2018**	**2019**	**2015-2019**	**2020-2024**
1. Federal Funds Rate	**CONSENSUS**	**0.4**	**1.7**	**2.9**	**3.6**	**3.9**	**2.5**	**3.7**
	Top 10 Average	0.8	2.6	3.9	4.2	4.5	3.2	4.4
	Bottom 10 Average	0.2	0.8	1.6	2.6	3.1	1.6	2.9
2. Prime Rate	**CONSENSUS**	**3.5**	**4.8**	**6.0**	**6.6**	**6.9**	**5.6**	**6.7**
	Top 10 Average	3.9	5.6	6.9	7.2	7.6	6.2	7.4
	Bottom 10 Average	3.3	4.1	5.0	5.7	6.1	4.8	5.8
3. LIBOR, 3-Mo.	**CONSENSUS**	**0.9**	**2.2**	**3.3**	**4.0**	**4.2**	**2.9**	**4.0**
	Top 10 Average	1.6	3.3	4.6	5.0	5.2	3.9	5.0
	Bottom 10 Average	0.4	1.1	2.0	2.8	3.3	1.9	3.0
4. Commercial Paper, 1-Mo.	**CONSENSUS**	**0.6**	**2.0**	**3.1**	**3.7**	**3.9**	**2.6**	**3.7**
	Top 10 Average	1.0	2.7	3.9	4.3	4.5	3.3	4.3
	Bottom 10 Average	0.3	1.3	2.3	2.9	3.1	2.0	3.0
5. Treasury Bill Yield, 3-Mo.	**CONSENSUS**	**0.5**	**1.7**	**2.9**	**3.5**	**3.7**	**2.5**	**3.6**
	Top 10 Average	1.0	2.7	3.9	4.3	4.5	3.3	4.3
	Bottom 10 Average	0.2	0.8	1.7	2.4	3.0	1.6	2.7
6. Treasury Bill Yield, 6-Mo.	**CONSENSUS**	**0.7**	**2.0**	**3.1**	**3.7**	**3.9**	**2.7**	**3.8**
	Top 10 Average	1.2	2.9	4.1	4.5	4.6	3.5	4.5
	Bottom 10 Average	0.3	1.1	1.9	2.7	3.1	1.8	2.8
7. Treasury Bill Yield, 1-Yr.	**CONSENSUS**	**0.9**	**2.2**	**3.2**	**3.8**	**4.0**	**2.8**	**3.9**
	Top 10 Average	1.5	3.2	4.3	4.7	4.8	3.7	4.6
	Bottom 10 Average	0.4	1.2	2.0	2.8	3.1	1.9	2.9
8. Treasury Note Yield, 2-Yr.	**CONSENSUS**	**1.4**	**2.6**	**3.6**	**4.0**	**4.3**	**3.2**	**4.2**
	Top 10 Average	2.0	3.5	4.5	4.9	5.0	4.0	4.9
	Bottom 10 Average	0.8	1.7	2.4	3.1	3.5	2.3	3.3
10. Treasury Note Yield, 5-Yr.	**CONSENSUS**	**2.3**	**3.3**	**4.1**	**4.4**	**4.6**	**3.7**	**4.4**
	Top 10 Average	2.9	4.0	4.8	5.1	5.3	4.4	5.1
	Bottom 10 Average	1.7	2.6	3.2	3.5	3.7	2.9	3.6
11. Treasury Note Yield, 10-Yr.	**CONSENSUS**	**3.4**	**4.1**	**4.6**	**4.8**	**5.0**	**4.4**	**4.9**
	Top 10 Average	3.9	4.8	5.3	5.6	5.8	5.1	5.6
	Bottom 10 Average	2.8	3.5	3.8	4.0	4.1	3.7	4.0
12. Treasury Bond Yield, 30-Yr.	**CONSENSUS**	**4.3**	**4.7**	**5.2**	**5.5**	**5.6**	**5.0**	**5.5**
	Top 10 Average	4.8	5.5	6.0	6.3	6.5	5.8	6.2
	Bottom 10 Average	3.7	4.0	4.4	4.6	4.7	4.3	4.6
13. Corporate Aaa Bond Yield	**CONSENSUS**	**4.9**	**5.4**	**5.9**	**6.2**	**6.3**	**5.7**	**6.2**
	Top 10 Average	5.6	6.2	6.7	7.0	7.2	6.5	7.0
	Bottom 10 Average	4.2	4.5	4.9	5.2	5.3	4.8	5.3
13. Corporate Baa Bond Yield	**CONSENSUS**	**5.9**	**6.3**	**6.8**	**7.1**	**7.2**	**6.7**	**7.0**
	Top 10 Average	6.5	7.1	7.5	7.9	8.1	7.4	7.9
	Bottom 10 Average	5.1	5.4	5.7	6.1	6.1	5.7	6.0
14. State & Local Bonds Yield	**CONSENSUS**	**4.8**	**5.2**	**5.6**	**5.7**	**5.7**	**5.4**	**5.5**
	Top 10 Average	5.2	5.9	6.3	6.5	6.6	6.1	6.3
	Bottom 10 Average	4.3	4.5	4.8	4.9	4.9	4.7	4.7
15. Home Mortgage Rate	**CONSENSUS**	**5.1**	**5.6**	**6.1**	**6.4**	**6.5**	**5.9**	**6.4**
	Top 10 Average	5.6	6.3	6.9	7.1	7.3	6.6	7.1
	Bottom 10 Average	4.4	5.0	5.3	5.5	5.6	5.2	5.6
A. FRB - Major Currency Index	**CONSENSUS**	**77.8**	**78.4**	**78.8**	**79.1**	**79.2**	**78.7**	**79.7**
	Top 10 Average	81.0	82.3	83.4	84.2	84.4	83.1	84.8
	Bottom 10 Average	74.6	74.3	74.0	73.7	74.0	74.1	74.7
		Year-Over-Year, % Change					Five-Year Averages	
		2015	**2016**	**2017**	**2018**	**2019**	**2015-2019**	**2020-2024**
B. Real GDP	**CONSENSUS**	**3.0**	**2.9**	**2.7**	**2.6**	**2.5**	**2.7**	**2.4**
	Top 10 Average	3.5	3.3	3.1	2.9	2.9	3.1	2.7
	Bottom 10 Average	2.5	2.5	2.3	2.1	2.2	2.3	2.1
C. GDP Chained Price Index	**CONSENSUS**	**2.0**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**
	Top 10 Average	2.5	2.5	2.6	2.5	2.5	2.5	2.5
	Bottom 10 Average	1.5	1.7	1.7	1.7	1.7	1.7	1.7
D. Consumer Price Index	**CONSENSUS**	**2.2**	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**
	Top 10 Average	2.6	2.8	2.8	2.8	2.8	2.8	2.8
	Bottom 10 Average	1.7	1.9	1.9	1.9	2.0	1.9	1.9

[Company Name]
Derivation of Mean Equity Risk Premium Based on a Study
Using Holding Period Returns of Public Utilities

		Over A Rated Moody's Public Utility Bonds - AUS Consultants Study (1)
1.	Arithmetic Mean Holding Period Returns on the Standard & Poor's Utility Index 1926-2012 (2):	10.69 %
2.	Arithmetic Mean Yield on Moody's A Rated Public Utility Yields 1926-2012	(6.53)
3.	Historical Equity Risk Premium	4.16 %
4.	Forecasted Equity Risk Premium Based on PRPM™ (3)	5.24
5.	Average of Historical and PRPM™ Equity Risk Premium	4.70 %

Notes: (1) Based on S&P Public Utility Index monthly total returns and Moody's Public Utility Bond average monthly yields from 1928-2012, (AUS Consultants, 2013).

(2) Holding period returns are calculated based upon income received (dividends and interest) plus the relative change in the market value of a security over a one-year holding period.

(3) The Predictive Risk Premium Model (PRPM™) is applied to the risk premium of the monthly total returns of the S&P Utility Index and the monthly yields on Moody's A rated public utility bonds from 1928 - 2012.

Chaparral City Water Company
Indicated Common Equity Cost Rate Through Use
of the Traditional Capital Asset Pricing Model (CAPM) and Empirical Capital Asset Pricing Model (ECAPM)

	1	2	3	4	5	6
Proxy Group of Nine Water Companies	Value Line Adjusted Beta	Market Risk Premium (1)	Risk-Free Rate (2)	Traditional CAPM Cost Rate (3)	ECAPM Cost Rate (4)	Indicated Common Equity Cost Rate (5)
American States Water Co.	0.70	7.24 %	4.43 %	9.50 %	10.04 %	
American Water Works Co., Inc.	0.65	7.24	4.43	9.14	9.77	
Aqua America, Inc.	0.60	7.24	4.43	8.77	9.50	
Artesian Resources Corp.	0.60	7.24	4.43	8.77	9.50	
California Water Service Group	0.65	7.24	4.43	9.14	9.77	
Connecticut Water Service, Inc.	0.75	7.24	4.43	9.86	10.31	
Middlesex Water Company	0.70	7.24	4.43	9.50	10.04	
SJW Corporation	0.85	7.24	4.43	10.58	10.86	
York Water Company	0.70	7.24	4.43	9.50	10.04	
Average	0.69			9.42 %	9.98 %	9.70 %
Median	0.70			9.50 %	10.04 %	9.77 %

See page 24 for notes.

Chaparral City Water Company
Development of the Market-Required Rate of Return on Common Equity Using
the Capital Asset Pricing Model for
the Proxy Group of Nine Water Companies
Adjusted to Reflect a Forecasted Risk-Free Rate and Market Return

Notes:

(1) For reasons explained in Ms. Ahern's direct testimony, from the 13 weeks ending January 3, 2014, Value Line Summary & Index, a forecasted 3-5 year total annual market return of 9.21% can be derived by averaging the 13 weeks ending January 3, 2014 forecasted total 3-5 year total appreciation, converting it into an annual market appreciation and adding the Value Line average forecasted annual dividend yield.

The 3-5 year average total market appreciation of 32% produces a four-year average annual return of 7.19% ($(1.32^{0.25})$ - 1). When the average annual forecasted dividend yield of 2.02% is added, a total average market return of 9.21% (2.02% + 7.19%) is derived.

The 13 weeks ending January 3, 2014 forecasted total market return of 9.21% minus the risk-free rate of 4.43% (developed in Note 2) is 4.78% (9.21% - 4.43%).

The Predictive Risk Premium Model (PRPM™) market equity risk premium of 10.40% is derived by applying the PRPM™ to the monthly equity risk premium of large company common stocks over the income return on long-term U.S. Government Securities from January 1926 through November 2013.

The Morningstar, Inc. (Ibbotson Associates) calculated arithmetic mean monthly market equity risk premium of 6.55% for the period 1926-2012 results from a total market return of 11.83%% less the arithmetic mean income return on long-term U.S. Government Securities of 5.28% (11.83% - 5.28% = 6.55%).

These three expectational risk premiums are then averaged, resulting in a 7.24% market equity risk premium, which is then multiplied by the beta in column 1 of page 23 of this Schedule. ((4.78% + 10.40% + 6.55%)/3).

(2) For reasons explained in Ms. Ahern's direct testimony, the risk-free rate that Ms. Ahern relies upon for her CAPM analysis is the average forecast of 30-year Treasury Note yields per the consensus of nearly 50 economists reported in the Blue Chip Financial Forecasts dated December 1, 2013 & January 1, 2014 (see pages 20 & 21 of this schedule).The estimates are detailed below:

	30-Year Treasury Note Yield
First Quarter 2014	3.90%
Second Quarter 2014	4.00%
Third Quarter 2014	4.10%
Fourth Quarter 2014	4.20%
First Quarter 2015	4.30%
Second Quarter 2015	4.40%
2015 – 2019	5.00%
2020 – 2024	5.50%
Average	4.43%

(3) The traditional Capital Asset Pricing Model (CAPM) is applied using the following formula:

$R_S = R_F + \beta (R_M - R_F)$

Where R_S = Return rate of common stock
R_F = Risk Free Rate
β = Value Line Adjusted Beta
R_M = Return on the market as a whole

(4) The empirical CAPM is applied using the following formula:

$R_S = R_F + .25 (R_M - R_F) + .75 \beta (R_M - R_F)$

Where R_S = Return rate of common stock
R_F = Risk-Free Rate
β = Value Line Adjusted Beta
R_M = Return on the market as a whole

Source of Information:
Value Line Summary & Index
Blue Chip Financial Forecasts, December 1, 2013 & January 1, 2014
Value Line Investment Survey, (Standard Edition)
2013 Ibbotson® SBBI® Valuation Yearbook, Morningstar, Inc., 2013, Chicago, IL

EXHIBIT

A-12

ADMITTED

BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

BOB STUMP, Chairman
GARY PIERCE
BRENDA BURNS
SUSAN BITTER SMITH
BOB BURNS

IN THE MATTER OF THE APPLICATION OF CHAPARRAL CITY WATER COMPANY FOR A DETERMINATION OF THE CURRENT FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASE IN ITS RATES AND CHARGES BASED THEREON	DOCKET NO. W-02113A-13-0118

REJOINDER TESTIMONY

OF

PAULINE M. AHERN, CRRA
PRINCIPAL
AUS CONSULTANTS

ON BEHALF OF

CHAPARRAL CITY WATER COMPANY

FEBRUARY 12, 2014

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EXECUTIVE SUMMARY
CHAPARRAL CITY WATER COMPANY
DOCKET NO. W-02113A-13-0118

Ms. Ahern's rejoinder testimony responds to certain aspects of the surrebuttal testimonies of ACC Staff Witness John A. Cassidy and RUCO Witness David C. Parcell on the following issue:

Capital Structure

Ms. Ahern provides evidence that Mr. Cassidy's and now Mr. Parcell's recommended hypothetical capital structure of 40% debt and 60% equity remains inappropriate for ratemaking purposes for Chaparral City Water Company for all the reasons provided in her rebuttal testimony.

In addition, Ms. Ahern addresses the concept of double leverage which Mr. Cassidy has introduced in his surrebuttal testimony as an additional reason for recommending a hypothetical capital structure for Chaparral City Water Company.

Ms. Ahern demonstrates that no equity has been infused into Chaparral City Water Company since its acquisition by EPCOR Arizona Water, Inc. Therefore, no debt at the parent could have been used to finance a non-existent equity infusion.

In addition, Ms. Ahern addresses the concept of double leverage, demonstrating that it is flawed for several reasons:

1) Double leverage violates the basis financial principle of risk and return;

2) Double leverage is inconsistent with the concept of the opportunity cost of capital

3) Double leverage discriminates against the investors, i.e., the parent, of the regulated operating utility, thus violating both the concept of fairness and the capital attraction standard;

4) Double leverage is based upon some highly problematic assumptions; and,

5) Double leverage is a tautology - an unnecessary redundancy, i.e., saying the same thing twice.

CHAPARRAL CITY WATER COMPANY

Rebuttal Testimony of

Pauline M. Ahern

Introduction

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

A. My name is Pauline M. Ahern. I am a Principal of AUS Consultants. My business address is 155 Gaither Drive, Suite A, Mt. Laurel, New Jersey 08054.

Q. Are you the same Pauline M. Ahern who provided both direct and rebuttal testimony in this case?

A. Yes.

Purpose

Q. What is the purpose of your testimony?

A. The purpose is to provide testimony on behalf of Chaparral City Water Company ("CCWC" or "the Company") in response to certain aspects of the surrebuttal testimony of John A. Cassidy, Witness for the Staff of the Arizona Corporation Commission (the "ACC" or "the Commission") and the surrebuttal testimony of David C. Parcell, witness for the Residential Utility Consumers Office ("RUCO"). With regard to both Mr. Cassidy's and Mr. Parcell's testimonies, I will address their proposed hypothetical capital structure ratios, specifically Mr. Cassidy's unsupported assumption that double leverage exists between EPCOR Arizona Water, Inc. ("EWAZ") and EPCOR Utilities, Inc. (EPCOR Utilities). Finally, I will respond to comments on the Company's rebuttal testimony by Mr. Parcell.

Q. Have you prepared an exhibit which supports your rejoinder testimony?

A. Yes. It has been designated as Exhibit PMA-3 and consists of Schedules 1 through 6.

Capital Structure

ACC Staff Witness Cassidy

Q. Mr. Cassidy provides four reasons why Staff is recommending a hypothetical capital structure for CCWC on page 3, lines 3 - 15. Please comment.

A. Staff's first reason is "the need to give recognition to CCWC's reduced exposure to financial risk relative to Staff's proxy group of companies" (lines 4-5). Curiously, Staff's recommended capital structure ratios actually introduce greater financial risk to CCWC than is contained in CCWC's proposed capital structure ratios of 14.45% long-term debt and 85.55% common equity.

Staff's second reason is to "encourage CCWC to move towards a more balanced capital structure going forward" (lines 5-6). However, Staff has provided no empirical support in either its direct or surrebuttal testimony to demonstrate that setting rates in past rate cases based upon CCWC's actual capital structure ratios has been detrimental to its customers, i.e., ratepayers.

Staff's third reason is that it "considers a balanced capital structure for a Class 'A' utility to be one in which the debt components lies within a range of 40-60 percent" (lines 6-8). Again, Staff has provided no empirical support in either its direct or surrebuttal testimony to demonstrate why such ~~is~~ a recommended hypothetical capital structure would benefit CCWC's customers to a greater extent than the actual capital structure ratios upon which CCWC's rates have historically been set.

Staff's fourth reason is that "this CCWC docket marks the first rate case in which Staff has relied on estimates derived from its DCF cost of equity models only" (lines 8-9). However, Staff did not provide this as a reason for recommending a hypothetical capital structure for CCWC in its direct testimony.

Mr. Cassidy continues by noting "with some interest that the Company did not choose to dispute or challenge this aspect of Staff's current recommendation" (lines 9-11). This statement is a clear mischaracterization of my rebuttal testimony where I discuss at some length on page 14, line 22 through page 23, line 22 why exclusive reliance upon Discounted Cash Flow ("DCF") analyses is not appropriate. In addition, I provided an update to my original cost of common equity analysis in Schedule 11R of Exhibit PMA-2 utilizing the same multiple cost of common equity models employed in my direct testimony, i.e. DCF, Risk Premium Model ("RPM") and Capital Asset Pricing Model ("CAPM").

Following its litany of the four reasons for recommending hypothetical capital structure ratios, Mr. Cassidy then proceeds to introduce a discussion on the subject of double leverage which was not contained in his direct testimony.

Q. **Please comment upon Mr. Cassidy's discussion of double leverage.**

A. Mr. Cassidy naively assumes that double leverage exists between CCWC and its parent without providing any empirical support for its existence. He has assumed, without any concrete evidence, that CCWC's "parent company issues debt and allocates it down" to CCWC "while characterizing this financial support as equity capital" to paraphrase lines 9 – 10 on page 4 of his surrebuttal testimony. He then provides as evidence a comparison of the capital structure ratios of CCWC, EPCOR Utilities, and EWAZ, considering without further investigation that the

variances "in capital structure between CCWC and both its ultimate and immediate parent to be *prima facie* evidence that double leverage is present."

However, a review of the Financials of CCWC for 2011 and 2012, after the acquisition was completed on May 31, 2011, demonstrates that there have been no equity infusions from either parent. Hence there is no debt at either parent which has been "allocated down" to CCWC and "characterized" as common equity capital. Page 5 of the 2011 Financials of CCWC (Schedule 1 of Exhibit PMA-3) shows no addition to either the common stock or additional paid-in-capital account. Likewise, on page 5 of the 2012 Financials of CCWC (Schedule 2 of Exhibit PMA-3) shows no addition to the common stock account and a "Transaction with shareholder" of $4,047,492 to additional paid-in-capital account, which I have been informed by the Company is a reclassification of a portion of retained earnings as requested by the auditors.

In view of the foregoing, there is no double leverage between CCWC and its parents. Thus, Mr. Cassidy's suggestion that such double leverage exists as a rationale for recommending a hypothetical capital structure is unsupported and should be rejected by the ACC.

In addition, the very concept of double leverage and subsequent use of a hypothetical capital structure is flawed.

Q. Why is the concept of double leverage flawed?

A. The concept of double leverage is flawed for five reasons.

1. Double leverage violates the basic financial principle of risk and return;
2. It is inconsistent with the concept of the opportunity cost of capital;

3. It discriminates against the investor, i.e., the parent, of the regulated operating utility, thus violating both the concept of fairness and the capital attraction standard;

4. It is based upon some highly problematic assumptions; and,

5. As Roger A. Morin states[1]: "[t]he double leverage approach is a tautology." (See page 5 of Schedule 3)

Q. Please explain how double leverage violates the basic financial principle of risk and return.

A. The basic financial principle of risk and return is that the rate of return required by investors on any investment is dependent upon the risk of that investment and that investment alone. Since most investors are risk averse, this means that the higher the investor perceived risk of an investment, the higher the return required by investors. As Eugene F. Brigham states[2] :

> *In a market dominated by risk-averse investors, riskier securities will have higher expected returns, as estimated by the average investor, than will less risky securities, for if this situation does not hold, actions will occur in the market to force it to occur.* (italics in original) (See page 3 of Schedule 4)

The risk of any investment, including investment in CCWC, is independent of the ownership of the capital financing that investment. Hence, the capital structure of CCWC's parent companies is irrelevant to the risk of any investment in CCWC. It is a basic financial principle that it is the use of the funds invested

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1 Morin, Roger A., New Regulatory Finance, (Public Utilities Reports 2006) 526.

2 Brigham, Eugene F., Fundamentals of Financial Management, 114 (The Dryden Press, 5th Ed. 1989) 114.

which gives rise to the risk of the investment, not the source of the funds. As Richard A. Brealey and Stewart C. Myers state[3]:

> *The true cost of capital depends on the use to which the capital is put.* (italics in original)
>
> * * * *
>
> The company cost of capital is the correct discount rate for projects that have the same risk as the company's existing business. . . . In principle, each project should be evaluated at its own opportunity cost of capital; the true cost of capital depends on the use to which the capital is put. (See pages 4 and 7 of Schedule 5)

For example, if one were to inherit money, free of charge, and then invest it in a given utility's common stock, one would require a rate of return on that stock commensurate with the risks to which that common stock investment is exposed. It would be illogical to state that the required return on investment is zero just because there was zero cost in acquiring the capital, i.e., inherited money, which was the source of the investment. Even the Internal Revenue Service places your cost basis, as an inheritor, on the market value of inherited common stock on the date of death of the person who willed the stock and not on its zero cost to you.

Just as illogical is the inevitable conclusion that, in the event that the common shares of the operating water utility subsidiary were held by both a corporate parent and by an outside investor or investors, that portion of subsidiary equity supplied by the parent would have one cost rate, i.e., the parent's weighted overall cost of capital, while the portion supplied by the outside

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[3] Brealey, Richard A. and Myers, Stewart C., Principles of Corporate Finance (McGraw-Hill Book Company, 1988) 205, 229.

investor or investors would have another, i.e., their investor required return based upon the risk to which their capital is put. As Roger A. Morin states[4]:

> Equity is equity, irrespective of its source, and the cost of that equity is governed by its use, by the risk to which it is exposed. (See page 2 of Schedule 3).

In view of the foregoing, the very concept of double leverage violates the basic financial principle of risk and return.

Q. Please explain how double leverage is inconsistent with the concept of the opportunity cost of capital.

A. The opportunity cost of capital is that the rate of return offered by investments of comparable risk should be equal. It is called the opportunity cost because it represents the return which is given up or foregone by investing in one investment alternative as opposed to an alternative investment of comparable risk. If the risk-adjusted cost of equity investment in an operating water utility subsidiary, such as CCWC, is 10.50% (my updated recommended common equity cost rate) and the authorized return is less than 10.50% through the use of double leverage in the form of a hypothetical capital structure based upon the erroneous assumption of double leverage, then there is no incentive for a parent company, such as EWAZ, to invest in that operating subsidiary. In order to do so, the parent would have to forego the risk-adjusted return of 10.50% on alternative investments not subject to such double leverage.

In fact, Staff's updated recommended 9.60% common equity cost rate results in an effective implied authorized return on common equity, ROE, for

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[4] Morin, 523.

CCWC of but 7.67% based upon an effective composite Federal and State income tax rate of 38.29% and derived as follows:

Table 1

	Staff's Ratios	Cost Rate	Weighted Cost Rate After-Inc. Tax	Weighted Cost Rate Before Inc. Tax
Debt	40.0%	5.2%	2.1%	2.1%
Common Equity	60.0%	9.6%	5.8%	9.4%
			7.9%	11.5%

	CCWC's Ratios	Cost Rate	Weighted Cost Rate After-Inc. Tax	Weighted Cost Rate Before Inc. Tax
Debt	14.45%	5.97%	0.86%	0.86%
Common Equity	85.55%	**7.67%**	6.56%	10.6%
			7.43%	11.5%

Hence, the use of double leverage presents an incentive to spin-off the subsidiary whose rates are set based upon a hypothetical capital structure due to the assumption that double leverage exists, because that utility subsidiary, if divested, would then be allowed a return on equity commensurate with its own business and financial risks. If such a divestiture were to occur, the cost reducing benefits due to economies of scale and diversification would be lost to the utility's ratepayers.

Hence, double leverage is inconsistent with the concept of the opportunity cost of capital.

Q. How does the use of double leverage discriminate against the parent holding company as the investor, thus violating the concept of fairness and the capital attraction standard?

A. The holding company's required return on its equity investment in the operating utility subsidiary is the risk-adjusted cost of common equity of that utility which is dependent upon that utility's specific business and financial risks as discussed previously. However, in assuming that double leverage exists and using that assumption to rationalize the recommendation of hypothetical capital structure ratios, denies the parent holding company investor of the opportunity to earn its required rate of return based upon the risk to which its common equity investment in that utility is exposed. This would not be the case for a utility whose stock is held not by a holding company, but by individual investors.

For example, if there are two operating utilities with identical business and financial risks, the cost of common equity for both would be identical according to the basic financial principle of risk and return. However, if one of the utilities is an operating subsidiary of a parent holding company and its allowed return on common equity, i.e., cost of common equity, is set based upon a hypothetical capital structure based upon the assumption of the existence of double leverage, the parent holding company will not be fairly compensated for the risk it bears by investing in that subsidiary. This is discriminatory. As Roger A. Morin states[5]:

> Estimating equity costs by one procedure for publicly held utilities and by another for utilities owned by a holding company is inconsistent with financial theory and discriminates against the

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[5] Morin,. 525.

> holding company form of ownership. Two utilities identical in all respects but their ownership format should have the same set of rates. Yet, this would not be the case under the double leverage adjustment. (See page 4 of Schedule 3)

In addition, double leverage weakens the regulated utility's ability to attract capital in violation of the capital attraction standard established in Bluefield[6] which states that:

> A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties. . . . The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.

The regulated utility must compete in the capital markets for debt capital and must earn a reasonable return on its common equity to assure potential bond holders of its creditworthiness. The use of double leverage as a rationale for recommending a hypothetical capital structure does not permit an opportunity to earn a rate of return commensurate with publicly owned enterprises of similar risk, thereby pressuring cash flows and impairing interest coverage and, in turn, the regulated utility's ability to attract debt capital at reasonable costs.

Thus, the concept of double leverage is both discriminatory and patently unfair to the parent holding company investor.

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[6] Bluefield Water Works Improvement Co. v. Public Serv. Comm'n, 262 U.S. 679 (1922).

Q. What are some of the problematic assumptions upon which the concept of double leverage is based?

A. First, double leverage assumes that all of the regulated subsidiary's equity capital was provided by the parent holding company. However, the retained earnings of the subsidiary are not derived from the parent. Rather, retained earnings result from the accumulated net income to common equity, after payment of common dividends, and are derived from revenues collected from the regulated operating subsidiary's ratepayers. In addition, if the proceeds of any of the senior capital, i.e., debt and / or preferred equity, at the parent level were used to specifically invest in the operations of other subsidiaries or to acquire another subsidiary, the assumption that such funds were available for investment in the subsidiary subject to double leverage is invalid.

Second, double leverage assumes that the business and financial risks of all the operating subsidiaries are identical and, in turn, identical to the business and financial risks of the parent holding company. This is clearly non-sensical, given that EWAZ operates in a different service territory than CCWC and is a larger utility. Moreover, EPCOR Utilities builds, owns and operates electric transmission and distribution systems as well as water and wastewater treatment facilities and infrastructure in both Canada and the U.S. representing different geographical areas under different regulatory paradigms, and hence, facing different operating and financial risks. Clearly, the risks of all of EPCOR Utilities' operating subsidiaries are not equal. Once again, the risk and return principle is violated by double leverage, because it assumes the same cost of common equity for all the subsidiaries regardless of their specific risk differences.

Consequently, many of the assumptions of double leverage are highly problematic and nonsensical.

Q. Please explain how "[t]he double leverage approach is a tautology."

A. A tautology is an unnecessary redundancy, i.e., saying the same thing twice. The double leverage approach is a tautology because as Morin states on page 5 of Schedule 3 "[i]t is not the parent's weighted average cost of capital (WACC) that determines the subsidiary's cost of equity because the parent's WACC is itself a weighted average of equity costs of all subsidiaries."[7] However, by recommending a hypothetical capital structure based upon the existence of double leverage, Mr. Cassidy is also assuming that the parent's cost of equity, based upon that capital structure, is applicable to CCWC. A holding company is like a mutual fund, but one which holds its operating subsidiaries in its portfolio of assets instead of capital market securities, i.e., stocks and bonds. A mutual fund's required return, based upon portfolio theory, is the weighted average of the returns of the individual securities in the fund. Each security in the fund has its own unique required return which is a function of its individual risk profile. The concept of double leverage, if applied to a mutual fund, would say that the required return on any given individual security held by the mutual fund is the weighted average required return on the mutual fund as a whole. This defies common sense. If an investor could expect to receive the same return on the individual securities as in the mutual fund as a whole why, would he / she invest in the fund and pay the attendant fees which would then reduce his / her return?

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[7] Morin, 526.

Thus, the use of double leverage transposes the direction of cause and effect on the parent's WACC. Consistent with the fundamental and basic financial concept of risk and return as discussed above, the cost of common equity of a regulated operating utility subsidiary is a function of its business and financial risks and must be found on a stand-alone basis, which requires the use of the Company's own average capital structure and cost rates, including the cost rate of common equity capital, and not the use of double leverage, which assumes the cost of common equity capital of the subsidiary to be the weighted average overall cost of capital of the parent company.

Q. **What is your conclusion regarding Staff's recommendation of a hypothetical capital structure consisting of 40.0% debt and 60.0% common equity?**

A. Staff's hypothetical capital structure ratios should be rejected by the ACC for all of the reasons provided in my rebuttal testimony as well as in view of all of the foregoing. The ACC should set CCWC's rates in this proceeding based upon its requested actual capital structure ratios of 14.45% debt and 85.55% common equity.

RUCO Witness Parcell

Q. **RUCO Witness Parcell is now recommending a hypothetical capital structure consisting of 40% debt and 60% common equity ratios as well. Do you have any comment?**

A. Yes. On pages 17 through 19 of his surrebuttal testimony, Mr. Parcell indicates that he has decided to move away from his original recommendation to use the actual capital structure ratios of CCWC and now accepts and endorses Mr. Cassidy's recommended hypothetical capital structure ratios of 40.0% debt and

60.0% common equity. Without providing any rationale or empirical support, he simply notes that CCWC's "capital structure ratios are significantly higher than both the proxy water utilities and the Company's affiliated and parent companies." However, the fact that CCWC's actual capital structure ratios were significantly higher than the proxy water utilities when he wrote his direct testimony, did not stop him from recommending that they be used for setting rates for CCWC in this proceeding. Likewise, the fact that he now realizes that CCWC's actual capital structure ratios were significantly higher than "the Company's affiliated and parent companies" should not stop him from continuing to recommend CCWC's actual capital structure ratios for setting rates.

Response to RUCO Staff Witness David C. Parcell's Comments on Company's Rebuttal Testimony

Q. **On page 2, lines 4 – 7 of Mr. Parcell's surrebuttal testimony, he states that you have implicitly proposed a modification to the DCF cost rate results. Please comment.**

A. Mr. Parcell has mischaracterized my rebuttal testimony, I have not proposed, explicitly or implicitly, that the results of the DCF model be modified as is clear from both page 2 of Schedule 1 of Exhibit PMA-1 and page12 of Schedule 11R of Exhibit PMA-2, where I summarize my cost of common equity models and show unmodified DCF results. My testimony is that because of the tendency of the DCF model to mis-specify the investors required return on the market value of their investment when that DCF result is applied to book value, i.e., original cost rate base less depreciation, and market-to-book ratios differ from unity, it is necessary to rely upon multiple, properly applied cost of common equity models.

Q. Mr. Parcell also states on page 2, lines 27 – 28 of his surrebuttal testimony that you maintain that the DCF model produces "understated" results. Please comment.

A. Once again, Mr. Parcell has mischaracterized my testimony. My testimony, as stated on lines 14 – 16 on page 20 of my rebuttal testimony that "[w]hen the market value of assets diverges significantly from their book value, a market-based DCF cost rate applied to the book value of common equity, *i.e.*, rate base will not produce investors' expected returns? (emphasis added) I am not alone in making this observation. I will repeat my citation from Roger A. Morin[8], Ph.D., Professor Emeritus at Georgia State University:

> The third reason and perhaps most important for caution and skepticism is that application of the DCF model produces estimates of common equity cost that are consistent with investors' expected return only when stock price and book value are reasonably similar, that is when the M/B is close to unity. As shown below, application of the standard DCF model to utility stocks understates the investor's expected return when the market-to-book (M/B) ratio of a given stock exceeds unity. This was particularly relevant in the capital market environment of the 1990s and 2000s where utility stocks were trading at M/B ratios well above unity and have been for nearly two decades. The converse is also true, that is, the DCF model overstates that investor's return when the stock's M/B ratio is less than unity. The reason for the distortion is that the DCF market return is applied to a book value rate base by the regulator, that is, a utility's earnings are limited to earnings on a book value rate base.

Q. Starting at line 27, on page 3 of his surrebuttal testimony and ending at line 4 on page 4, Mr. Parcell discusses the notion that "investors are now very much aware of recent failures of security analysts to accurately predict EPS growth." Pease comment.

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[8] Morin, 434.

A. There is no empirical evidence that investors, consistent with the EMH, would disregard analysts' estimates of growth in earnings per share. "Do Analyst Conflicts Matter? Evidence from Stock Recommendations,"[9] provided in Schedule 6, examined whether conflicts of interest with investment banking ["IB"] and brokerage businesses induced sell-side analysts to issue optimistic stock recommendations and whether investors were misled by such biases. They conclude on page 1 of Schedule 6.

> Overall, our findings do not support the view that conflicted analysts are able to systematically mislead investors with optimistic stock recommendations.

On page 29 of Schedule 6, Agrawal and Chen state:

> Overall, our empirical findings suggest that while analysts do respond to IB and brokerage conflicts by inflating their stock recommendations, the market discounts these recommendations after taking analysts' conflicts into account. These findings are reminiscent of the story of the nail soup told by Brealey and Myers (1991), except that here analysts (rather than accountants) are the ones who put the nail in the soup and investors (rather than analysts) are the ones to take it out. Our finding that the market is not fooled by biases stemming from conflicts of interest echoes similar findings in the literature on conflicts of interest in universal banking (for example, Kroszner and Rajan, 1994, 1997; Gompers and Lerner 1999) and on bias in the financial media (for examples, Bhattacharya et al. forthcoming; Reuter and Zitzewitz 2006). Finally, while we cannot rule out the possibility that some investors may have been naïve, our findings do not support the notion that the marginal investor was systematically misled over the last decade by analysts' recommendations.

In addition, Mr. Parcell has clearly placed his opinion above that of academicians, such as Agrawal and Chen, and Morin whom I cited on pages 25

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9 Agrawal, Anup and Chen, Mark A., "Do Analysts' Conflicts Matter? Evidence from Stock Recommendations", (Journal of Law and Economics, August 2008), Vol. 51.

and 26 of my rebuttal testimony addressing the accuracy of security analysts' projections of earnings per share ("EPS") growth. That citation, too, bears repeating. Morin states[10]:

> Because of the dominance of institutional investors and their influence on individual investors, analysts' forecasts of long-run growth rates provide a sound basis for estimating required returns. Financial analysts exert a strong influence on the expectations of many investors who do not possess the resources to make their own forecasts, that is, they are a cause of g. The accuracy of these forecasts in the sense of whether they turn out to be correct is not at issue here, as long as they reflect widely held expectations. As long as the forecasts are typical and/or influential in that they are consistent with current stock price levels, they are relevant. The use of analysts' forecasts in the DCF model is sometimes denounced on the grounds that it is difficult to forecast earnings and dividends for only one year, let alone for longer time periods. This objection is unfounded, however, because it is present investor expectations that are being priced; it is the consensus forecast that is embedded in price and therefore in required return, and not the future as it will turn out to be.
>
> * * *
>
> Published studies in the academic literature demonstrate that growth forecasts made by security analysts represent an appropriate source of DCF growth rates, are reasonable indicators of investor expectations and are more accurate than forecasts based on historical growth. These studies show that investors rely on analysts' forecasts to a greater extent than on historic data only.

In view of the foregoing, with all due respect, Mr. Parcell's comments regarding the "problematic" nature of relying upon EPS growth forecasts is incorrect.

Q. Do you have any comment upon the 2010 "Investor Alert" Analyzing Recommendations" by the Securities and Exchange Commission ("SEC") cited by Mr. Parcell at lines 17 – 29 on page 4 of his surrebuttal testimony?

[10] Morin 298.

A. Yes. Mr. Parcell's citation is misplaced as it pertains to "buy, hold, or sell" recommendations by security analysts' relative to common stock and not to security analysts' projection of EPS growth rates.

Q. On page 5, line 17 through page 6, line 5 of his surrebuttal testimony, Mr. Parcell claims that your statement regarding his use of the most recent three-month average yields on 20-year U.S. Treasury bonds is inconsistent with your own analyses. Please comment.

A. Mr. Parcell is incorrect. He is correct when he states that my application of the RPM and CAPM models do rely, in part, upon historical risk premiums. However, in using historical risk premiums, I rely upon both the arithmetic mean historical risk premium and a Predictive Risk Premium Model™ ("PRPM™") equity risk premium, both of which are expectational, or forward-looking in nature. Statistically, the arithmetic mean is "the best estimate of the expected value of a variable that has behaved randomly in the past" as noted by Ibbotson® SBBI® 2013 Valuation Yearbook – Market Results for Stocks, Bonds, Bills and Inflation ("SBBI – 2013")[11] on page 58 (see page 10 of Schedule 7R of Exhibit PMA-2). And the PRPM™, by its nature, produces a predicted or forward-looking equity risk premium. Hence, Mr. Parcell is incorrect. My statements regarding his use of historical / current yields on 20-year U.S. Treasury bonds are not inconsistent with my own analyses. Once again, Mr. Parcell has mischaracterized my testimony.

[11] Ibbotson® SBBI® - 2013 Valuation Yearbook – Market Results for Stocks, Bonds, Bills and Inflation (Morningstar, Inc., 2013).

Q. On page 6, lines 15 - 29 of his surrebuttal testimony, Mr. Parcell discusses your comments relative to the use of forecasted versus historical / current yields in a CAPM analysis. Please comment.

A. Mr. Parcell states on lines 23 – 24 on page 6 that "[u]se of the current yield in a DCF context is similar to using the current risk-free rate in a CAPM context." While that statement is true, neither Mr. Parcell nor I used a current dividend yield in our DCF analyses. As he stated page 18 of his direct testimony, "I believe the most appropriate dividend yield component is a quarterly compounding variant, which is expressed as follows:

$$Yield = \frac{D_o(1+0.5g)}{P_o}"$$

Thus, Mr. Parcell actually used a projected dividend yield in his DCF analysis, which is not analogous to using the current risk-free rate in a CAPM analysis.

Q. On page 7, lines 1 – 5 of his surrebuttal testimony, Mr. Parcell states that it is proper to consider both geometric and arithmetic mean returns because "investors have access to both types of returns when they make investment decisions." Please comment.

A. Both Mr. Parcell and I have relied upon historical market equity returns from Ibbotson Associates. It is only logical that if investors have access to these returns, they also have access to Ibbotson Associates recommendation / conclusion that <u>only</u> the arithmetic mean return / equity risk premium is appropriate for cost of capital purposes because it is the "most appropriate when

discounting future cash flows as they state on pages 55 – 56 of SBBI – 2013 Valuation.

Q. Mr. Parcell maintains that it is not necessary to incorporate an empirical CAPM ("ECAPM") analysis. Please comment.

A. Mr. Parcell's discussion on line 21, page 8 through line 2, page 9 of his surrebuttal testimony once again ignores empirical academic literature. Both my direct and rebuttal testimonies cited the academic literature which have determined that the Security Market Line ("SML") described by the CAPM formula at any given moment in time is not as steeply sloped as the predicted SML. This literature underscores that the traditional CAPM understates the cost rate for common equity for companies with betas less than 1.0 and overstates the cost rate for companies with betas greater than 1.0. The ECAPM is not based upon any assumptions of mine, but rather upon extensive academic empirical research.

Q. Do you have any final comment?

A. Yes. The fact that I have not addressed all of Mr. Parcell's comments upon my rebuttal testimony should not be taken to mean that I am in agreement with those comments.

Q. Does that conclude your rejoinder testimony?

A. Yes.

EXHIBIT A
SCHEDULES

Chaparral City Water Company

Financial Statements
December 31, 2011

Chaparral City Water Company
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December 31, 2011

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INDEPENDENT AUDITORS' REPORT

To the Directors of Chaparral City Water Company

We have audited the accompanying financial statements of Chaparral City Water Company, which comprise the balance sheet and statement of capitalization as at December 31, 2011, the statements income, changes in common stockholder's equity and cash flows for the year then ended, and notes, comprising a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with U.S. generally accepted accounting principles, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of Chaparral City Water Company as at December 31, 2011 and the results of its financial performance and its cash flows for the year then ended in accordance with U.S. generally accepted accounting principles.

KPMG LLP

Chartered Accountants

April 27, 2012
Edmonton, Canada

KPMG LLP is a Canadian limited liability partnership and a member firm of the KPMG network of independent member firms affiliated with KPMG International Cooperative ("KPMG International"), a Swiss entity. KPMG Canada provides services to KPMG LLP.

Chaparral City Water Company
Balance Sheet
December 31, 2011

Assets	
Utility plant (Note 3)	$ 64,384,389
Less: accumulated depreciation	(23,374,244)
Construction work in progress	339,219
Net utility plant	41,349,364
Other Property and Investments	
Goodwill	3,321,058
Restricted cash	730,638
	4,051,696
Current Assets	
Cash and cash equivalents	1,841,157
Accounts receivable, net of allowance of $17,787	450,341
Other accounts receivable	23,638
Unbilled revenues	282,861
Deferred income taxes - current	12,471
Regulatory assets – current (Note 2)	32,599
Prepaid expenses and other current assets	249,763
Total current assets	2,892,830
Other Assets	
Debt issuance costs	291,507
Total other assets	291,507
Total assets	$ 48,585,397
Capitalization and Liabilities	
Common stockholder's equity	$ 22,854,464
Long-term debt, less current maturities (Note 4)	4,935,000
Total capitalization	27,789,464
Commitments and contingencies (Note 9)	
Current Liabilities	
Long-term debt, current (Note 4)	365,000
Accounts payable	342,163
Intercompany payables due to related party	315,434
Income taxes payable	367,118
Accrued employee expenses	42,420
Accrued interest	23,785
Other	236,874
Total current liabilities	1,692,794
Other Credits	
Customer deposits	208,350
Advances for construction	4,626,636
Contributions in aid of construction, net	12,461,325
Deferred income taxes	1,279,250
Regulatory liabilities (Note 2)	461,005
Other	66,573
Total other credits	19,103,139
Total capitalization and liabilities	$ 48,585,397

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Capitalization
December 31, 2011

Common stockholder's equity	
Common stock	$ 4,603,140
Additional paid-in capital	14,959,074
Retained earnings	3,292,250
Total common stockholder's equity	22,854,464
Long-term debt	
Industrial Development Authority Bonds	
Series 1997A term bonds, due December 1, 2022 (5.40%)	4,515,000
Series 1997B term bonds, due December 1, 2022 (5.30%)	785,000
Total long-term debt	5,300,000
Less: current maturities	(365,000)
Long-term debt, less current maturities	4,935,000
Total capitalization	$ 27,789,464

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Income
Year Ended December 31, 2011

Operating revenues	
Sales of water	$ 8,958,247
Operating expenses	
Water purchased	964,143
Power purchased for pumping	553,148
Other operation expenses	1,226,856
Administrative and general expenses	1,450,136
Maintenance	428,764
Depreciation	1,880,295
Property and other taxes	225,770
Gain on settlement for removal of wells	(760,000)
Total operating expenses	5,969,112
Operating income	2,989,135
Other income (expense)	
Interest income	575
Interest expense	(332,462)
Total other income (expense)	(331,887)
Income from operations before income tax expense	2,657,248
Income tax expense	1,259,949
Net income	$ 1,397,299

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Changes in Common Stockholder's Equity
Year Ended December 31, 2011

	Common Stock	Additional Paid-in Capital	Retained Earnings	Total
Balance, January 1, 2011	$4,603,140	$14,959,074	$3,394,951	$ 22,957,165
Dividends on Common Stock	–	–	(1,500,000)	(1,500,000)
Net income	–	–	1,397,299	1,397,299
Balance, December 31, 2011	$4,603,140	$14,959,074	$ 3,292,250	$ 22,854,464

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Cash Flows
Year Ended December 31, 2011

Cash flows from operating activities	
Net income	$ 1,397,299
Adjustments to reconcile net income to net cash provided by operating activities:	
Depreciation	1,880,295
Deferred income taxes	525,053
Amortization of debt issuance costs	26,501
Gain on settlement for removal of wells	(760,000)
Changes in operating assets and liabilities:	
Accounts receivable	(39,582)
Other accounts receivable	41,248
Unbilled revenues	77,300
Materials and supplies	5,518
Prepaid expenses and other current assets	(33,549)
Taxes receivable/payable	321,135
Other assets/liabilities	(121,813)
Accounts payable	97,654
Intercompany receivables/payables	137,740
Customer deposits	(66,116)
Other	(21,500)
Net cash flows provided by operating activities	3,467,183
Cash flows from investing activities	
Capital expenditures	(1,000,383)
Change in restricted cash	(6)
Net cash flows used in investing activities	(1,000,389)
Cash flows from financing activities	
Receipt of advances for and contributions in aid of construction	37,045
Refunds on advances for construction	(114,858)
Repayments of long-term debt	(345,000)
Common dividends paid	(1,500,000)
Net cash flows used in financing activities	(1,922,813)
Increase in cash and cash equivalents	543,981
Cash and cash equivalents at beginning of year	1,297,176
Cash and cash equivalents at end of year	$ 1,841,157
Supplemental disclosure of cash flow information	
Interest paid	$ 303,595
Income taxes paid, net of refunds	$ 169,185

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

1. Summary of Significant Accounting Policies

Nature of Operations
Chaparral City Water Company ("CCWC" or "the Company") is an Arizona public utility company engaged principally in the purchase, production, distribution and sale of water. CCWC serves approximately 13,000 customers in Fountain Hills, Arizona and a portion of the City of Scottsdale, Arizona. Regulated by the Arizona Corporation Commission ("ACC"), CCWC is required to provide service and grant credit to customers within its defined service area.

On June 7, 2010, American States Water Company ("AWR"), the parent company of CCWC, entered into a stock purchase agreement with EPCOR Water (USA) Inc. ("EPCOR") to sell all of the common stock of CCWC. The consummation of the transaction contemplated by the agreement was subject to customary conditions, including among other things, regulatory approval by the ACC. The ACC voted on March 30, 2011 to approve the transaction and issued a final order on April 7, 2011.

On May 31, 2011, EPCOR completed the acquisition of 100% of the common stock of CCWC from AWR for total consideration of $30 million and the assumption of $5 million in long-term debt.

Basis of Presentation
The preparation of financial statements of CCWC on a stand-alone basis is in accordance with accounting principles generally accepted in the United States of America and requires the use of estimates and assumptions that affect (i) the reported amount of assets and liabilities, (ii) disclosure of contingent assets and liabilities known to exist as of the date the financial statements are published, and (iii) the reported amount of revenues and expenses recognized during each period presented. Actual results could differ from those estimates.

Regulatory Accounting
CCWC's accounting policies conform to accounting principles generally accepted in the United States of America, including the accounting principles for rate-regulated enterprises, which reflect the rate-making policies of the ACC, and are maintained in accordance with the Uniform System of Accounts prescribed by the ACC. CCWC is subject to regulation by the ACC to the extent necessary to enable the ACC to determine that CCWC's rates constitute reasonable costs to its customers. Under such accounting guidance, rate regulated entities defer costs and credits on the balance sheet as regulatory assets and liabilities when it is probable that those costs and credits will be recognized in the ratemaking process in a period different from the period in which they would have been reflected in income by an unregulated company. These deferred regulatory assets and liabilities are then reflected in the income statement in the period in which the same amounts are reflected in the rates charged for service. The amounts included as regulatory assets and liabilities that will be collected over a period exceeding one year are classified as long-term assets and liabilities as at December 31, 2011.

Cash and Cash Equivalents
Cash equivalents consist of highly liquid money market instruments with original maturities of three months or less. At times, cash and cash equivalent balances may be in excess of federally insured limits. CCWC's cash and cash equivalents are held with financial institutions with high credit standings.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

Restricted Cash
In accordance with the terms of its long-term debt agreements, CCWC is required to maintain amounts on deposit in a trust account (the Debt Service Reserve) for payment of principal and interest (Note 4). The funds in this account will be maintained until such time that the terms of the financing agreement are fully satisfied. At December 31, 2011, CCWC had $730,638 classified as non-current restricted cash on the balance sheet in connection with this debt service reserve.

Accounts Receivable
Accounts receivable is reported on the balance sheet net of any allowance for doubtful accounts. The allowance is based on CCWC's evaluation of the receivable portfolio under current conditions and review of specific problems and such other factors that, in management's judgment, requires recognition in estimating losses.

Utility Plant and Depreciation
CCWC capitalizes as utility plant the cost of additions and replacements of retirement units. Such costs include labor, materials, and certain indirect charges.

Depreciation is computed utilizing the straight-line group method at rates based on the estimated useful lives of the assets as prescribed by the ACC. The composite provision for depreciation for CCWC was approximately 3.99% for the year ended December 31, 2011. Expenditures for maintenance and repairs are expensed as incurred. Replaced or retired property costs, including cost of removal, are charged to the accumulated provision for depreciation.

Impairment of Long-Lived Assets
Long-lived assets are reviewed for impairment annually or whenever events or changes in circumstances indicate that the carrying amount of an asset may not be fully recoverable in accordance with the accounting guidance for the impairment or disposal of long-lived assets. CCWC will recognize an impairment loss only if the carrying value amount of a long-lived asset is not recoverable from customer rates authorized by the ACC. An impairment loss is measured as the excess of the carrying value over the amounts recovered in customer rates. CCWC also periodically reviews its utility plant for possible impairment in accordance with the accounting guidance for regulated enterprises for accounting for abandonments and disallowances of plant costs.

Goodwill
In accordance with the accounting guidance for goodwill and other intangible assets, goodwill is tested for impairment at least annually and more frequently if circumstances indicate that it may be impaired. The goodwill impairment model is a two-step process. First, it requires a comparison of the book value of net assets to the fair value of the related operations that have goodwill assigned to them. CCWC uses the terminal multiple valuation method in estimating fair value which assumes a business will be sold at the end of the projection period at a specific terminal multiple. Earnings and discounted cash flows were developed from CCWC's internal forecasts. Additionally, management must make an estimate of a weighted average cost of capital to be used as a discount rate, which takes into account certain risk and size premiums, long-term bond yields, and the capital structure of the industry. Changes in these projections or estimates could result in CCWC either passing or failing the first step in the accounting guidance impairment model, which could significantly change the amount of any impairment ultimately recorded.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

CCWC also considers other qualitative and quantitative factors, including terminal multiples used in the water industry, the regulatory environment in which the Company operates that can significantly impact future earnings and cash flows, and the effects of the volatile current economic environment. If the fair value is determined to be less than book value, a second step is performed to compute the amount of the impairment. In this process, a fair value for goodwill is estimated, based in part on the fair value of the Company's assets and liabilities used in the first step, and compared to its carrying value. The amount by which carrying value exceeds fair value represents the amount of goodwill impairment.

As of December 31, 2011, the $3,321,058 of goodwill is not considered to be at risk of impairment as CCWC's sale to EPCOR indicates a fair value above the book value of the Company.

Revenues
CCWC records operating revenues when the service is provided to customers. Revenues include amounts billed to customers on a cycle basis based on meter reading for services provided and unbilled revenues representing estimated amounts to be billed for usage from the last meter reading date to the end of the accounting period. Actual usage may vary from this estimate.

Advances for Construction & Contributions in aid of Construction
Advances for construction represent amounts advanced by developers, which are refundable over 10 to 20 years. Refund amounts under the contracts are based on annual revenues from the extensions. After all refunds are made, any remaining balance is transferred to contributions-in-aid of construction. There were $129,200 of advances that expired and transferred to contributions-in-aid of construction during the year ended December 31, 2011. Contributions in aid of construction are similar to advances, but require no refunding and are amortized over the useful lives of the related property.

Fair Value of Financial Instruments
For cash and cash equivalents, accounts receivable, accounts payable and short-term debt, the carrying amount is assumed to approximate fair value due to the short-term nature of the amounts. The table below estimates the fair value of long-term debt held by CCWC. Rates available to utility subsidiaries at December 31, 2011 for debt with similar terms and remaining maturities were used to estimate fair value for long-term debt. Changes in the assumptions will produce differing results.

	December 31, 2011	
	Carrying Amount	Fair Value
Financial liabilities:		
Long-term debt	$ 5,300,000	$ 6,089,055

Debt Issuance Costs
Original debt issuance costs are capitalized and amortized over the lives of the respective issues.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

Sales and Use Taxes
In addition to the collection of regular rates, CCWC separately charges and collects from its customers a proportionate share of any privilege, sales and use tax in accordance with ACC rules. CCWC bills and collects these taxes from its customers, which are then remitted to the state and local governments on a monthly basis. Because CCWC acts as an agent, these taxes are accounted for on a net basis. During the year ended December 31, 2011, CCWC billed its customers $901,757 for these taxes.

Related Party Transactions
Prior to the close of business on May 31, 2011, CCWC received various services from its former parent, AWR, and from Golden State Water Company ("GSWC"), a wholly owned subsidiary of AWR. AWR maintained coverage to insure against property and general liability claims incurred in the ordinary course of CCWC's business. Ultimate settlements of claims that occurred prior to the close of business on May 31, 2011 are the responsibility of AWR. GSWC also allocated certain corporate office administrative and general costs to CCWC using agreed upon allocation factors based on a weighted rate calculated from the number of customers, utility plant, expenses and labor costs ("four-factor method") that was established by the California Public Utilities Commission for regulated companies. In addition, CCWC remitted its federal tax payables to AWR (as the filer of the consolidated return in which it is included). As at May 31, 2011, total intercompany payables due to AWR and affiliates were $343,216 for these items. All amounts were settled as part of the acquisition of CCWC by EPCOR.

During June 1, 2011 through December 31, 2011 CCWC benefited from shared services provided by EPCOR and its wholly owned subsidiary, EPCOR Water Services Inc. These services include customer service, regulatory affairs, human resources, insurance, legal, employee benefits, management, accounting and financial services. All transactions are in the normal course of operations and are based on normal commercial rates. As at December 31, 2011, total intercompany payables due to EPCOR and its affiliates were $315,434.

Subsequent Events
CCWC has evaluated events and transactions that occurred after December 31, 2011 through March 29, 2012, which is the date these financial statements were issued.

New Accounting Pronouncements
Recently adopted accounting pronouncements: In October 2009, the FASB issued an update to the accounting standards and provided amendments to the criteria of Accounting Standards Codification Topic 605, *"Revenue Recognition"*, for separately recognizing consideration in multiple-deliverable arrangements. The amendments establish a selling price hierarchy for determining the selling price of a deliverable. This guidance was effective for CCWC beginning January 1, 2011 and did not have an impact on its financial statements.

In January 2010, the FASB issued an update to the accounting standards and amended the disclosure guidance with respect to fair value measurements. Specifically, the new guidance requires disclosure of amounts transferred in and out of Levels 1 and 2 fair value measurements, a reconciliation presented on a gross basis rather than a net basis of activity in Level 3 fair value measurements, greater disaggregation of the assets and liabilities for which fair value measurements are presented and more robust disclosure of the valuation techniques and inputs used to measure Level 2 and 3 fair value measurements. The adoption of this guidance had no impact on CCWC's financial statements.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

Other accounting standards that have been issued or proposed by the FASB or other standards-setting bodies that do not require adoption until a future date are not expected to have a material impact on CCWC's financial statements upon adoption.

2. Regulatory Matters

In accordance with accounting principles for rate-regulated enterprises, CCWC records regulatory assets, which represent probable future revenue associated with certain costs that will be recovered from customers through the ratemaking process, and regulatory liabilities, which represent probable future reductions in revenues associated with amounts that are to be credited to customers through the ratemaking process. At December 31, 2011, CCWC had approximately $425,381 of net regulatory liabilities not accruing carrying costs. Regulatory assets, less regulatory liabilities, included in the balance sheet as at December 31, 2011 are as follows:

Deferred general rate case costs	$	107,099
Asset retirement obligations		66,112
Proceeds on settlement of removal of wells		(598,592)
Retroactive revenues		(3,025)
		(428,406)
Less: current asset balance		(32,599)
	$	(461,005)

Deferred General Rate Case Costs:
Deferred rate case expenses are capitalized as regulatory assets and amortized as specified by the ACC for ratemaking purposes. In November 2009, CCWC filed an application for rehearing on several issues, including the recovery of previously incurred rate case costs in connection with an appeal and subsequent remand proceeding. On April 7, 2011, the ACC issued a final decision allowing CCWC to recover an additional $100,000 of rate case expenses incurred in its appeal of its 2006 general rate case and the subsequent remand proceeding before the ACC.

Asset Retirement Obligations:
As more fully discussed in Note 3, effective January 1, 2003, CCWC adopted the accounting guidance for asset retirement obligations. Because retirement costs have historically been recovered through rates at the time of retirement, upon implementing the accounting guidance, the cumulative effect was reflected as a regulatory asset. CCWC will also reflect the gain or loss at settlement as a regulatory asset or liability on the balance sheet.

Proceeds on Settlement for Removal of Wells:
In 2005, in an agreement with the Fountain Hills Sanitary District ("FHSD"), CCWC agreed to permanently cease using one of its wells in order for the FHSD to secure an Aquifer Protection Permit for its recharge system. Based on previous rulings by the ACC on similar gains, CCWC recognized a net gain of $760,000 (50% of the proceeds) in 2005 related to the settlement agreement and established a regulatory liability for the remaining $760,000 pending the ACC's review of the matter. On October 8, 2009, the ACC ordered CCWC to treat the entire settlement proceeds of $1,520,000 as a reduction to rate base. As a result, CCWC recognized a loss of $760,000 during the third quarter of 2009 and increased the regulatory liability by this amount.

In November 2009, CCWC filed an application for rehearing on several issues including the sharing of this gain from the settlement proceeds. On April 7, 2011, the ACC issued a final order to

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

reverse its October 2009 decision and allowed CCWC to retain 50% of the $1,520,000 settlement proceeds. Accordingly, for the year ended December 31, 2011, CCWC recorded a pretax gain of $760,000 and reduced the regulatory liability related to the settlement of removal of wells.

Retroactive Revenues
As part of the April 7, 2011 ACC decision on the proceeds on settlement of removal of wells and additional rate case expenses, CCWC was authorized to recover the difference in revenues between what would have been collected to-date had the April 7, 2011 decision been in place effective October 2009, and revenues actually collected to-date under rates approved from the original 2009 decision. Accordingly, in May 2011 CCWC recorded retroactive revenues of $149,258 to be collected, with interest at 6% per annum, through a six-month surcharge. During the six month surcharge collection period, CCWC collected excess revenues in the amount of $3,025 and therefore recorded a regulatory liability in the balance sheet as at December 31, 2011.

3. Utility Plant

The following table reflects CCWC's utility plant by major class as at December 31, 2011:

Land	$	271,857
Intangible assets		1,282,734
Source of water supply		3,373,394
Pumping		6,029,036
Water treatment		7,025,559
Transmission and distribution		44,523,384
Other property and equipment		1,878,425
		64,384,389
Less: Accumulated depreciation		(23,374,244)
Construction work in progress		339,219
Net utility plant	$	41,349,364

As at December 31, 2011, the intangible assets included in Utility Plant consist of unamortized water rights for the additional Central Arizona Project ("CAP") allocation to CCWC in the amount of 1,931 acre-feet per year. In November 2007, a final written agreement was executed and CCWC paid approximately $1.3 million for these additional CAP water rights (see Note 9).

Asset Retirement Obligation
Effective January 1, 2003, CCWC adopted accounting guidance for asset retirement obligations, which requires businesses to record the fair value of a liability for an asset retirement obligation in the period in which it is incurred. When the liability is initially recorded, CCWC capitalizes a cost by increasing the carrying amount of the related long-lived asset. Over time, the liability is accreted to its present value each period, and the capitalized cost is depreciated over the useful life of the related asset. Upon settlement of the liability, CCWC either settles the obligation for its recorded amount or incurs a gain or loss upon settlement. CCWC's legal obligations for retirement reflect principally the retirement of wells, which by law need to be properly capped at the time of removal. Retirement costs have historically been recovered through rates at the time of retirement. Accordingly, at implementation of the guidance for asset retirement obligations, the cumulative effect was reflected as a regulatory asset. The Company also reflects the gain or loss at settlement as a regulatory asset or liability on the balance sheet.

For the year ended December 31, 2011, CCWC incurred accretion of $3,536.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

4. Long-term Debt

Industrial Development Authority Bonds
Substantially all of utility plant is pledged as collateral for CCWC's Industrial Development Authority ("IDA") Bonds. The Bond Agreement, among other things, (i) requires CCWC to maintain certain financial ratios; (ii) restricts CCWC's ability to incur debt and make liens, sell, lease or dispose of assets, merge with another corporation, and (iii) restricts the payment of dividends. CCWC maintains a debt service reserve fund, which had a balance of $655,760 at December 31, 2011. Amounts are classified as noncurrent restricted cash on the balance sheet. The loan and trust agreement contains restrictive covenants, including the maintenance of a debt service coverage ratio of 2.0, as defined in the loan and trust agreement, calculated annually at year end. As of December 31, 2011, CCWC was in compliance with all covenants under the loan and trust agreement.

Maturities of long-term debt outstanding at December 31, 2011 are as follows:

2012	$ 365,000
2013	390,000
2014	405,000
2015	430,000
2016	450,000
Thereafter	3,260,000
	5,300,000
Less: current portion	(365,000)
	$ 4,935,000

Repayment Contract
In 1984, CCWC entered into an agreement with the United States Bureau of Reclamation for construction of a delivery and storage system to transport CAP water to CCWC's property (the "Delivery Agreement"). In connection therewith, a repayment obligation was incurred by CCWC related to construction costs plus interest. CCWC made the final payment on this obligation in 2006. Interest accrued at a rate of 3.34% per annum. The cost of the constructed assets is recorded as utility plant. Under the terms of the Delivery Agreement, CCWC retains the right to use the delivery and storage system for an unspecified time period conditional upon meeting certain obligations including making scheduled principal and interest repayments for the construction costs and operating and maintaining the system. The Delivery Agreement also provides that the United States Bureau of Reclamation retains ownership of the system. Pursuant to this Agreement, CCWC continues to maintain a debt service reserve fund, which had a balance of $74,879 at December 31, 2011. This amount is classified as part of noncurrent restricted cash on the balance sheet.

5. Dividend Limitations

CCWC is subject to contractual restrictions on its ability to pay dividends. CCWC's maximum ability to distribute dividends is limited to maintenance of no more than 55% debt in the capital structure for the quarter immediately preceding the distribution. The ability of CCWC to pay dividends is also restricted by Arizona law. Under restrictions of the Arizona tests, approximately $1.6 million was available to pay dividends at December 31, 2011. Contractual restrictions are the most restrictive. On May 26, 2011, CCWC distributed a cash dividend of $1.5 million to its then-parent, AWR.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2011

6. Taxes on Income

The Company's financial statements recognize the current and deferred income tax consequences that result from the Company's activities during the current and preceding periods pursuant to the provisions of Accounting Standards Codification Topic 740, Income Taxes (ASC 740), as if the Company were a separate taxpayer rather than a member of the parent company's consolidated income tax return group. Differences between the Company's separate company income tax provision and cash flows attributable to income taxes pursuant to the provisions of the Company's tax sharing arrangement with the parent company will be recognized as capital contributions from, or dividends to, the parent company.

The Company applies the provisions of the accounting guidance for accounting for income taxes, which requires the use of an asset and liability approach in accounting for income taxes. This approach requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been recognized in the Company's financial statements or tax returns.

The significant components of the deferred tax assets and liabilities as reflected in the balance sheet at December 31, 2011 were:

Deferred tax assets	
Contributions and advances	$ 3,274,795
Regulatory liability-related (well-removal settlement)	121,421
Other	17,345
	3,413,561
Deferred tax liabilities	
Goodwill	(1,267,980)
Fixed assets	(3,412,360)
	(4,680,340)
Accumulated deferred income taxes, net	$ (1,266,779)

The current and deferred components of income tax expense were as follows:

Current provision	
Federal	$ 605,353
State	129,543
Total current tax expense	734,896
Deferred provision	
Federal	457,677
State	92,692
Adjustment to enacted state rate	(25,316)
Total deferred tax expense	525,053
Total income tax expense	$ 1,259,949

Income tax expense from continuing operations for the year was higher than the amount that would result from applying the domestic corporate income tax rate primarily as a result of an adjustment made to the Company's component 1 goodwill which was reflected on its 2010 income tax return as filed as well as certain other adjustments made on amended 2006 through 2009 income tax

Chaparral City Water Company
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December 31, 2011

returns. In addition, the federal statutory rate differs from the effective rate due to state taxes, net of federal effect.

As at December 31, 2011, the Company had no unrecognized tax benefits.

7. Employee Benefit Plans

Certain CCWC employees participated in a defined benefit plan (the "Plan") administered by AWR that provided eligible employees (through the close of business on May 31, 2011) monthly benefits upon retirement based on average salaries and length of service. The pension costs for CCWC were $25,522 for the period January 1, 2011 through May 31, 2011 and have been included in administrative and general expenses on the statement of income. On June 1, 2011 employees of CCWC were no longer eligible to participate in the Plan as a result of the acquisition of CCWC by EPCOR.

Certain CCWC employees were also included in the 401(k) Investment Incentive Program (the "401(k) Plan") administered by AWR through May 31, 2011, under which employees may invest a percentage of their pay, up to a maximum investment prescribed by law, in an investment program managed by an outside investment manager. Company contributions to the 401(k) Plan are based upon a percentage of individual employee contributions. CCWC contributions to the 401(k) Plan for the period January 1, 2011 through May 31, 2011 totaled $11,763. On June 1, 2011 employees of CCWC were no longer eligible to participate in the 401(k) Plan as a result of the acquisition of CCWC by EPCOR.

On June 1, 2011, CCWC employees became eligible to participate in the TriNet 401(k) Plan – EPCOR Water (USA), Inc. (the "TriNet 401(k) Plan"). Eligible employees may invest a percentage of their pay, up to a maximum investment prescribed by law, in an investment program managed by an outside investment manager. Company contributions to the TriNet 401(k) Plan are based upon a percentage of individual employee contributions. CCWC contributions to the TriNet 401(k) Plan for the period June 1, 2011 through December 31, 2011 totaled $31,453.

8. Related-Party Transactions

Through the close of business on May 31, 2011, CCWC benefited from customer service, regulatory affairs, human resources, insurance, legal, employee benefits, management, accounting and financial services provided and paid for by AWR and reimbursed by CCWC. AWR allocated these costs to CCWC using agreed upon allocation factors based on a weighted rate calculated from the number of customers, utility plant, expenses and labor costs ("four-factor method") that was established by the California Public Utilities Commission for regulated companies. The costs for these services, including allocated costs for the employee benefit plans discussed above, were $356,238 for the period January 1, 2011 through May 31, 2011 and have been included in other operation expenses and administrative and general expenses.

Between June 1, 2011 and December 31, 2011, CCWC benefited from shared services which included customer service, regulatory affairs, human resources, insurance, legal, employee benefits, management, accounting and financial services provided and paid for by EPCOR. All transactions are in the normal course of operations and are based on normal commercial rates. The costs for these services were $416,931 and have been included in other operation expenses and administrative and general expenses. During this same period, administrative and general

Chaparral City Water Company
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December 31, 2011

expenses were offset by $33,831 for employee costs that were transferred to other wholly owned subsidiaries of EPCOR.

9. Commitments and Contingencies

CCWC obtains its water supply from one operating well and from Colorado River water delivered by the CAP. The majority of CCWC's water supply is obtained from its CAP allocation and well water is used for peaking capacity in excess of treatment plant capability, during treatment plant shutdowns, and to keep the well system in optimal operating condition.

CCWC has an assured water supply designation, by decision and order of the Arizona Department of Water Resources stating that CCWC has demonstrated the physical, legal and continuous availability of CAP water and groundwater, in an aggregate volume of 11,759 acre-feet per year for a minimum of 100 years. The 11,759 acre-feet is comprised of existing CAP allocation of 8,909 acre-feet per year, 350 acre-feet per year groundwater allowance, incidental recharge credits of 500 acre-feet per year, and a Central Arizona Groundwater Replenishment District contract of 2,000 acre-feet per year.

CCWC has a long-term water supply contract with the Central Arizona Conservation District (the "District") through December 2108, and is entitled to take 8,909 acre-feet of water per year from CAP. In connection with this long-term water supply contract, CCWC pays an annual charge based on its full allocation regardless of the amount of water delivered. The rate for such charge is set by the District and is subject to annual increases. Based on the District's published new rate schedules, the estimated remaining commitment under this contract is $400,905 as at December 31, 2011.

Notwithstanding an assured water supply designation, CCWC's water supply may be subject to interruption or reduction, in particular owing to interruption or reduction of CAP water. In the event of interruption or reduction of CAP water, CCWC can rely on its well water supplies for short-term periods. However, the quantity of water CCWC supplies to some or all of its customers may be interrupted or curtailed, pursuant to the provisions of its tariffs. CCWC has the physical capability to deliver water in excess of that which is currently accounted for in CCWC's assured water supply account.

CCWC is involved from time to time in claims and litigation, both as plaintiff and defendant, in the ordinary course of business. The Company believes that rate recovery, proper insurance coverage, and reserves are in place to insure against property, general liability, and workers' compensation claims incurred in the ordinary course of business. The Company is of the opinion that the outcome of such claims and litigation will not have a materially adverse effect upon CCWC's results of operations, financial position or cash flows.

Chaparral City Water Company

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INDEPENDENT AUDITORS' REPORT

To the Directors of Chaparral City Water Company

We have audited the accompanying financial statements of Chaparral City Water Company, which comprise the balance sheet and statement of capitalization as at December 31, 2012, the statements of income, changes in common stockholder's equity and cash flows for the year then ended, and notes, comprising a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with U.S. generally accepted accounting principles, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of Chaparral City Water Company as at December 31, 2012, and its results of operations and its cash flows for the year then ended in accordance with U.S. generally accepted accounting principles.

Yours truly,

KPMG LLP

Chartered Accountants
April 29, 2013
Edmonton, Canada

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Chaparral City Water Company
Balance Sheet
December 31, 2012

Assets		
Utility plant (Note 3)	$	65,617,301
Less: accumulated depreciation		(25,734,123)
Construction work in progress		1,612,943
Net utility plant		41,496,121
Other Property and Investments		
Goodwill		3,321,058
Restricted cash		730,646
		4,051,704
Current Assets		
Cash and cash equivalents		4,931,943
Accounts receivable, net of allowance of $43,794		473,164
Other accounts receivable		19,981
Unbilled revenues		344,987
Prepaid expenses and other current assets		259,560
Total current assets		6,029,635
Other Assets		
Regulatory assets – non-current (Note 2)		79,806
Debt issuance costs		265,006
Deferred income taxes		2,839,111
Total other assets		3,183,923
Total assets	$	54,761,383
Capitalization and Liabilities		
Common stockholder's equity	$	26,949,123
Long-term debt, less current maturities (Note 4)		4,545,000
Total capitalization		31,494,123
Commitments and contingencies (Note 8)		
Current Liabilities		
Long-term debt, current (Note 4)		390,000
Accounts payable		845,144
Intercompany payables due to related party (Note 5)		2,985,504
Regulatory liabilities (Note 2)		74,500
Accrued interest		22,147
Other		283,306
Total current liabilities		4,600,601
Other Credits		
Customer deposits		148,869
Intercompany payables due to related party (Note 5)		1,500,624
Advances for construction		3,933,916
Contributions in aid of construction, net		12,637,731
Regulatory liabilities (Note 2)		375,080
Other		70,439
Total other credits		18,666,659
Total capitalization and liabilities	$	54,761,383

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Capitalization
December 31, 2012

Common stockholder's equity	
Common stock	$ 4,603,140
Additional paid-in capital	19,006,566
Retained earnings	3,339,417
Total common stockholder's equity	26,949,123
Long-term debt	
Industrial Development Authority Bonds	
Series 1997A term bonds, due December 1, 2022 (5.40%)	4,205,000
Series 1997B term bonds, due December 1, 2022 (5.30%)	730,000
Total long-term debt	4,935,000
Less: current maturities	(390,000)
Long-term debt, less current maturities	4,545,000
Total capitalization	$ 31,494,123

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Income
Year Ended December 31, 2012

Operating revenues	
Sales of water	$ 9,119,018
Operating expenses	
Water purchased	911,156
Power purchased for pumping	565,129
Other operation expenses	2,015,901
Administrative and general expenses	1,602,935
Maintenance	181,576
Depreciation	1,852,898
Property and other taxes	219,269
Total operating expenses	7,348,864
Operating income	1,770,154
Other income (expense)	
Other income	2,807
Interest expense	(283,567)
Total other income (expense)	(280,760)
Income from operations before income tax recovery	1,489,394
Income tax recovery (Note 6)	58,397
Net Income	$ 1,547,791

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Changes in Common Stockholder's Equity
Year Ended December 31, 2012

	Common Stock	Additional Paid-in Capital	Retained Earnings	Total
Balance, January 1, 2012	$4,603,140	$14,959,074	$3,292,250	$ 22,854,464
Dividends on Common Stock	–	–	(1,500,624)	(1,500,624)
Transaction with shareholder	–	4,047,492	–	4,047,492
Net income	–	–	1,547,791	1,547,791
Balance, December 31, 2012	$4,603,140	$19,006,566	$ 3,339,417	$ 26,949,123

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Statement of Cash Flows
Year Ended December 31, 2012

Cash flows from operating activities	
Net income	$ 1,547,791
Adjustments to reconcile net income to net cash provided by operating activities:	
Depreciation	1,852,898
Net gain on sale of property	2,800
Provision for doubtful accounts	26,007
Income tax recovery	(58,397)
Amortization of debt issuance costs	26,501
Changes in operating assets and liabilities:	
Accounts receivable	(48,830)
Other accounts receivable	3,657
Unbilled revenues	(62,126)
Prepaid expenses and other current assets	(9,797)
Taxes receivable/payable	(367,118)
Regulatory asset/liabilities	24,163
Other assets/liabilities	(71,933)
Accounts payable	502,981
Intercompany receivables/payables	2,670,070
Customer deposits	(59,482)
Net cash flows provided by operating activities	5,979,185
Cash flows from investing activities	
Capital expenditures	(2,509,436)
Change in restricted cash	(8)
Net cash flows used in investing activities	(2,509,444)
Cash flows from financing activities	
Receipt of advances for and contributions in aid of construction	40,887
Refunds on advances for construction	(54,842)
Repayments of long-term debt	(365,000)
Net cash flows used in financing activities	(378,955)
Increase in cash and cash equivalents	3,090,786
Cash and cash equivalents at beginning of year	1,841,157
Cash and cash equivalents at end of year	$ 4,931,943
Supplemental disclosure of cash flow information	
Interest paid	$ 285,415
Income taxes paid, net of refunds	$ -

The accompanying notes are an integral part of these financial statements

Chaparral City Water Company
Notes to Financial Statements
December 31, 2012

1. Summary of Significant Accounting Policies

Nature of Operations
Chaparral City Water Company ("CCWC" or "the Company") is an Arizona public utility company engaged principally in the purchase, treatment, distribution and sale of water. CCWC serves approximately 13,000 customers in Fountain Hills, Arizona and a portion of the City of Scottsdale, Arizona. Regulated by the Arizona Corporation Commission ("ACC"), CCWC is required to provide service and grant credit to customers within its defined service area. EPCOR Water (USA), Inc. owns 100% of the common stock of CCWC.

Basis of Presentation
The preparation of financial statements of CCWC is in accordance with accounting principles generally accepted in the United States of America and requires the use of estimates and assumptions that affect (i) the reported amount of assets and liabilities, (ii) the disclosure of contingent assets and liabilities known to exist as of the date the financial statements are published, and (iii) the reported amount of revenues and expenses recognized during each period presented. Actual results could differ from those estimates.

Regulatory Accounting
CCWC's accounting policies conform to accounting principles generally accepted in the United States of America, including the accounting principles for rate-regulated enterprises, which reflect the rate-making policies of the ACC, and are maintained in accordance with the Uniform System of Accounts prescribed by the ACC. CCWC is subject to regulation by the ACC to the extent necessary to enable the ACC to determine that CCWC's rates constitute reasonable costs to its customers. Under such accounting guidance, rate regulated entities defer costs and credits on the balance sheet as regulatory assets and liabilities when it is probable that those costs and credits will be recognized in the ratemaking process in a period different from the period in which they would have been reflected in the statement of income by an unregulated company. These deferred regulatory assets and liabilities are then reflected in the statement of income in the period in which the same amounts are reflected in the rates charged for service. The amounts included as regulatory assets and liabilities that will be collected over a period exceeding one year are classified as long-term assets and liabilities as at December 31, 2012.

Cash and Cash Equivalents
Cash equivalents consist of highly liquid money market instruments with original maturities of three months or less. At times, cash and cash equivalent balances may be in excess of federally insured limits. CCWC's cash and cash equivalents are held with financial institutions with high credit standings.

Restricted Cash
In accordance with the terms of its long-term debt agreements, CCWC is required to maintain amounts on deposit in a trust account (the Debt Service Reserve) for payment of principal and interest Note 4. The funds in this account will be maintained until such time that the terms of the financing agreement are fully satisfied. At December 31, 2012, CCWC had $730,646 classified as non-current restricted cash on the balance sheet in connection with this debt service reserve.

Accounts Receivable
Accounts receivable are reported on the balance sheet net of any allowance for doubtful accounts ("the allowance"). The allowance is based on CCWC's evaluation of the receivable portfolio under

Chaparral City Water Company
Notes to Financial Statements
December 31, 2012

current conditions and review of specific problems and such other factors that, in management's judgment, requires recognition in estimating losses.

Utility Plant and Depreciation
CCWC capitalizes as utility plant the cost of additions and replacements of retired units. Such costs include labor, materials, and certain indirect charges.

Depreciation is computed utilizing the straight-line group method at rates based on the estimated useful lives of the assets as prescribed by the ACC. The composite provision for depreciation for CCWC was approximately 3.56% for the year ended December 31, 2012. Expenditures for maintenance and repairs are expensed as incurred. Replaced or retired property costs, including cost of removal, are charged to the accumulated provision for depreciation.

Impairment of Long-Lived Assets
Long-lived assets are reviewed for impairment annually or whenever events or changes in circumstances indicate that the carrying amount of an asset may not be fully recoverable in accordance with the accounting guidance for the impairment or disposal of long-lived assets. CCWC will recognize an impairment loss only if the carrying value amount of a long-lived asset is not recoverable from customer rates authorized by the ACC. An impairment loss is measured as the excess of the carrying value over the amounts recovered in customer rates. CCWC also periodically reviews its utility plant for possible impairment in accordance with the accounting guidance for regulated enterprises for accounting for abandonments and disallowances of plant costs.

Goodwill
In accordance with the provisions of Accounting Standards Codification Topic 350, Intangibles – Goodwill and Other (ASC 350), goodwill is tested for impairment at least annually and more frequently if circumstances indicate that it may be impaired. Accounting Standards Update (ASU) No. 2011-08 introduced a qualitative impairment assessment that may be used prior to performing step one of the two-step goodwill impairment test. The assessment determines whether it is more likely-than-not that the fair value of a reporting unit is less than its carrying amount. If determined that there is less than a 50% chance that the fair value of a reporting unit is less than its carrying amount, then performing the two step test is unnecessary.

At year end, CCWC performed a qualitative assessment to determine whether it was more likely than not that its book value of net assets were less than the fair value. CCWC considered relevant events and circumstances including macroeconomic conditions, industry and market conditions, cost factors, financial performance, and other relevant events.

At December 31, 2012, the $3,321,058 of goodwill is not considered to be at risk of impairment.

Revenues
CCWC records operating revenues when the service is provided to customers. Revenues include amounts billed to customers on a cycle basis based on meter reading for services provided and unbilled revenues representing estimated amounts to be billed for usage from the last meter reading date to the end of the accounting period.

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Notes to Financial Statements
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Advances for Construction & Contributions in Aid of Construction
Advances for construction represent amounts advanced by developers, which are refundable over 10 to 20 years. Refund amounts under the contracts are based on annual revenues from the extensions. After all refunds are made, any remaining balance is transferred to contributions in aid of construction. There were $562,878 of advances that expired and transferred to contributions in aid of construction during the year ended December 31, 2012. Contributions in aid of construction are similar to advances, but require no refunding and are amortized over the useful lives of the related property.

Fair Value of Financial Instruments
For cash and cash equivalents, accounts receivable, accounts payable and the current portion of long-term debt, the carrying amount is assumed to approximate fair value due to the short-term nature of the amounts. The table below estimates the fair value of long-term debt held by CCWC. Rates available to utility subsidiaries at December 31, 2012 for debt with similar terms and remaining maturities were used to estimate fair value for long-term debt. Changes in the assumptions will produce differing results.

	December 31, 2012	
	Carrying Amount	Fair Value
Financial liabilities:		
Long-term debt	$ 4,935,000	$ 5,642,391

Sales and Use Taxes
In addition to the collection of regular rates, CCWC separately charges and collects from its customers a proportionate share of any privilege, sales and use tax in accordance with ACC rules. CCWC bills and collects these taxes from its customers, which are then remitted to the state and local governments on a monthly basis. Because CCWC acts as an agent, these taxes are accounted for on a net basis. During the year ended December 31, 2012, CCWC billed its customers $906,583 for these taxes.

Debt Issuance Costs
Original debt issuance costs are capitalized and amortized over the lives of the respective issues.

Related Party Transactions
During the year ended December 31, 2012 CCWC benefited from shared services provided by EPCOR Utilities Inc. and its wholly owned subsidiaries, EPCOR Water Services Inc. and EPCOR Water (USA) Inc. These services include customer service, regulatory affairs, human resources, insurance, legal, employee benefits, management, accounting and financial services. All transactions are in the normal course of operations and are based on normal commercial rates. As at December 31, 2012, total intercompany payables due to EPCOR and its affiliates were $2,985,504.

Subsequent Events
CCWC has evaluated events and transactions that occurred after December 31, 2012 through April 29, 2013, which is the date these financial statements were issued.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2012

New Accounting Pronouncements
Accounting standards that have been issued or proposed by the Financial Accounting Standards Board or other standards-setting bodies that do not require adoption until a future date are not expected to have a material impact on CCWC's financial statements upon adoption.

2. Regulatory Matters

In accordance with accounting principles for rate-regulated enterprises, CCWC records regulatory assets, which represent probable future revenue associated with certain costs that will be recovered from customers through the ratemaking process, and regulatory liabilities, which represent probable future reductions in revenues associated with amounts that are to be credited to customers through the ratemaking process. At December 31, 2012, CCWC's net regulatory liabilities are not accruing carrying costs. Regulatory assets, less regulatory liabilities, included in the balance sheet as at December 31, 2012 are as follows:

Regulatory assets - non-current	$ 79,806
Regulatory liabilities:	
Asset retirement obligations	(69,753)
Proceeds on settlement of removal of wells	519,333
	449,580
Less: current portion	(74,500)
	$ 375,080

Regulatory Assets – Non-Current:
In October 2009, the ACC issued an order to allow CCWC recovery of 50% of the Central Arizona Project ("CAP") M&I charges related to the additional allocation discussed in Note 3 and Note 8. The ACC order determines that 50% of the additional allocation was considered used and therefore the remaining 50% should be deferred for a period of 48 months. At December 31, 2012 the deferred regulatory balance above is included in other long term assets on the balance sheet.

Asset Retirement Obligations:
As more fully discussed in Note 3, as retirement costs have historically been recovered through rates at the time of retirement, upon implementing the accounting guidance for asset retirement obligation's, the cumulative effect was reflected as a regulatory asset. CCWC will also reflect the gain or loss at settlement as a regulatory asset or liability on the balance sheet.

Proceeds on Settlement for Removal of Wells:
In 2005, in an agreement with the Fountain Hills Sanitary District ("FHSD"), CCWC agreed to permanently cease using one of its wells in order for the FHSD to secure an Aquifer Protection Permit for its recharge system. A regulatory liability of $760,000 was established related to the proceeds on settlement for removal of the well, based on ACC rulings. The liability will be recognized into income over a 10 year period as prescribed by the ACC. The remaining regulatory liability related to the removal of the well is $519,333.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2012

3. Utility Plant

The following table reflects CCWC's utility plant by major class as at December 31, 2012:

Land	$	271,857
Intangible assets		1,282,734
Source of water supply		3,380,364
Pumping		6,116,712
Water treatment		7,144,157
Transmission and distribution		45,520,225
Other property and equipment		1,901,252
		65,617,301
Less: Accumulated depreciation		(25,734,123)
Construction work in progress		1,612,943
Net utility plant	$	41,496,121

As at December 31, 2012, the intangible assets included in Utility Plant consist of unamortized water rights for the additional CAP allocation to CCWC in the amount of 1,931 acre-feet per year. In November 2007, a final written agreement was executed and CCWC paid approximately $1.3 million for these additional CAP water rights (see Note 9).

Asset Retirement Obligation
CCWC records the fair value of a liability for an asset retirement obligation in the period in which it is incurred. When the liability is initially recorded, CCWC capitalizes a cost by increasing the carrying amount of the related long-lived asset. Over time, the liability is accreted to its present value each period, and the capitalized cost is depreciated over the useful life of the related asset. Upon settlement of the liability, CCWC either settles the obligation for its recorded amount or incurs a gain or loss upon settlement. CCWC's legal obligations for retirement reflect principally the retirement of wells, which by law need to be properly capped at the time of removal. Retirement costs have historically been recovered through rates at the time of retirement. Accordingly, at implementation of the guidance for asset retirement obligations, the cumulative effect was reflected as a regulatory asset. The Company also reflects the gain or loss at settlement as a regulatory asset or liability on the balance sheet.

For the year ended December 31, 2012, CCWC incurred accretion expense of $3,536 which is included in depreciation expense in the statement of income.

4. Long-term Debt

Industrial Development Authority Bonds
Substantially all of utility plant is pledged as collateral for CCWC's Industrial Development Authority ("IDA") Bonds. The Bond Agreement, among other things, (i) requires CCWC to maintain certain financial ratios; (ii) restricts CCWC's ability to incur debt and make liens, sell, lease or dispose of assets, merge with another corporation, and (iii) restricts the payment of dividends. CCWC maintains a debt service reserve fund, which had a balance of $655,760 at December 31, 2012. Amounts are classified as noncurrent restricted cash on the balance sheet. The loan and trust agreement contains restrictive covenants, including the maintenance of a debt service coverage ratio of 2.0, as defined in the loan and trust agreement, calculated annually at year end.

Chaparral City Water Company
Notes to Financial Statements
December 31, 2012

As of December 31, 2012, CCWC was in compliance with all covenants under the loan and trust agreement.

Maturities of long-term debt outstanding at December 31, 2012 are as follows:

2013	$ 390,000
2014	405,000
2015	430,000
2016	450,000
2017	475,000
Thereafter	2,785,000
	4,935,000
Less: current portion	(390,000)
	$ 4,545,000

Repayment Contract
In 1984, CCWC entered into an agreement with the United States Bureau of Reclamation for construction of a delivery and storage system to transport CAP water to CCWC's property (the "Delivery Agreement"). The cost of the constructed assets is recorded as utility plant. Under the terms of the Delivery Agreement, CCWC retains the right to use the delivery and storage system for an unspecified time period conditional upon meeting certain obligations including operating and maintaining the system. The Delivery Agreement also provides that the United States Bureau of Reclamation retains ownership of the system. Pursuant to this Agreement, CCWC continues to maintain a debt service reserve fund, which had a balance of $74,886 at December 31, 2012. This amount is classified as part of noncurrent restricted cash on the balance sheet.

5. Dividend Limitations

CCWC is subject to contractual restrictions on its ability to pay dividends. CCWC's maximum ability to distribute dividends is limited to maintenance of no more than 55% debt in the capital structure for the quarter immediately preceding the distribution. On March 29, 2012, CCWC declared a $1.5 million dividend payable to EPCOR Water (USA), Inc. which is included in Intercompany payables due to related party in the balance sheet as at December 31, 2012.

The ability of CCWC to pay future dividends is also restricted by Arizona law. Under restrictions of the Arizona tests, approximately $1.1 million is available to pay dividends at December 31, 2012.

6. Taxes on Income

The Company's financial statements recognize the current and deferred income tax consequences that result from the Company's activities during the current and preceding periods pursuant to the provisions of Accounting Standards Codification Topic 740, Income Taxes (ASC 740), as if the Company were a separate taxpayer rather than a member of the parent company's consolidated income tax return group. Differences between the Company's separate company income tax provision and cash flows attributable to income taxes pursuant to the provisions of the Company's tax sharing arrangement with the parent company will be recognized as capital contributions from, or dividends to, the parent company.

The Company applies the provisions of the accounting guidance for accounting for income taxes, which requires the use of an asset and liability approach in accounting for income taxes. This approach requires the recognition of deferred tax assets and liabilities for the expected future tax

Chaparral City Water Company
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consequences of events that have been recognized in the Company's financial statements or tax returns.

The significant components of the deferred tax assets and liabilities as reflected in the balance sheet at December 31, 2012 are:

Deferred tax assets	
Other	$ 149,029
Goodwill	2,428,360
Contributions and advances	4,919,869
	7,497,258
Deferred tax liabilities	
Fixed assets	(4,658,147)
Deferred income taxes, net	$ 2,839,111

The initial recognition of the deferred tax asset for goodwill is recognized in equity as additional paid-in-capital, as the change in tax base was a result of transactions with the shareholder.

The current and deferred components of income tax expense (recovery) are as follows:

Current provision	
Federal	$ -
State	-
Total current tax expense (recovery)	-
Deferred provision	
Federal	(58,397)
State	-
Total deferred tax expense (recovery)	(58,397)
Total income tax expense (recovery)	$ (58,397)

EPCOR Water (USA), Inc. files one consolidated tax return which includes all of the subsidiary entities in the state of Arizona and New Mexico. There is no current provision as CCWC's taxable income was offset by net operating losses in the EPCOR Water (USA), Inc. consolidated federal and Arizona state income tax returns. The deferred provision is due to the tax affected changes in the deferred tax asset and liability accounts for the current year.

7. Employee Benefit Plans

For the period January 1, 2012 through September 30, 2012, CCWC employees participated in the TriNet 401(k) Plan – EPCOR Water (USA), Inc. (the "TriNet 401(k) Plan"). Eligible employees may invest a percentage of their pay, up to a maximum investment prescribed by law, in an investment program managed by an outside investment manager. On October 1, 2012 CCWC employees became eligible to participate in the EPCOR Water (USA), Inc. 401(k) Plan and all balances in the TriNet 401(k) Plan were transferred. Company contributions to the EPCOR Water (USA) 401(k) plan are based upon a percentage of individual employee contributions and totaled $88,199.

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8. Commitments and Contingencies

CCWC obtains its water supply from one operating well and from Colorado River water delivered by the CAP. The majority of CCWC's water supply is obtained from its CAP allocation and well water is used for peaking capacity in excess of treatment plant capability, during treatment plant shutdowns, and to keep the well system in optimal operating condition.

CCWC has an assured water supply designation, by decision and order of the Arizona Department of Water Resources stating that CCWC has demonstrated the physical, legal and continuous availability of CAP water and groundwater, in an aggregate volume of 11,759 acre-feet per year for a minimum of 100 years. The 11,759 acre-feet is comprised of existing CAP allocation of 8,909 acre-feet per year, 350 acre-feet per year groundwater allowance, incidental recharge credits of 500 acre-feet per year, and a Central Arizona Groundwater Replenishment District contract of 2,000 acre-feet per year.

CCWC has a long-term water supply contract with the Central Arizona Conservation District (the "District") through December 2108, and is entitled to take 8,909 acre-feet of water per year from CAP. In connection with this long-term water supply contract, CCWC pays an annual charge based on its full allocation regardless of the amount of water delivered. The rate for such charge is set by the District and is subject to annual increases. Based on the District's published new rate schedules, the estimated remaining commitment under this contract is $681,539 as at December 31, 2012.

Notwithstanding an assured water supply designation, CCWC's water supply may be subject to interruption or reduction, in particular owing to interruption or reduction of CAP water. In the event of interruption or reduction of CAP water, CCWC can rely on its well water supplies for short-term periods. However, the quantity of water CCWC supplies to some or all of its customers may be interrupted or curtailed, pursuant to the provisions of its tariffs. CCWC has the physical capability to deliver water in excess of that which is currently accounted for in CCWC's assured water supply account.

CCWC is involved from time to time in claims and litigation, both as plaintiff and defendant, in the ordinary course of business. The Company believes that rate recovery, proper insurance coverage, and reserves are in place to insure against property, general liability, and workers' compensation claims incurred in the ordinary course of business. The Company is of the opinion that the outcome of such claims and litigation will not have a materially adverse effect upon CCWC's results of operations, financial position or cash flows.

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19.2 Critique of Double Leverage

Adherents to the double leverage calculation argue that the true cost of capital to a utility subsidiary is the weighted cost of its own debt and the weighted cost of the parent's debt and equity funding. Moreover, unless the subsidiary's equity is assigned the parent's weighted cost of capital, parent shareholders will reap abnormally high returns. Although persuasive on the surface, these arguments conceal serious conceptual and practical problems. Moreover, the validity of double leverage rests on highly questionable assumptions.

The flaws associated with the double leverage approach have been discussed thoroughly in the academic literature. Pettway and Jordan (1983) and Beranek and Miles (1988) point out the flaws in the double leverage argument, particularly the excess return argument, and also demonstrate that the stand-alone method is a superior procedure. Rozeff (1983) discusses the ratepayer cross-subsidies of one subsidiary by another when employing double leverage. Lerner (1973) concludes that the returns granted an equity investor must be based on the risks to which the investor's capital is exposed and not on the investor's source of funds.

Theoretical Issues

The double leverage approach contradicts the core of the cost of capital concept. Financial theory clearly establishes that the cost of equity is the risk-adjusted opportunity cost to the investors and not the cost of the specific capital sources employed by investors. The true cost of capital depends on the use to which the capital is put and not on its source. The *Hope* and *Bluefield* doctrines have made clear that the relevant considerations in calculating a company's cost of capital are the alternatives available to investors and the returns and risks associated with those alternatives. The specific source of funding and the cost of those funds to the investor are irrelevant considerations.

Carrying the double leverage standard to its logical conclusion leads to even more unreasonable prescriptions. If the common shares of the subsidiary were held by both the parent and by individual investors, the equity contributed by the parent would have one cost under the double leverage computation while the equity contributed by the public would have another. This is clearly illogical. Or, does double leverage require tracing the source of funds used by each individual investor so that its cost can be computed by applying double leverage to each individual investor? Of course not! Equity is equity, irrespective of its source, and the cost of that equity is governed by its use, by the risk to which it is exposed.

To illustrate, let us say that an individual investor borrows money at the bank at an after-tax cost of 8% and invests the funds in a speculative oil exploration venture. Clearly, the required return on the oil venture investment is not the

8% cost but rather the return forgone in speculative projects of similar risk, say 20%. Yet, under the double leverage approach, the individual's fair return on this risky venture would be 8%, which is the cost of the capital source, and not 20%, which is the required return on investments of similar risk. Double leverage implies that for all investors who inherited stock or received stock as a gift, the allowed return on equity would be zero, since the cost of the stock to the investors is zero. It also implies that if, tomorrow morning, a subsidiary were sold to a company with a higher cost of capital than the parent, the subsidiary's cost of equity would suddenly become higher on the next morning as a result of the change in ownership. If we assumed that the double leverage concept were appropriate, we would also have to assume that the day following a divestiture or spinoff, the cost of equity of the newly divested or spunoff company suddenly rises by a substantial amount. This is logically absurd, as it is the use of capital that governs its cost, and not its source.

For example, if a subsidiary with a double leverage cost of equity of 12% were sold to another company with a higher cost of capital of, for example, 15%, would regulation alter the return accordingly just because of the change in ownership? If so, the same utility with the same assets and providing the same service under the new management would have a higher cost of service to ratepayers because of the transfer of ownership. Clearly, if a utility subsidiary were allowed an equity return equal to the parent's weighted cost of capital while the same utility were allowed a fair, presumably higher, return were it not part of a holding company complex, an irresistible incentive to dissolve the holding company structure would exist in favor of the one-company operating utility format. The attendant benefits of scale economies and diversification would then be lost to the ratepayers.

The cost of capital is governed by the risk to which the capital is exposed and not by the cost of those funds or whether they were obtained from bondholders or common shareholders. The identity of the subsidiary's shareholders should have no bearing on its cost of equity because it is the risk to which the subsidiary's equity is exposed that governs its cost of money, not whether it is borrowed from bondholders or sold to common shareholders for issued shares. Had the parent company not been in the picture, and had the subsidiary's stock been widely held by the public, the subsidiary would be entitled to a return that would fully cover the cost of both its debt and equity.

Just as individual investors require different returns from different assets in managing their personal affairs, why should regulation cause parent companies making investment decisions on behalf of their shareholders to act any differently? A parent company normally invests money in many operating companies of varying sizes and varying risks. These operating subsidiaries pay different rates for the use of investor capital, such as long-term debt capital, because investors recognize the differences in capital structure, risk, and

prospects between the subsidiaries. Yet, the double leverage calculation would assign the same return to each activity, based on the parent's cost of capital. Investors recognize that different subsidiaries are exposed to different risks, as evidenced by the different bond ratings and cost rates of operating subsidiaries. The same argument carries over to common equity. If the cost rate for debt is different because the risk is different, the cost rate for common equity is also different, and the double leverage adjustment should not obscure this fact.

The double leverage concept is also at odds with the opportunity cost concept of economics. According to this principle of economics, the cost of any resource is the cost of an alternative forgone. The cost of investing funds in an operating utility subsidiary is the return forgone on investments of similar risk. If the fair risk-adjusted return assigned by the market on utility investments is 15%, and the regulator assigns a return less than 15% because of a double leverage calculation, there is no incentive or defensible reason for a parent holding company to invest in that utility.

Fairness and Capital Attraction

The double leverage approach is highly discriminatory, and violates the doctrine of fairness. If a utility is not part of a holding company structure, the cost of equity is computed using one method, say the CAPM method, while otherwise the cost of equity is computed using the double leverage adjustment. Estimating equity costs by one procedure for publicly held utilities and by another for utilities owned by a holding company is inconsistent with financial theory and discriminates against the holding company form of ownership. Two utilities identical in all respects but their ownership format should have the same set of rates. Yet, this would not be the case under the double leverage adjustment.

The capital attraction standard may also be impaired under the double leverage calculation. This is because a utility subsidiary must compete on its own in the market for debt capital, and therefore must earn an appropriate return on equity to support its credit rating. Imputing the parent's weighted cost to the utility's equity capital may result in inadequate equity returns and less favorable coverage, hence impairing the utility subsidiary's ability to attract debt capital under favorable terms.

Questionable Assumptions

Several assumptions underlying the double leverage standard are highly questionable. One assumption, to which the previous numerical illustrations have already alluded, is the traceability of the subsidiary's equity capital to its parent. None of the subsidiary's retained earnings can be traced to the capital raised by the parent. Some analysts salvage the double leverage approach by

assigning one cost rate to retained earnings and another to the common equity capital raised by the parent, with the curious result that equity has two cost rates. The traceability issue goes further. If a parent company issues bonds or preferred stock to acquire an operating subsidiary, the traceability assumption is broken. Corporate reorganizations and mergers further invalidate the traceability assumption.

By virtue of using the parent's weighted cost as the equity cost rate for the subsidiary, another questionable assumption is that the parent capital is invested in subsidiaries that all have the same risks. Lastly, the double leverage procedure makes the unlikely assumption that the parent holding company invests its funds in each subsidiary proportionately to each subsidiary's debt-equity ratio, which is unreasonable.

Double Leverage: A Tautology

The double leverage approach is a tautology. It is not the parent's weighted average cost of capital (WACC) that determines the subsidiary's cost of equity because the parent's WACC is itself a weighted average of equity costs of all subsidiaries. Double leverage adherents confuse the direction of cause and effect. The equity cost of subsidiaries must be found on a stand-alone basis.

The last nail in the double leverage coffin goes like this. If capital market equilibrium is to hold, the cash flows to the parent company's bondholders and stockholders must equal the cash flows from the parent's equity in each subsidiary. Letting K denote the cost of capital, the subscripts p and s denote the parent and subsidiary, D and E the dollar amounts of debt and equity, and the subscripts 'd' and 'e' denote debt and equity, we can therefore say:

$$K_{dp}D_p + K_{ep}E_p = \sum_{s}^{n} K_{es}E_s \qquad (19\text{-}1)$$

The various unknowns, including the parent return on equity, can be found in terms of all the other given variables. What the above equation makes clear is that the parent cost of equity is determined by the subsidiary's cost of equity, and that parent capital costs cannot determine the subsidiary's capital costs. This can be seen even more clearly by dividing the above equation by total parent value V to obtain:

$$K_{dp}D_p/V + K_{ep}E_p/V = \sum_{s}^{n} K_{es}E_s/V \qquad (19\text{-}2)$$

The left side of the equation is the usual expression for the parent's WACC, and the right side is the weighted average of equity costs of all subsidiaries. However,

$$\sum_{s}^{n} E_s = V \qquad (19\text{-}3)$$

so that the parent's WACC is itself a weighted average of equity costs of all subsidiaries. The fundamental logical fault of double leverage is to arbitrarily equate the equity cost of each subsidiary to the left side of the above equation. The inescapable conclusion is that the subsidiary cost of equity must be found on a stand-alone basis, because the parent's WACC is itself a weighted average of subsidiary equity costs.

In summary, the double leverage adjustment has serious conceptual and practical limitations and violates basic notions of finance, economics, and fairness. The assumptions which underlie its use are questionable, if not unrealistic. The approach should not be used in regulatory proceedings.

EXAMPLE 19-1

In the numerical example provided at the beginning of the chapter, the parent's cost of equity capital was arbitrarily and wrongly assumed to be 15%. This example shows that the parent cost of equity consistent with the terms of the example is 23.33%, and not 15%. If the subsidiary was regulated in the correct way, the allowed return is computed as $0.50 \times 10\% + .50 \times 20\% = 15\%$. According to advocates of Double Leverage, this implies excess returns to the parent, that is:

Earnings from the subsidiary to the parent	$\$100 \times 15\% =$	\$15.00
Less total interest:	$\$50 \times 10\% + \$12.50 \times 10\% =$	\$6.25
Earnings to parent equity:		\$8.75

which represents a return of \$8.75/\$37.50 = 23.33%, far in excess of the ***assumed*** parent equity cost of 15%.

Double Leverage advocates adjust for this alleged excess by assigning the parent's overall return of 13.78% to the subsidiary's equity. The subsidiary's overall return becomes 11.88%, as shown below:

	$ Amount	% Weight	Cost	Weighted Cost
Debt - Subsidiary	\$50.00	50.0%	10.0%	5.00%
Equity provided by parent				
Debt - Parent (25%)	\$12.50	12.5%	10.0%	1.25%
Equity - Parent (75%)	\$37.50	37.5%	15.0%	5.63%
		Weighted Cost		11.88%

(continued next page)

EXAMPLE 19-1 *(continued)*

The 11.88% becomes the Double Leverage allowed return on the subsidiary's total assets. Only with this allowed rate of return, according to the tenets of Double Leverage, does the parent's equity receive the ***assumed*** rate of return of 15%. That is, the parent receives $100 × 11.88% = $11.88 less the interest cost of $6.25, or $5.63, on an equity investment of $37.50, which is a 15% return. And, so it seems, the parent receives the required rate of return.

The fundamental flaw of this approach is that the assumptions of the example are internally inconsistent and illogical. When an illustration is constructed with an assumed subsidiary cost of equity, the assumed parent cost of equity must be consistent with it. It is not the parent's weighted average cost of capital which determines the subsidiary's cost of equity because the parent's cost of capital is itself a weighted average of equity costs of all subsidiaries.

Equation 19-2 makes it clear that the parent cost of equity is determined by the subsidiary cost of equity, and that parent capital costs cannot determine subsidiary capital costs. Given the cost of debt K_{dp}, the subsidiary's cost of equity K_s, and the amounts of capital, the above equation implies that the parent equity cost consistent with a 20% subsidiary cost of equity is 23.33%:

$$[\$50 \times 20\% - \$12.50 \times 10\%] / \$37.50 = 23.33\%$$

Conclusions

The double leverage approach has serious conceptual and practical limitations and is not consistent with basic financial theory and the notion of fairness. The assumptions and logic underlying the method are questionable. The double leverage argument violates the core notion that an investment's required return depends on its particular risks. The Double Leverage approach has no place in regulatory practice and should be discarded.

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rate of return of 15 percent. Investors are averse to risk, so there would be a general preference for U.S. Water. People with money to invest would bid for U.S. Water rather than Kelly stock, and Kelly's stockholders would start selling their stock and using the money to buy U.S. Water stock. The buying pressure would tend to drive up the price of U.S. Water stock, and the selling pressure would simultaneously cause Kelly's price to decline.

These price changes, in turn, would cause changes in the expected rates of return on the two securities. Suppose, for example, that the price of U.S. Water stock was bid up from $100 to $150, whereas the price of Kelly's stock declined from $100 to $75. This would cause U.S. Water's expected return to fall to 10 percent, while Kelly's expected return would rise to 20 percent. The difference in returns, 20% − 10% = 10%, is a **risk premium, RP**, which represents the compensation investors require for assuming the additional risk of Kelly stock.

risk premium, RP
The difference between the expected rate of return on a given risky asset and that on a less risky asset

This example demonstrates a very important principle: *In a market dominated by risk-averse investors, riskier securities will have higher expected returns, as estimated by the average investor, than will less risky securities, for if this situation does not hold, actions will occur in the market to force it to occur.* We will consider the question of how much higher the returns on risky securities must be later in the chapter, after we see how diversification affects the way risk should be measured. Then, in Chapter 6, we will see how risk-adjusted rates of return affect the price investors are willing to pay for a security.

PORTFOLIO RISK AND THE CAPITAL ASSET PRICING MODEL

In the preceding section we considered the riskiness of a stock held in isolation. Now we analyze the riskiness of stocks held in portfolios.[6] As we shall see, a stock held as part of a portfolio is less risky than the same stock held in isolation. This fact has been incorporated into a generalized framework for analyzing the relationship between risk and rates of return; this framework is called the **Capital Asset Pricing Model**, or **CAPM**. The CAPM framework is an extremely important analytical tool in both financial management and investment analysis. In the following sections we discuss the elements of the CAPM.[7]

Capital Asset Pricing Model (CAPM)
A model based on the proposition that any stock's required rate of return is equal to the risk-free rate of return plus its risk premium, where risk reflects diversification

[6] A *portfolio* is a collection of investment securities. If you owned some General Motors stock, some Exxon stock, and some IBM stock, you would be holding a three-stock portfolio. For reasons set forth in this section, the majority of all stocks are held as parts of portfolios.

[7] The CAPM is a relatively complex subject, and we present only the basic conclusions in this text. For a more detailed discussion, see any standard investments textbook.

F I F T H E D I T I O N

PRINCIPLES OF CORPORATE FINANCE

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9 Capital Budgeting and Risk

Long before the development of modern theories linking risk and expected return, smart financial managers adjusted for risk in capital budgeting. They realized intuitively that, other things being equal, risky projects are less desirable than safe ones. Therefore financial managers demanded a higher rate of return from risky projects, or they based their decisions on conservative estimates of the cash flows.

Various rules of thumb are often used to make these risk adjustments. For example, many companies estimate the rate of return required by investors in their securities and use the **company cost of capital** to discount the cash flows on all new projects. Since investors require a higher rate of return from a very risky company, such a firm will have a higher company cost of capital and will set a higher discount rate for its new investment opportunities. For example, in Table 8-1 we estimated that investors expected a rate of return of .163 or about 16.5 percent from Microsoft common stock. Therefore, according to the company cost of capital rule, Microsoft should have been using a 16.5 percent discount rate to compute project net present values.[1]

This is a step in the right direction. Even though we can't measure risk or the expected return on risky securities with absolute precision, it is still reasonable to assert that Microsoft faced more risk than the average firm and, therefore, should have demanded a higher rate of return from its capital investments.

But the company cost of capital rule can also get a firm into trouble if the new projects are more or less risky than its existing business. Each project should be evaluated at its *own* opportunity cost of capital. This is a clear implication of the value-additivity principle introduced in Chapter 7. For a firm composed of assets A and B, the firm value is

$$\text{Firm value} = PV(AB) = PV(A) + PV(B) = \text{sum of separate asset values}$$

Here PV(A) and PV(B) are valued just as if they were mini-firms in which stockholders could invest directly. Investors would value A by discounting its forecasted cash flows at a rate reflecting the risk of A. They would value B by discounting at a rate reflecting the risk of B. The two discount rates will, in general, be different.

[1]Microsoft did not use any significant amount of debt financing. Thus its cost of capital is the rate of return investors expect on its common stock. The complications caused by debt are discussed later in this chapter.

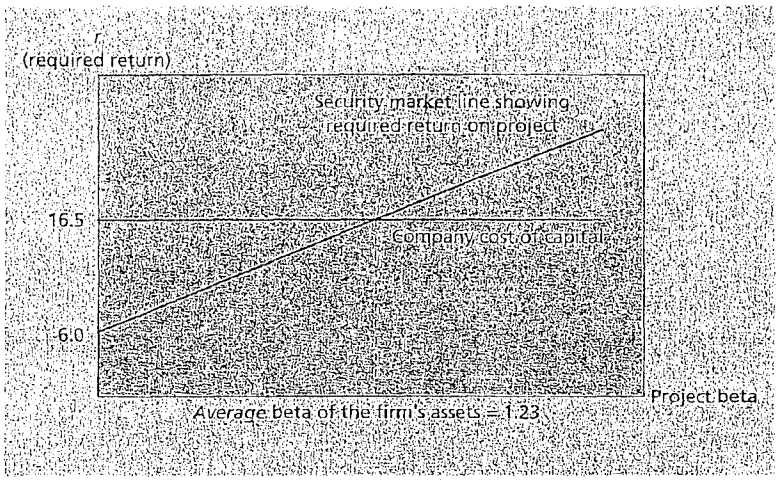

Figure 9-1 A comparison between the company cost of capital rule and the required return under the capital asset pricing model. Microsoft's company cost of capital is about 16.5 percent. This is the correct discount rate only if the project beta is 1.23. In general, the correct discount rate increases as project beta increases. Microsoft should accept projects with rates of return above the security market line relating required return to beta.

If the firm considers investing in a third project C, it should also value C as if C were a mini-firm. That is, the firm should discount the cash flows of C at the expected rate of return that investors would demand to make a separate investment in C. *The true cost of capital depends on the use to which the capital is put.*

This means that Microsoft should accept any project that more than compensates for the *project's beta*. In other words, Microsoft should accept any project lying above the upward-sloping line that links expected return to risk in Figure 9-1. If the project has a high risk, Microsoft needs a higher prospective return than if the project has a low risk. Now contrast this with the company cost of capital rule, which is to accept any project *regardless of its risk* as long as it offers a higher return than the *company's* cost of capital. In terms of Figure 9-1, the rule tells Microsoft to accept any project above the horizontal cost-of-capital line, i.e., any project offering a return of more than 16.5 percent.

It is clearly silly to suggest that Microsoft should demand the same rate of return from a very safe project as from a very risky one. If Microsoft used the company cost of capital rule, it would reject many good low-risk projects and accept many poor high-risk projects. It is also silly to suggest that just because Duke Power has a low company cost of capital, it is justified in accepting projects that Microsoft would reject. If you followed such a rule to its seemingly logical conclusion, you would think it possible to enlarge the company's investment opportunities by investing a large sum in Treasury bills. That would make the common stock safe and create a low company cost of capital.[2]

The notion that each company has some individual discount rate or cost of capital is widespread, but far from universal. Many firms require different returns from different categories of investment. For example, discount rates might be set as follows:

[2]If the present value of an asset depended on the identity of the company that bought it, present values would not add up. Remember, a good project is a good project is a good project.

Category	Discount Rate
Speculative ventures	30%
New products	20%
Expansion of existing business	15% (company cost of capital)
Cost improvement, known technology	10%

The capital asset pricing model is widely used by large corporations to estimate the discount rate. It states

$$\text{Expected project return} = r = r_f + (\text{project beta})(r_m - r_f)$$

To calculate this, you have to figure out the project beta. Before thinking about the betas of individual projects, we will look at some problems you would encounter in using beta to estimate a company's cost of capital. It turns out that beta is difficult to measure accurately for an individual firm: Much greater accuracy can be achieved by looking at an average of similar companies. But then we have to define *similar*. Among other things, we will find that a firm's borrowing policy affects its stock beta. It would be misleading, e.g., to average the betas of Chrysler, which has been a heavy borrower, and General Motors, which has generally borrowed less.

The company cost of capital is the correct discount rate for projects that have the same risk as the company's existing business but *not* for those projects that are safer or riskier than the company's average. The problem is to judge the relative risks of the projects available to the firm. To handle that problem, we will need to dig a little deeper and look at what features make some investments riskier than others. After you know *why* AT&T stock has less market risk than, say, Ford Motor, you will be in a better position to judge the relative risks of capital investment opportunities.

There is still another complication: Project betas can shift over time. Some projects are safer in youth than in old age; others are riskier. In this case, what do we mean by *the* project beta? There may be a separate beta for each year of the project's life. To put it another way, can we jump from the capital asset pricing model, which looks out one period into the future, to the discounted-cash-flow formula that we developed in Chapters 2 and 6 for valuing long-lived assets? Most of the time it is safe to do so, but you should be able to recognize and deal with the exceptions.

We will use the capital asset pricing model, or CAPM, throughout this chapter. But don't infer that the CAPM is the last word on risk and return. The principles and procedures covered in this chapter work just as well with other models such as arbitrage pricing theory (APT). For example, we could have started with an APT estimate of the expected rate of return on Microsoft stock; the discussion of company and project costs of capital would have followed exactly.

9-1 MEASURING BETAS

Suppose that you were considering an across-the-board expansion by your firm. Such an investment would have about the same degree of risk as the existing business. Therefore you should discount the projected flows at the company cost of capital. To estimate that, you could begin by estimating the beta of the company's stock.

An obvious way to measure the beta of the stock is to look at how its price has responded in the past to market movements. For example, in Figure 9-2*a* and *b* we have plotted monthly rates of return from AT&T and Hewlett-Packard against mar-

Thus we could view the project as offering an expected payoff of .5(1500) + .5(0) = 750, or $750,000, at $t = 1$ on a $125,000 investment at $t = 0$. Of course, the certainty equivalent of the payoff is less than $750,000, but the difference would have to be very large to justify rejecting the project. For example, if the certainty equivalent is half the forecasted cash flow and the risk-free rate is 7 percent, the project is worth $225,500:

$$\text{NPV} = C_0 + \frac{\text{CEQ}_1}{1 + r_f}$$
$$= -125 + \frac{.5(750)}{1.07} = 225.5, \text{ or } \$225{,}500$$

This is not bad for a $125,000 investment—and quite a change from the negative NPV that management got by discounting all future cash flows at 25 percent.

A Common Mistake

You sometimes hear people say that because distant cash flows are "riskier," they should be discounted at a higher rate than earlier cash flows. That is quite wrong: Using the same risk-adjusted discount rate for each year's cash flow implies a larger deduction for risk from the later cash flows. The reason is that the discount rate compensates for the risk borne *per period*. The more distant the cash flows, the greater the number of periods and the larger the *total* risk adjustment.

It makes sense to use a single risk-adjusted discount rate as long as the project has the same market risk at each point in its life. But look out for exceptions like the electric mop project, where market risk changes as time passes.

9-6 SUMMARY

In Chapter 8 we set out some basic principles for valuing risky assets. In this chapter we have shown you how to apply these principles to practical situations.

The problem is easiest when you believe that the project has the same market risk as the company's existing assets. In this case, the required return equals the required return on a portfolio of the company's securities. This is called the *company cost of capital*.

Capital asset pricing theory states that the required return on any asset depends on its risk. In this chapter we have defined risk as beta and used the capital asset pricing model to calculate expected returns.

The most common way to estimate the beta of a stock is to figure out how the stock price has responded to market changes in the past. Of course, this will give you only an estimate of the stock's true beta. You may get a more reliable figure if you calculate an industry beta for a group of similar companies.

Suppose that you now have an estimate of the stock's beta. Can you plug that into the capital asset pricing model to find the company's cost of capital? No, the stock beta may reflect both business and financial risk. Whenever a company borrows money, it increases the beta (and the expected return) of its stock. Remember, the company cost of capital is the expected return on a portfolio of all the firm's securities, not just the common stock. You can calculate it by estimating the expected return on each of the securities and then taking a weighted average of these separate returns. Or you can calculate the beta of the portfolio of securities and then plug this *asset beta* into the capital asset pricing model.

The company cost of capital is the correct discount rate for projects that have the same risk as the company's existing business. Many firms, however, use the company cost of capital to discount the forecasted cash flows on all new projects. This is a dangerous procedure. In principle, each project should be evaluated at its own opportunity cost of capital; the true cost of capital depends on the use to which the capital is put. If we wish to estimate the cost of capital for a particular project, it is *project risk* that counts. Of course the company cost of capital is fine as a discount rate for average-risk projects. It is also a useful starting point for estimating discount rates for safer or riskier projects.

We cannot give you a neat formula that will allow you to estimate project betas, but we can give you some clues. First, avoid adding fudge factors to discount rates to offset worries about bad project outcomes. Adjust cash-flow forecasts to give due weight to bad outcomes as well as good; *then* ask whether the chance of bad outcomes adds to the project's market risk. Second, you can often identify the characteristics of a high- or low-beta project even when the project beta cannot be calculated directly. For example, you can try to figure out how much the cash flows are affected by the overall performance of the economy: Cyclical investments are generally high-beta investments. You can also look at the project's operating leverage: Fixed production charges work like fixed debt charges; i.e., they increase beta.

There is one more fence to jump. Most projects produce cash flows for several years. Firms generally use the same risk-adjusted rate r to discount each of these cash flows. When they do this, they are implicitly assuming that cumulative risk increases at a constant rate as you look further into the future. That assumption is usually reasonable. It is precisely true when the project's future beta will be constant, i.e., when risk *per period* is constant.

But exceptions sometimes prove the rule. Be on the alert for projects where risk clearly does *not* increase steadily. In these cases, you should break the project into segments within which the same discount rate can be reasonably used. Or you should use the certainty-equivalent version of the DCF model, which allows separate risk adjustments to each period's cash flow.

APPENDIX: USING THE CAPITAL ASSET PRICING MODEL TO CALCULATE CERTAINTY EQUIVALENTS

When calculating present value, you can take account of risk in either of two ways. You can discount the expected cash flow C_1 by the risk-adjusted discount rate r:

$$\text{PV} = \frac{C_1}{1 + r}$$

Alternatively, you can discount the certainty-equivalent cash flow CEQ_1 by the risk-free rate of interest r_f:

$$\text{PV} = \frac{\text{CEQ}_1}{1 + r_f}$$

In this appendix we show how you can derive CEQ_1 from the capital asset pricing model.

We know from our present value formula that $1 + r$ equals the expected dollar payoff on the asset divided by its present value:

Do Analyst Conflicts Matter? Evidence from Stock Recommendations

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Abstract

We examine whether conflicts of interest with investment banking and brokerage businesses induce sell-side analysts to issue optimistic stock recommendations and, if so, whether investors are misled by such biases. Using quantitative measures of potential conflicts constructed from a novel data set containing revenue breakdowns of analyst employers, we find that recommendation levels are indeed positively related to conflict magnitudes. The optimistic bias stemming from investment banking conflicts was especially pronounced during the late-1990s stock market bubble. However, evidence from the response of stock prices and trading volumes to upgrades and downgrades suggests that the market recognizes analysts' conflicts and properly discounts analysts' opinions. This pattern persists even during the bubble period. Moreover, the 1-year stock performance following revised recommendations is unrelated to the magnitude of conflicts. Overall, our findings do not support the view that conflicted analysts are able to systematically mislead investors with optimistic stock recommendations.

1. Introduction

In April 2003, 10 of the largest Wall Street firms reached a landmark settlement with state and federal securities regulators on the issue of conflicts of interest

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faced by stock analysts.[1] The settlement requires the firms to pay a record $1.4 billion in compensation and penalties in response to government charges that the firms issued optimistic stock research to win favor with potential investment banking (IB) clients. Part of the settlement funds are earmarked for investor education and for provision of research from independent firms. In addition to requiring large monetary payments, the settlement mandates structural changes in the firms' research operations and requires the firms to disclose conflicts of interest in analysts' research reports.

The notion that investors are victims of biased stock research presumes that (1) analysts respond to the conflicts by inflating their stock recommendations and (2) investors take analysts' recommendations at face value. Even if analysts are biased, it is possible that investors understand the conflicts of interest inherent in stock research and rationally discount analysts' opinions. This alternative viewpoint, if accurate, would lead to very different conclusions about the consequences of analysts' research. Indeed, investors' rationality and self-interested behavior imply that stock prices should accurately reflect a consensus about the informational quality of public announcements (Grossman 1976; Grossman and Stiglitz 1980). Rational investors would recognize and adjust for analysts' potential conflicts of interest and thereby largely avoid the adverse consequences of biased stock recommendations.

In this article, we provide evidence on the extent to which analysts and investors respond to conflicts of interest in stock research. We address four questions. First, is the extent of optimism in stock recommendations related to the magnitudes of analysts' conflicts of interest? Second, to what extent do investors discount the opinions of more conflicted analysts? In particular, do stock prices and trading volumes react to recommendation revisions in a manner that rationally reflects the degree of analysts' conflicts? Third, is the medium-term (that is, 3- to 12-month) performance of recommendation revisions related to conflict severity? And, finally, did conflicts of interest affect analysts or investors differently during the late-1990s stock bubble than during the postbubble period? The answers to these questions are clearly of relevance to stock market participants, public policy makers, regulators, and the academic profession.

We use a unique, hand-collected data set that contains the annual revenue breakdown for 232 public and private analyst employers. This information allows us to construct quantitative measures of the magnitude of potential conflicts not only from IB business but also from brokerage business. We analyze a sample of over 110,000 stock recommendations issued by over 4,000 analysts during the 1994–2003 time period. Using univariate tests as well as cross-sectional regressions that control for the size of the company followed and individual analysts' experience, resources, workloads, and reputations, we attempt to shed

[1] Two more securities firms (Deutsche Bank Securities Inc. and Thomas Weisel Partners LLC) were added to the formal settlement in August 2004.

light both on how analysts respond to pressures from IB and brokerage businesses and on how investors compensate for the existence of such conflicts of interest.

A number of studies (for example, Dugar and Nathan 1995; Lin and McNichols 1998; Michaely and Womack 1999; Dechow, Hutton, and Sloan 2000; Bradley, Jordan, and Ritter 2008) focus on conflicts faced by analysts in the context of existing underwriting relationships (see also Malmendier and Shanthikumar 2007; Cliff 2007).[2] Our article complements this literature in several ways. First, we take into account the pressure to generate underwriting business from both current and potential client companies. Even if an analyst's firm does not currently do IB business with a company that the analyst tracks, it might like to do so in the future. Second, we examine the conflict between research and all IB services (including advice on mergers, restructuring, and corporate control), rather than just underwriting. Third, we examine conflicts arising from brokerage business in addition to those from IB.[3]

Fourth, the prior empirical finding that underwriter analysts tend to be more optimistic than other analysts is consistent with two alternative interpretations: (*a*) an optimistic report on a company by an underwriter analyst is a reward for past IB business or an attempt to win future IB business by currying favor with the company or (*b*) a company chooses an underwriter whose analyst already likes the stock. The second interpretation implies that underwriter choice is endogenous and does not necessarily imply a conflict of interest. We sidestep this issue of endogeneity by not focusing on underwriting relations between an analyst's firm and the company followed. Instead, our conflict measures focus on the importance to the analyst's firm of IB and brokerage businesses, as measured by the percentage of its annual revenue derived from IB business and from brokerage commissions. Unlike underwriting relations between an analyst's firm and the company followed, the proportions of the entire firm's revenues from each of these businesses can reasonably be viewed as given, exogenous variables from the viewpoint of an individual analyst. Finally, our approach yields substantially larger sample sizes than those used in prior research, and it therefore leads to greater statistical reliability of the results.

Several articles adopt an approach that is similar in spirit to ours. For example, Barber, Lehavy, and Trueman (2007) find that recommendation upgrades (downgrades) by investment banks—which typically also have brokerage businesses—

[2] Bolton, Freixas, and Shapiro (2007) theoretically analyze a different type of conflict of interest in financial intermediation, one faced by a financial advisor whose firm also produces financial products (such as in-house mutual funds). Mehran and Stulz (2007) provide an excellent review of the literature on conflicts of interest in financial institutions.

[3] Hayes (1998) analyzes how pressure on analysts to generate brokerage commissions affects the availability and accuracy of earnings forecasts. Both Irvine (2004) and Jackson (2005) find that analysts' optimism increases a brokerage firm's share of the trading volume. Ljungqvist et al. (2007) find that analysts employed by larger brokerage houses issue more optimistic recommendations and more accurate earnings forecasts. However, none of these articles examines how investors' responses to analysts' recommendations and the investment performance of recommendations vary with the severity of brokerage conflicts, issues that we investigate here.

underperform (outperform) similar recommendations by non-IB brokerages and independent research firms. Cowen, Groysberg, and Healy (2006) find that full-service securities firms—which have both IB and brokerage businesses—issue less optimistic forecasts and recommendations than do non-IB brokerage houses. Finally, Jacob, Rock, and Weber (2008) find that short-term earnings forecasts made by investment banks are more accurate and less optimistic than those made by independent research firms. We extend this line of research by quantifying the reliance of a securities firm on IB and brokerage businesses. This is an important feature of our article for at least two reasons. First, given that many securities firms operate in multiple lines of business, it is difficult to classify them by business lines. By separately measuring the magnitudes of both IB and brokerage conflicts in each firm, our approach avoids the need to rely on a classification scheme. Second, since the focus of this research is on the consequences of analysts' conflicts, the measurement of those conflicts is important. Our conclusions sometimes differ from those in classification-based studies.

We find that analysts do indeed seem to respond to pressures from IB and brokerage businesses: larger potential conflicts of interest from these businesses are associated with more positive stock recommendations. We also document that the distortive effects of IB conflicts were larger during the late-1990s stock bubble than during the postbubble period. Nonetheless, the empirical analysis yields several pieces of evidence to suggest that investors are sophisticated enough to adjust for these biases. First, the short-term reactions of both stock prices and trading volumes to recommendation upgrades are negatively and statistically significantly related to the magnitudes of potential IB or brokerage conflicts. For downgrades, the corresponding relation is negative for stock prices but positive for trading volumes. Second, the 1-year investment performance after recommendation revisions bears no systematic relation to the magnitude of conflicts. Finally, investors continued to discount conflicted analysts' opinions during the bubble period, even amid the euphoria prevailing in the market at the time. Together these results strongly support the idea that the marginal investor, taking analysts' conflicts into account, rationally discounts optimistic stock recommendations.[4]

The remainder of the article is organized as follows. We discuss the issues in Section 2 and describe our sample and data in Section 3. Section 4 examines the relation between recommendation levels and the degree of IB or brokerage conflict faced by analysts. Section 5 analyzes how conflicts are related to the response of stock prices or trading volumes to recommendation revisions. Section

[4] In a companion paper (Agrawal and Chen 2005), we find that analysts appear to respond to conflicts when making long-term earnings growth projections but not short-term earnings forecasts. This finding is consistent with the idea that, with short-term forecasts, analysts worry about their deception being revealed with the next quarterly earnings release, but they have greater leeway with long-term forecasts. We also find that the frequency of forecast revisions is positively related to the magnitude of brokerage conflicts, and several tests suggest that analysts' trade generation incentives impair the quality of stock research.

6 investigates the relation between conflicts and the investment performance of recommendation revisions. Section 7 presents our results for the late-1990s stock bubble and postbubble periods, and Section 8 concludes.

2. Issues and Hypotheses

Investment banking activity is a potential source of analyst conflict that has received widespread attention in the financial media (for example, Gasparino 2002; Maremont and Bray 2004) as well as the academic literature (for example, Lin and McNichols 1998; Michaely and Womack 1999). When IB business is an important source of revenue for a securities firm, a stock analyst employed by the firm often faces pressure to inflate his or her recommendations. This pressure is due to the fact that the firm would like to sell IB services to a company that the analyst tracks.[5] The company, in turn, would like the analyst to support its stock with a favorable opinion. Thus, we expect that the more critical is IB revenue to an analyst's employer, the greater the incentives an analyst faces to issue optimistic recommendations.[6]

Analysts also face a potential conflict with their employers' brokerage businesses. Here, the pressure on analysts originates not from the companies that they follow but from within their employing firms. Brokerage business generates a large portion of most securities firms' revenues, and analyst compensation schemes are typically related explicitly or implicitly to trading commissions. Thus, analysts have incentives to increase trading volumes in both directions (that is, buys and sells). Given the many institutional constraints that make short sales relatively costly, many more investors participate in stock purchases than in stock sales.[7] Indeed, it is mostly existing shareholders of a stock who sell. This asymmetry between purchases and sales implies that the more important brokerage business is to an analyst's employer, the more pressure the analyst faces to be bullish when issuing recommendations.

Analysts who respond to the conflicts they face by issuing blatantly misleading stock recommendations can develop bad reputations that reduce their labor income and hurt their careers.[8] Stock recommendations, however, are not as easily evaluated as other outputs of analysts' research, such as 12-month price targets or quarterly earnings forecasts, which can be judged against public, near-

[5] Throughout this article, we refer to an analyst's employer as a "firm" and a company followed by an analyst as a "company."

[6] Ljungqvist, Marston, and Wilhelm (2006, forthcoming) find that, while optimistic recommendations do not help the analyst's firm win the lead underwriter or comanager positions in general, they help the firm win the comanager position in deals in which the lead underwriter is a commercial bank.

[7] Numerous regulations in the United States increase the cost of selling shares short (see, for example, Dechow et al. 2001). Therefore, the vast majority of stock sales are regular sales rather than short sales. For example, over the 1994–2001 period, short sales comprised only about 10 percent of the annual New York Stock Exchange trading volume (New York Stock Exchange 2002).

[8] See Jackson (2005) for a theoretical model showing that analysts' concerns about their reputations can reduce optimistic biases arising from brokerage business.

term realizations. So it is not clear whether analysts' career concerns can completely prevent them from responding to pressures to generate IB or brokerage business.

The relation between conflict severity and the short-term (2- or 3-day) stock price impact of a recommendation should depend on whether investors react to the opinion rationally or naively.[9] Under the rational discounting hypothesis, the relation should be asymmetric for upgrades and downgrades. For upgrades, the stock price response should be negatively related to the degree of conflict. This implication arises because analysts who face greater pressure from IB or brokerage business are likely to be more bullish in their recommendations, and rational investors should discount an analyst's optimism more heavily. For downgrades, however, the story is different. When an analyst downgrades a stock despite facing large conflicts, rational investors should find the negative opinion more convincing and should be more likely to revalue the stock accordingly. This implies that the short-term stock price response to a downgrade should be negatively related to the degree of conflict.

The rational discounting hypothesis also predicts cross-sectional relations between conflict severity and the short-term trading volume responses to recommendations. As Kim and Verrecchia (1991) demonstrate in a rational expectations model of trading, the more precise a piece of news, the more individuals will revise their prior beliefs and, hence, the more trading that will result. In the present context, investor rationality implies that an upgrade by a highly conflicted analyst represents less precise news to investors, and so such a revision should be followed by a relatively small abnormal volume. But when an analyst downgrades a stock despite a substantial conflict, the signal is regarded as being more precise, and thus the downgrade should lead to relatively large abnormal trading.

By contrast, under the naive investor hypothesis, investors are largely ignorant of the distortive pressures that analysts face and accept analysts' recommendations at face value. This implies that there should be no relation between conflict severity and the short-term response of either stock prices or trading volume to recommendation revisions. Furthermore, the absence of a systematic relation should hold true for both upgrades and downgrades.

What are the implications of the two hypotheses for the medium-term (3- to 12-month) investment performance of analysts' recommendations? Under the rational discounting hypothesis, there should be no systematic relation between the magnitude of conflicts faced by an analyst and the performance of his or her stock recommendations: the market correctly anticipates the potential distortions up front and accordingly adjusts its response. But the naive investor hypothesis predicts that performance should be negatively related to conflict

[9] This framework follows Kroszner and Rajan (1994) and Gompers and Lerner (1999), who analyze the conflicts that a bank faces in underwriting securities of a company when the bank owns a (debt or equity) stake in it.

severity for both upgrades and downgrades. That is, investors ignore analysts' conflicts up front and pay for their ignorance later.

3. Sample and Data

3.1. Sample

Our sample of stock recommendations comes from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendations History file. This file contains data on newly issued recommendations as well as revisions and reiterations of existing recommendations made by individual analysts over the period 1993–2003. Although the exact wording of recommendations can vary considerably across brokerage houses, I/B/E/S classifies all recommendations into five categories ranging from strong buy to strong sell. We rely on the I/B/E/S classification and encode recommendations on a numerical scale from 5 (strong buy) to 1 (strong sell).

Since we are primarily interested in examining how the nature and consequences of analysts' recommendations are related to IB or brokerage business, we require measures of the importance of these business lines to analysts' employers. Under U.S. law, all registered broker-dealer firms must file audited annual financial statements with the Securities and Exchange Commission (SEC) in x-17a-5 filings.[10] These filings contain information on broker-dealer firms' principal sources of revenue, broken down into revenue from IB, brokerage commissions, and all other businesses (such as asset management and proprietary trading). We use these filings to obtain various financial data, including data on our key explanatory variables: the fractions of total brokerage house revenues from IB and from brokerage commissions. Beginning with the names of analyst employers contained in the I/B/E/S Broker Translation file,[11] we search for all available revenue information in x-17a-5 filings from 1994 to 2003.[12] For publicly traded broker-dealer firms, we also use 10-K annual report filings over the sample period to gather information on revenue breakdowns, if necessary. We thus obtain annual data from 1994 to 2003 on IB revenue, brokerage revenue, and other revenue for 188 privately held and 44 publicly traded brokerage houses.[13] For each brokerage house, we match recommendations to the latest broker-year revenue data preceding the recommendation date. Over the sample period, we

[10] The Securities Exchange Act, sections 17(a)–17(e), requires these filings. We accessed them from Thomson Financial's Global Access database and the Securities and Exchange Commission's (SEC's) public reading room in Washington, D.C.

[11] We use the file supplied directly by the Institutional Brokers Estimate System (I/B/E/S) on CD-ROM. This file does not recode the name of an acquired brokerage firm to that of its acquirer for years before the merger.

[12] The electronic availability of x-17a-5 filings is very limited prior to 1994, the year the SEC first mandated electronic form filing. Hence, we do not search for revenue information prior to 1994.

[13] We exclude a small number of firm-years in which the total revenue is negative (for example, because of losses from proprietary trading).

are able to match in this fashion 110,493 I/B/E/S recommendations issued by 4,089 analysts.

All broker-dealer firms are required to publicly disclose their balance sheets as part of their x-17a-5 filings. But a private broker-dealer firm can withhold the public disclosure of its income statement, which contains the revenue breakdown information needed for this study, if the SEC deems that such disclosure would harm the firm's competitive position. Thus, our sample of private securities firms is limited to broker-dealers that disclose their revenue breakdowns in x-17a-5 filings. We examine whether this selection bias affects our main results by separately analyzing the subsample of publicly traded securities firms, for which public disclosure of annual revenue information is mandatory. Our findings do not appear to be affected by this selection bias. All of our results for the subsample of publicly traded securities firms are qualitatively similar to the results for the full sample reported in the article. In the Appendix, we describe the characteristics of disclosing and nondisclosing private securities firms, shed some light on the firms' income statement disclosure decisions, and use a selectivity-corrected probit model to examine whether the resulting selection bias can explain analysts' response to conflicts in these private firms. We find no evidence that selection bias affects our results for these firms.

3.2. Characteristics of Analysts, Their Employers, and Companies Followed

We next measure characteristics of analysts, their employers, and the companies they cover. Prior research (for example, Clement 1999; Jacob, Lys, and Neale 1999) finds that analysts' experience and workloads affect the accuracy and credibility of their research. Using the I/B/E/S Detail History files, we measure an analyst's experience and workloads in terms of all research activity reported in I/B/E/S, including stock recommendations, quarterly and annual earnings-per-share forecasts, and long-term earnings growth forecasts. We measure general research experience as the number of days since an analyst first issued research on any company in the I/B/E/S database and company-specific research experience as the number of days since an analyst first issued research on a particular company. We measure an analyst's workload as the number of different companies or the number of different four-digit I/B/E/S sector industry groups (S/I/Gs)[14] for which the analyst issued research in a given calendar year.

The amount of resources devoted to investment research within brokerage houses also affects the quality of analysts' research (Clement 1999). Larger houses have access to better technology, information, and support staff. Accordingly, we use three measures of brokerage house size: the number of analysts issuing stock recommendations for a brokerage house over the course of a calendar year, book value of total assets, and net sales. All of our subsequent results are qual-

[14] The I/B/E/S sector industry group numbers are six-digit codes that provide information on the industry sectors and subsectors for companies in the I/B/E/S database. We use the first four digits, which correspond to broad industry groupings.

Table 1
Revenue Sources (%) of Analysts' Employers

Recommendation Level	Investment Banking		Brokerage Commission		Sample Size
	Mean	Median	Mean	Median	
5 (Strong buy)	13.94	11.81	29.87	24.09	28,901
4 (Buy)	13.81	11.21	26.68	17.22	37,478
3 (Hold)	12.68	11.13	28.44	24.07	37,883
2 (Sell)	11.61	10.55	23.13	16.12	4,875
1 (Strong sell)	16.27	14.90	33.44	24.95	1,356
p-Value (4 and 5) versus (1 and 2)	.0000	.0000	.0000	.0023	

Note. Shown are the percentages of analyst employer revenues from investment banking and brokerage commissions, by recommendation level. Data are for 110,493 stock recommendations and are drawn from the Institutional Brokers Estimate System U.S. Detail Recommendations History file for 1994–2003.

itatively similar under each of the three size measures. To save space, we report results only of tests based on the first size measure.

To capture the degree to which investors believe that individual analysts have skill in providing timely and accurate research, we use two measures of analysts' reputation. The first is based on *Institutional Investor* (*II*) magazine's All-America Research Team designation. Each year around October 15, *II* mails an issue to subscribers that lists the names of analysts who receive the most votes in a poll of institutional money managers. About 300–400 analysts are identified. We construct a variable that indicates, for each recommendation revision, whether the recommending analyst was named to the first, second, third, or honorable mention team in the latest annual survey. As a complementary, objective measure of analysts' reputation, we use a variable based on the *Wall Street Journal*'s (*WSJ*'s) annual All-Star Analysts Survey. The *WSJ* All-Star Analysts are determined by an explicit set of criteria relating to past stock-picking performance and forecasting accuracy.[15] The survey covers about 50 industries annually and names the top five stock pickers and top five earnings forecasters in each industry.[16]

Tables 1 and 2 report summary data on the characteristics of our sample. In Table 1, both the mean and the median percentages of analyst employer revenues derived from IB decline monotonically over the first four recommendation levels, but these values are the highest for strong sell recommendations. Similarly, it is the brokerage firms issuing strong sell recommendations that generally derive

[15] We recognize that the performance metrics used in the *Wall Street Journal* (*WSJ*) All-Star Analysts Survey are public information and can, in principle, be replicated by investors. However, to the extent that computing and evaluating analysts' performance is a costly activity, being named an All-Star Analyst can still affect an analyst's reputation and credibility.

[16] Since the I/B/E/S Broker Translation File provides only analysts' last names and first initials, in some instances it is not possible to ascertain from the I/B/E/S data alone whether an analyst in our sample was named to the *Institutional Investor* (*II*) or *WSJ* team. For these cases, we determine team membership of analysts from NASD BrokerCheck, an online database (http://www.nasd.com, accessed October 2004) that provides the full names of registered securities professionals as well as their employment and registration histories for the past 10 years. The database also keeps track of analysts' name changes (such as those resulting from marriage).

Table 2
Characteristics of Analysts, Firms, and Companies Followed

Characteristic	Mean	Median	SD	Sample Size
Investment banking revenue (%)	13.60	11.25	11.93	94,892
Brokerage commission revenue (%)	28.74	24.07	24.75	94,892
Analyst's company-specific experience (years)	2.42	1.20	3.29	85,531
Analyst's general experience (years)	6.41	4.90	5.32	85,531
Analysts employed by a firm	86.34	60	79.73	94,618
Companies followed by an analyst	17.24	15	12.93	84,016
Four-digit I/B/E/S S/I/Gs followed by an analyst	3.05	3	1.90	84,014
Institutional Investor All-America stock picker	.005	0	.07	85,531
Institutional Investor All-America Research Team member	.035	0	.18	85,531
Wall Street Journal All-Star stock picker	.018	0	.13	85,531
Wall Street Journal All-Star Analyst	.136	0	.34	85,531
Market capitalization ($ millions)	8,804.46	1,367.22	27,758.81	81,333
Analyst following	9.14	7	6.88	92,869

Note. Data are for 94,892 recommendation revisions and are drawn from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendations History file for 1994–2003. Recommendation revisions include recommendation changes as well as initiations, resumptions, and discontinuations of coverage. Analysts' experience is measured from all analyst research activity reported in I/B/E/S, including earnings-per-share forecasts, long-term earnings growth forecasts, and stock recommendations. An analyst is considered to be a top stock picker or team member if he or she appeared in the relevant portion of the most recent analyst survey by *Institutional Investor* or the *Wall Street Journal* at the time of a recommendation revision. Market capitalization is measured 12 months before the end of the current month, and analyst following is measured on the basis of stock recommendation coverage. Market capitalization values are inflation adjusted (with Consumer Price Index numbers and with 2003 as the base year). S/I/G = sector industry group.

the highest percentage of their total revenues from brokerage commissions. Notably, in each of the five categories, the mean percentage of revenue from commissions is about twice as large as the mean percentage of revenue from IB. This fact underscores the importance of trading commissions as a source of revenue for many securities firms. The last column shows that about 95 percent of the recommendations in the sample are at levels 5 (strong buy), 4 (buy), or 3 (hold). Levels 1 (strong sell) and 2 (sell) represent only about 1 percent and 4 percent of all recommendations, respectively.

The data in Table 2 provide a flavor of our sample of analysts and their employers. As noted by Hong, Kubik, and Solomon (2000), careers as analysts tend to be relatively short. The median recommendation is made by an analyst with under 5 years of experience, of which just over a year was spent following a given stock. Stock analysts tend to be highly specialized, following a handful of companies in a few industries. The median recommendation is made by an analyst following 15 companies in three industries who works for a securities firm employing 60 analysts. Being named as an All-America Research Team member by *II* is a rare honor, received by under 5 percent of all analysts in our sample. Finally, the typical company followed is large, with mean (median) market capitalization of about $8.8 billion ($1.4 billion) in inflation-adjusted

2003 dollars. Over the time span of a year, a company is tracked by a mean (median) of 9.1 (7) analysts.

4. Conflicts and the Levels of Analyst Recommendations Net of the Consensus

In this section, we examine whether the level of an analyst's stock recommendation net of the consensus (that is, median) recommendation level is related to the conflicts that he or she faces. We start by ascertaining the level of the outstanding recommendation on each stock by each analyst following it at the end of each quarter (March, June, September, December) from 1995 through 2003. An analyst's recommendation on a stock is included only if it is newly issued, reiterated, or revised in the preceding 12 months.

We estimate a regression explaining individual analysts' net stock recommendation levels at the end of a quarter (which is the recommendation level minus the median recommendation level across all analysts following a stock during the quarter).[17] The regression pools observations across analysts, stocks, and quarters and includes our two main explanatory variables: the percentage of an analyst employer's total revenues from IB and the percentage from brokerage commissions. Following Jegadeesh et al. (2004) and Kadan et al. (forthcoming), who find that momentum is an important determinant of analysts' recommendations, we control for the prior 6-month stock return.

The regression also controls for other factors that can affect the degree of analysts' optimism, such as the size of the company followed and the resources, reputation, experience, and workload of an analyst. As a measure of the resources available to an analyst, a dummy variable is used for a large brokerage house, and it equals one if the firm ranks in the top quartile of all houses in terms of the number of analysts employed during the year. The size of the company followed is measured by the natural logarithm of its market capitalization, measured 12 months before the end of the month. We measure an analyst's reputation by dummy variables that equal one if the recommending analyst was named in the most recent year as an All-America Research Team member by *II* or as an All-Star Analyst by the *WSJ*. An analyst's company-specific research experience is measured by the natural logarithm of one plus the number of days an analyst has been producing research (including earnings-per-share forecasts, long-term growth forecasts, or stock recommendations) on the company. We measure an analyst's workload by the natural logarithm of one plus the number of companies for which he or she produces forecasts or recommendations in the current year.

Finally, we control for industry and time period effects by adding dummy variables for I/B/E/S two-digit S/I/G industries and for each calendar quarter (March 1995, June 1995, and so forth). Since net recommendation levels can

[17] To ensure meaningful variation in the dependent variable, we omit stocks followed by only one analyst in a quarter.

Table 3

Ordered Probit Analysis of Recommendation Levels Net of the Consensus

Explanatory Variable	Coefficient	z-Statistic
Investment banking revenue (%)	.4167	17.35
Brokerage commission revenue (%)	.0363	3.00
Prior 6-month stock return	−.0068	−2.89
Large brokerage house dummy	−.0639	−8.60
Company size	.0038	2.89
Institutional Investor All-America Research Team dummy	.0032	.15
Wall Street Journal All-Star Analyst dummy	−.0196	−2.23
Company-specific research experience	.0012	1.42
Number of companies followed	.0070	4.64

Note. The results are from ordered probit regressions explaining individual analysts' stock recommendation levels net of the consensus (that is, median) recommendation level at the end of each quarter (March, June, September, December) for 1995–2003. Observations are excluded if the analyst issued no new or revised recommendation in the preceding 12 months. The regression includes observations pooled across analysts, stocks, and quarters. Data on recommendations are drawn from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendations History file for 1994–2003. Investment banking or brokerage commission revenue refer to the percentage of the brokerage firm's total revenues derived from investment banking or brokerage commissions. The large brokerage house dummy is an indicator variable that equals one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing stock recommendations listed in I/B/E/S in a given calendar year. Company size is the natural logarithm of the market capitalization of the company followed, measured 12 months prior to the end of the current month. The *Institutional Investor* All-America Research Team and *Wall Street Journal* All-Star Analyst dummies are indicator variables that equal one if the recommending analyst was listed as an All-America Research Team member or All-Star Analyst in the most recent analyst ranking. Company-specific research experience is the natural log of one plus the number of days that an analyst has been issuing I/B/E/S research on a company. Number of companies followed equals the natural log of one plus the number of companies followed by an analyst in the current calendar year. The regression includes dummy variables for two-digit I/B/E/S sector industry group industries and for calendar quarters. Test statistics are based on a robust variance estimator. The number of observations is 213,011; the p-value of the χ^2 test is <.0001.

take ordered values from −4 (strongly pessimistic) to 4 (strongly optimistic) in increments of .5, we estimate the regression as an ordered probit model.[18] The Z-statistics are based on a robust (Huber-White sandwich) variance estimator.

Table 3 shows the regression estimate. The coefficients of IB revenue percentage and commission revenue percentage are both positive. This finding implies that greater conflicts with IB and brokerage businesses lead an analyst to issue a higher recommendation on a stock relative to the consensus. Stocks followed by busier analysts and stocks of larger companies receive higher recommendations relative to the consensus. Stocks that experience a price run-up over the prior 6 months, stocks followed by analysts at large brokerage houses, and stocks followed by *WSJ* All-Star Analysts all receive lower recommendations relative to the consensus. All of these relations are highly statistically significant.

To provide a sense of the magnitude of the main effects of interest, we show in Table 4 the derivatives of the probability of each net recommendation level

[18] Notice that recommendation levels can take integer values from 1 to 5, and the median recommendation can take values from 1 to 5 in increments of .5. See Greene (2003) for a detailed exposition of the ordered probit model.

Table 4

Marginal Effects and Sample Distribution for the Ordered Probit Regression in Table 3

	Recommendation Level Net of the Consensus														
	−4	−3.5	−3	−2.5	−2	−1.5	−1	−.5	0	.5	1	1.5	2	2.5	3
Investment banking revenue (%)	−.00031	−.0002	−.0026	−.0010	−.0199	−.0086	−.0744	−.0321	.0123	.0325	.0671	.0077	.0188	.0002	.0003
Brokerage commission revenue (%)	−.00003	−.00001	−.0002	−.00009	−.0017	−.0008	−.0065	−.0028	.0011	.0028	.0059	.0007	.0016	.00002	.00003
Observed frequency	.0001	.0001	.0016	.0007	.0176	.0094	.1241	.0948	.4940	.0937	.1289	.0111	.0233	.0002	.0003

Note. Shown is the derivative of the probability of each net recommendation level with respect to investment banking or brokerage revenue percentage, estimated from the ordered probit regression in Table 3. Investment banking and brokerage commission revenue refer to the percentage of the brokerage firm's total revenues derived from investment banking and brokerage commissions. The last row shows observed frequency of each net recommendation level as a proportion of the sample of 213,011 observations.

with respect to IB revenue and commission revenue percentages.[19] Thus, for example, a 1-standard-deviation increase in IB revenue percentage increases the probability of an optimistic recommendation (that is, a net recommendation level greater than zero) by .1193 × (.0325 + .0671 + . . . + .0003) = .0151. Compared to the unconditional probability of an optimistic recommendation by an analyst, this represents an increase of about 5.9 percent (.0151/.2575). The effect of a change in commission revenue percentage is much smaller. A 1-standard-deviation increase in commission revenue percentage increases the probability of an optimistic recommendation by .2475 × .01105 = .0027, or about 1 percent (.0027/.2575) of the unconditional probability. Thus, despite possible concerns about a loss of reputation, analysts seem to respond to conflicts of interest, particularly those stemming from IB.

5. Conflicts and Investor Response to Recommendation Revisions

5.1 Stock Price Response

This section examines whether an analyst's credibility with investors is related to the degree of conflict faced. We interpret the reaction of stock prices to a recommendation revision as an indication of an analyst's credibility. Our analysis focuses on revisions in recommendation levels, rather than on recommendation levels per se, because revisions are discrete events that are likely to be salient for investors, and previous research finds that revisions have significant information content (see, for example, Womack 1996; Jegadeesh et al. 2004). To capture the effects of the most commonly observed and economically important types of revisions, we structure our tests around four basic categories: added to strong buy, added to buy or strong buy, dropped from strong buy, and dropped from buy or strong buy.[20] These four categories are defined to include initiations, resumptions, and discontinuations of coverage because such events also reflect analysts' positive or negative views about a company.[21] Thus, for example, we consider a stock to be added to strong buy under two scenarios: (*a*) the recommendation level is raised to strong buy from a lower level or (*b*) coverage is

[19] Notice that, for each explanatory variable, these derivatives sum to zero across all the net recommendation levels.

[20] Our analysis focuses on these four types of revisions instead of the other four (added to strong sell, and so forth) because, as shown in Table 1, sell and strong sell recommendations are quite rare. But note that dropped-from-buy and dropped-from-buy-or-strong-buy revisions can entail movement to the sell or strong sell category.

[21] We use the I/B/E/S Stopped Recommendations file to determine instances in which a brokerage firm discontinued coverage of a company. This file contains numerous cases in which an analyst stops coverage of a stock only to issue a new recommendation a month or two later. Conversations with I/B/E/S representatives indicate that such events likely represent pauses in coverage due to company quiet periods or analysts' reassignments within a brokerage house. We define a stopped coverage event to be a true stoppage only if the analyst does not issue a recommendation on the stock over the subsequent 6 months.

initiated or resumed at the level of strong buy.[22] Defining revisions in this fashion yields a sample of 94,892 recommendation revisions made over the 1994–2003 period.

5.1.1. Average Response

We compute the abnormal return on an upgraded or downgraded stock over day t as the return (including dividends) on the stock minus the return on the Center for Research in Security Prices equal-weighted market portfolio of New York Stock Exchange (NYSE), American Stock Exchange, and NASDAQ stocks. The cumulative abnormal return (CAR) on the stock over days t_1 to t_2 relative to the revision date (day 0) is measured as the sum of the abnormal returns over those days. Table 5 shows mean and median CARs for three windows: days -1 to 0, -1 to 1, and -5 to 5. The t-statistics for the difference of the mean abnormal returns from zero are computed as in Brown and Warner (1985) and are shown in parentheses. The p-values for the Wilcoxon test are reported in parentheses with the medians.

It is clear from Table 5 that recommendation revisions have large effects on stock prices. For example, when a stock is added to the strong-buy list, it experiences a mean abnormal return of about 2 percent over the 2-day revision period. Downgrades have even larger effects on stock prices than do upgrades. Strikingly, the 2-day mean abnormal return around the dropped-from-strong-buy list is -4 percent. Median values are consistently smaller in magnitude than are means, and this finding indicates that some revisions lead to price reactions of a very large magnitude. Mean and median 2-day abnormal returns are statistically different from zero for all four groups of forecast revisions. The magnitudes of abnormal returns are somewhat larger over the 3-day and 11-day windows than over the 2-day window. Overall, these returns are consistent with those found by prior research that examines the average stock price impact of recommendation revisions (for example, Womack 1996; Jegadeesh et al. 2004).

5.1.2. Cross-Sectional Analysis

Table 6 contains cross-sectional regressions of stock price reactions to recommendation revisions over days -1 to 1. The main explanatory variables of interest in these regressions are our revenue-based measures of the magnitudes of IB and brokerage conflicts. We include controls for the size of an analyst's employer, the size of the company followed, and measures of an analyst's reputation, experience, and workload.[23] We estimate a separate regression for each

[22] Note that the definitions of our four recommendation revision groups imply that stocks can be added to a group more than once on a given day. Nonetheless, excluding days on which a stock experiences multiple revisions does not change any of our qualitative results.

[23] Prior research finds that analysts who have more experience, carry lower workloads, or are employed by larger firms tend to generate more precise research (see, for example, Clement 1999; Jacob, Lys, and Neale 1999; Mikhail, Walther, and Willis 1997). In addition, more reputed analysts tend to generate timelier and more accurate research (see, for example, Stickel 1992; Hong and Kubik 2003). We expect such analysts to be more influential with investors.

Table 5

Cumulative Abnormal Returns surrounding Revisions in Analyst Stock Recommendations

Recommendation Revision	Days −1 to 0 Mean (*t*-Statistic)	Days −1 to 0 Median (*p*-Value)	Days −1 to 0 *N*	Days −1 to 1 Mean (*t*-Statistic)	Days −1 to 1 Median (*p*-Value)	Days −1 to 1 *N*	Days −5 to 5 Mean (*t*-Statistic)	Days −5 to 5 Median (*p*-Value)	Days −5 to 5 *N*
Upgrades:									
Added to strong buy	.0207	.0109	24,560	.0240	.0130	24,556	.0263	.0187	24,499
	(49.53)*	(.000)		(46.89)*	(.000)		(26.84)*	(.000)	
Added to buy or strong buy	.0149	.0071	36,879	.0165	.0085	36,875	.0207	.0128	36,780
	(46.47)*	(.000)		(42.01)*	(.000)		(27.53)*	(.000)	
Downgrades:									
Dropped from buy or strong buy	−.0337	−.0126	33,322	−.0358	−.0155	33,262	−.0491	−.0287	33,197
	(−56.21)*	(.000)		(−48.75)*	(.000)		(−34.92)*	(.000)	
Dropped from strong buy	−.0399	−.0153	22,825	−.0427	−.0183	22,795	−.0570	−.0326	22,767
	(−49.88)*	(.000)		(−43.58)*	(.000)		(−30.38)*	(.000)	

Note. The sample of recommendation revisions is drawn from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendations History file for 1994–2003. Recommendation revisions include recommendation changes and initiations, resumptions, and discontinuations in coverage. Day 0 is the revision date. Recommendation revisions are classified according to the level of any existing recommendation and whether coverage is being initiated or dropped. For example, a revision by an analyst is classified as added to strong buy if the new recommendation is strong buy and (*a*) the previous recommendation was lower than strong buy or (*b*) analyst coverage by the brokerage house is resumed or initiated. A recommendation is classified as dropped from strong buy if the previous recommendation was strong buy and (*a*) the new recommendation is lower than strong buy or (*b*) research coverage on the company is stopped. The *t*-statistics for the difference from zero are computed as in Brown and Warner (1985). The *p*-values for the difference from zero are from a Wilcoxon test.

* Statistically significant at the 1% level in two-tailed tests.

Table 6

Cross-Sectional Regressions of Cumulative Abnormal Returns over Days −1 to +1 surrounding Recommendation Revisions

Explanatory Variable	Added to Strong Buy	Added to Buy or Strong Buy	Dropped from Buy or Strong Buy	Dropped from Strong Buy
Intercept	.0369	.0412	−.2294	−.2224
	(7.66)**	(11.21)**	(−31.31)**	(−29.25)**
Investment banking revenue (%)	−.0262	−.0139	−.0200	−.0354
	(−5.65)**	(−3.57)**	(−2.74)**	(−3.92)**
Brokerage commission revenue (%)	−.0187	−.0148	−.0089	−.0013
	(−6.51)**	(−6.43)**	(−2.39)*	(−.29)
Large brokerage house dummy	.0116	.0088	−.0242	−.0220
	(7.46)**	(6.88)**	(−12.79)**	(−10.25)**
Company size	−.0056	−.0041	−.0004	.0018
	(−16.13)**	(−15.40)**	(−.97)	(3.77)**
Institutional Investor All-America Research Team dummy	.0159	.0122	−.0148	−.0207
	(4.11)**	(3.82)**	(−2.93)**	(−3.28)**
Wall Street Journal All-Star Analyst dummy	.0015	.0013	−.0011	.0045
	(.81)	(.84)	(−.48)	(1.78)
Company-specific research experience	.0017	.0019	.0039	.0018
	(8.42)**	(12.49)**	(7.37)**	(3.21)**
Number of companies followed	−.0012	−.0016	.0007	.0008
	(−2.97)**	(−5.37)**	(1.49)	(1.31)
Observations	19,440	28,665	28,618	19,632
Adjusted R^2	.038	.0240	.028	.035
P-Value of *F*-test	<.0001	<.0001	<.0001	<.0001

Note. Shown are coefficient estimates and (in parentheses) *t*-statistics from ordinary least squares regressions. Day 0 is the recommendation revision date. Data on recommendations are drawn from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendations History file for 1994–2003. Investment banking and brokerage commission revenue refer to the percentages of a brokerage firm's total revenues derived from investment banking and brokerage commissions. The large brokerage house dummy is an indicator variable that equals one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing stock recommendations listed in I/B/E/S in a given calendar year. Company size is the natural logarithm of the market capitalization of the company followed, measured 12 months prior to the end of the current month. The *Institutional Investor* All-America Research Team and *Wall Street Journal* All-Star Analyst dummies are indicator variables that equal one if the recommending analyst was listed as an All-America Research Team member or All-Star Analyst in the most recent analyst ranking. Company-specific research experience is the natural log of one plus the number of days that an analyst has been issuing I/B/E/S research on a company. Number of companies followed equals the natural log of one plus the number of companies followed by an analyst in the current calendar year. All regressions include dummy variables for calendar-year and two-digit I/B/E/S sector industry group industries (not reported). The *t*-statistics are based on a robust variance estimator.

* Statistically significant at the 5% level in two-tailed tests.

** Statistically significant at the 1% level in two-tailed tests.

of the four groups of recommendation revisions. The t-statistics based on a robust variance estimator are reported in parentheses.

The coefficient on IB revenue percentage is statistically significantly negative for both upgrades and downgrades. The coefficient on brokerage commission revenue percentage is also negative in all four regressions; it is statistically significant in all cases, except for the dropped-from-strong-buy revisions.[24] Collectively, these results favor the rational discounting hypothesis over the naive investor hypothesis. The magnitudes of these effects are nontrivial. For instance, a 1-standard-deviation increase in IB revenue percentage leads to a change of about −.31 (−.42) percentage points in the 3-day abnormal return around the move to (from) a strong buy recommendation. Similarly, a 1-standard-deviation increase in brokerage commission revenue percentage leads to a change of about −.37 (−.22) percentage points in the corresponding abnormal return around the move to (from) a buy or strong buy recommendation.[25]

The results for control variables are also noteworthy. The dummy variable for a large analyst employer is positively (negatively) related to the market reaction to upgrades (downgrades). This finding is consistent with the idea that revisions by analysts employed at larger brokerage houses (which tend to be more reputable) have more credibility with investors. The size of the company followed is negatively (positively) related to the market reaction to upgrades (downgrades), which is consistent with the notion that, for larger companies, an analyst's recommendation competes with more alternative sources of information and advice.

Revisions by *II* All-America Research Team analysts are positively (negatively) related to the stock price reaction to upgrades (downgrades), which suggests that they wield more influence with investors. This is a notable finding; we are unaware of previous work documenting a relation between an analyst's reputation and the stock price reaction to both upgrades and downgrades. As the coefficient on the *WSJ* All-Star Analyst dummy indicates, however, being designated as a *WSJ* All-Star Analyst does not seem to enhance the credibility of an analyst's recommendations.[26] The absence of an effect here is somewhat

[24] These and all subsequent regression results in this article are qualitatively similar when we winsorize the dependent variable at the first and ninety-ninth percentiles of its distribution.

[25] For each group of revisions (such as added to strong buy), we also estimate the regression after excluding similar revision events that a stock experiences within 3 days of a given revision event. These results are qualitatively similar to those reported in Tables 6 and 8. We also examine the possibility that investors perceived the conflicts to be more severe, and hence discounted them more, in securities firms that were charged by regulators (that is, the 10 firms that were part of the global analyst settlement) than in other firms. We do this by interacting both investment banking (IB) revenue percentage and brokerage commission revenue percentage variables in the regression with binary (0, 1) dummy variables for securities firms that are part of the global analyst settlement and firms that are not. We find no significant differences between the two groups of firms in their coefficients on IB revenue percentage and commission revenue percentage.

[26] Although *II* All-America Research Team and *WSJ* All-Star Analyst dummies both measure aspects of an analyst's reputation, they are not highly correlated. The correlation coefficient is .14 across all upgrades and .13 across all downgrades.

surprising given that the *WSJ* has a much broader readership base than that of *II*. One explanation is that *II* analyst rankings are based on an opinion poll of money managers, who control substantial assets and therefore directly affect stock prices, while *WSJ* rankings are based on strictly quantitative measures of analysts' past stock-picking or forecasting performance.

The market reaction to upgrades is positively related to an analyst's company-specific research experience. This finding suggests that more experienced analysts tend to be more influential with investors. But the reaction to downgrades is also positively related to analysts' experience. Finally, the stock price reaction to upgrades is negatively related to analysts' workload. This finding suggests that busier analysts' opinions tend to get discounted by the market. All of these relations are statistically significant.

5.2. Response of Trading Volume

In this section, we measure analysts' credibility via changes in the volume of trade around recommendation revisions.[27] Revisions of analysts' recommendations can affect trading volumes by inducing investors to rebalance their portfolios to reflect updated beliefs.

5.2.1. Average Response

We compute the abnormal volume for a trading day t as the mean-adjusted share turnover for stock i:[28]

$$e_{it} = v_{it} - v_i, \tag{1}$$

where v_{it} is the trading volume of stock i over day t divided by common shares outstanding on day t and v_i is the mean of v_{it} over days -35 to -6.

The cumulative abnormal volume (CAV) for stock i over days t_1 to t_2 is measured in the following way:

$$\mathrm{CAV}^i t_1, t_2 = \sum_{t=t_1}^{t_2} e_{it}. \tag{2}$$

Table 7 shows mean and median CAV values over three windows surrounding revisions in analyst stock recommendations. Over the 2-day revision period, the mean abnormal volume is positive for both upgrades and downgrades, but its magnitude is substantially larger for downgrades. The move to (from) the strong-buy list increases a stock's trading volume by a mean of about .9 percent (2.6 percent) of the outstanding shares, compared to a normal day's volume. For longer windows, the mean abnormal volumes are substantially higher for down-

[27] Many prior studies have used trading volume to examine investors' response to informational events (see, for example, Shleifer 1986; Jain 1988; Jarrell and Poulsen 1989; Meulbroek 1992; Sanders and Zdanowicz 1992).

[28] This approach has been used in a number of prior studies (for example, Shleifer 1986; Vijh 1994; Michaely and Vila 1996).

Table 7

Cumulative Abnormal Trading Volumes surrounding Announcements of Revisions in Stock Recommendations by Analysts

	Days −1 to 0			Days −1 to 1			Days −5 to 5		
Recommendation revision	Mean (t-Statistic)	Median (p-Value)	N	Mean (t-Statistic)	Median (p-Value)	N	Mean (t-Statistic)	Median (p-Value)	N
Upgrades:									
Added to strong buy	.0086	.0011		.0097	.0015		.0071	.0030	
	(8.89)*	(.000)	24,506	(8.18)*	(.000)	24,502	(3.13)*	(.000)	24,488
Added to buy or strong buy	.0053	.0002		.0058	.0004		.0020	.0008	
	(5.08)*	(.000)	36,800	(4.54)*	(.000)	36,796	(.818)	(.000)	36,766
Downgrades:									
Dropped from buy or strong buy	.0217	.0010		.0265	.0014		.0381	.0039	
	(114.47)*	(.000)	33,291	(114.14)*	(.000)	33,232	(85.70)*	(.000)	33,175
Dropped from strong buy	.0259	.0017		.0315	.0025		.0453	.0057	
	(128.76)*	(.000)	22,808	(127.86)*	(.000)	22,779	(96.03)*	(.000)	22,756

Note. The abnormal volume for stock i on day t is computed from daily Center for Research in Security Prices data as $e_{it} = v_{it} - v_i$, where v_{it} is the volume on day t and v_i is the average volume over days −35 to −6 relative to the recommendation revision date (day 0). All share volumes are normalized by dividing by common shares outstanding on the same day. The p-values are from a Wilcoxon test.

* Statistically significant at the 1% level in two-tailed tests.

grades. The median values are lower than the mean values. Each mean and median abnormal volume is statistically greater than zero, with a p-value below .01. Clearly, revisions of stock recommendations by analysts generate trading.

5.2.2. Cross-Sectional Analysis

Table 8 presents cross-sectional regressions explaining CAVs over days −1 to 1 surrounding the recommendation revisions. The explanatory variables in the regressions are the same as in regressions of CARs in Section 5.1.2. The results provide strong support for the rational discounting hypothesis. The coefficients on both the IB revenue percentage and commission revenue percentage variables are generally statistically significant and negative (positive) for both groups of upgrades (downgrades). The magnitudes of these effects are nontrivial. For example, a 1-standard-deviation increase in IB revenue percentage leads to a change in the 3-day abnormal volume around the addition (omission) of a stock to (from) the strong-buy list of about −.12 percent (.36 percent) of the outstanding shares; a corresponding change in the commission revenue percentage results in a change in the abnormal volume of about −.15 percent (.22 percent).

Recommendation revisions by larger brokerage houses generate more trading. The abnormal volume is also larger for revisions involving smaller companies. Revisions by *II* All-America Research Team members generate statistically significantly more abnormal volume for the dropped from buy or strong-buy group. Upgrades (downgrades) by more experienced analysts result in larger (smaller) abnormal volumes, and upgrades by busier analysts are less credible.

6. Conflicts and the Performance of Recommendation Revisions

We next consider the investment performance of analysts' recommendation revisions over periods of up to 12 months. Here, the choice of the benchmark used to compute abnormal returns is somewhat more important than it is in Section 5.1, where we measure abnormal returns over a few days around the revision. But the results here are likely to be less sensitive to the benchmark employed than are those in studies of long-run stock performance, where the time period of interest can be as long as 5–10 years (see, for example, Agrawal, Jaffe, and Mandelker 1992; Agrawal and Jaffe 2003).

6.1. Average Performance

We use an approach similar to Barber, Lehavy, and Trueman (2007). To evaluate the performance of stocks over a given window, say, months 1–12 following the month of their inclusion (month 0) in a given group of revisions such as the added-to-strong-buy list, we form a portfolio p that initially invests $1 in each recommendation. Each recommended stock remains in the portfolio until month 12 or the month that the stock is either downgraded or dropped from coverage by the securities firm, whichever is earlier. If multiple securities firms recommend a stock in a given month, the stock appears multiple times in the

Table 8

Cross-Sectional Regressions of Cumulative Abnormal Trading Volumes over Days −1 to +1 surrounding Recommendation Revisions

Explanatory Variable	Added to Strong Buy	Added to Buy or Strong Buy	Dropped from Buy or Strong Buy	Dropped from Strong Buy
Intercept	.0083	.0042	.0946	.0828
	(2.65)**	(1.90)	(13.72)**	(15.01)**
Investment banking revenue (%)	−.0100	−.0085	.0140	.0304
	(−3.31)**	(−2.26)*	(2.18)*	(3.63)**
Brokerage commission revenue (%)	−.0057	−.0059	.0087	.0055
	(−1.76)	(−4.13)**	(2.76)**	(1.45)
Large brokerage house dummy	.0058	.0038	.0168	.0171
	(3.72)**	(4.50)**	(11.12)**	(9.48)**
Company size	−.0031	−.0018	−.0023	−.0041
	(−9.54)**	(−12.30)**	(−7.60)**	(−11.40)**
Institutional Investor All-America Research Team dummy	.0035	.0033	.0084	.0046
	(1.74)	(1.88)	(2.32)*	(1.21)
Wall Street Journal All-Star Analyst dummy	.0008	.0013	.0023	−.0006
	(.74)	(1.42)	(1.36)	(−.29)
Company-specific research experience	.0010	.0010	−.0041	−.0019
	(8.39)**	(11.19)**	(−6.18)**	(−4.11)**
Number of companies followed	−.0009	−.0013	−.0001	−.0005
	(−3.49)**	(−6.23)**	(−.38)	(−.99)
Observations	19,431	28,653	28,594	19,619
Adjusted R^2	.025	.019	.030	.042
p-Value of F-test	<.0001	<.0001	<.0001	<.0001

Note. Shown are coefficient estimates and (in parentheses) t-statistics from ordinary least squares regressions. Day 0 is the recommendation revision date. Data on recommendations are drawn from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendations History file for 1994–2003. Investment banking and brokerage commission revenue refer to the percentage of brokerage firm's total revenues derived from investment banking and brokerage commissions. The large brokerage house dummy is an indicator variable that equals one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing stock recommendations listed in I/B/E/S in a given calendar year. Company size is the natural logarithm of the market capitalization of the company followed, measured 12 months prior to the end of the current month. The *Institutional Investor* All-America Research Team and *Wall Street Journal* All-Star Analyst dummies are indicator variables that equal one if the recommending analyst was listed as an All-America Research Team member or All-Star Analyst in the most recent analyst ranking. Company-specific research experience is the natural log of one plus the number of days that an analyst has been issuing I/B/E/S research on a company. Number of companies followed equals the natural log of one plus the number of companies followed by an analyst in the current calendar year. All regressions include dummy variables for calendar-year and two-digit I/B/E/S sector industry group industries (not reported). The t-statistics are based on a robust variance estimator.

* Statistically significant at the 5% level in two-tailed tests.

** Statistically significant at the 1% level in two-tailed tests.

portfolio that month, once for each securities firm with a strong buy recommendation. The portfolio return for calendar month t is given by

$$R_{pt} = \sum_{i=1}^{n_t} x_{it} \times R_{it} \Big/ \sum_{i=1}^{n_t} x_{it}, \tag{3}$$

where R_{it} is the month t return on recommendation i, x_{it} is one plus the compound return on the recommendation from month 1 to month $t-1$ (that is, x_{it} equals one for a stock that was recommended in month t), and n_t is the number of recommendations in the portfolio. This calculation yields a time series of monthly returns for portfolio p.

We compute the abnormal performance of portfolio p as the estimate of the intercept term α_p from the Fama and French (1993) three-factor model. Accordingly, we estimate the following time-series regression for portfolio p:

$$R_{pt} - R_{ft} = \alpha_p + \beta_{1p}(R_{mt} - R_{ft}) + \beta_{2p}\text{SMB}_t + \beta_{3p}\text{HML}_t + \varepsilon_{pt},$$
$$t = \text{January 1994 to December 2003}, \tag{4}$$

where R_f is the risk-free rate, R_m is the return on the value-weighted market index, SMB equals the monthly return on a portfolio of small firms minus the return on a portfolio of big firms, and HML is the monthly return on a portfolio of firms with high book-to-market ratio minus the return on a portfolio of firms with low book-to-market ratio. The error term in the regression is denoted ε. The time series of monthly returns on $R_m - R_f$, SMB, and HML are obtained from Kenneth French's Web site.[29] We repeat this procedure for each time window of interest, such as months 1–3, and for each group of revisions, such as the dropped-from-strong-buy list.

Table 9 shows the performance of analysts' recommendation revisions. Over the period of 3 months following the month of recommendation revision, the average abnormal returns for upgrades are positive, and the returns for downgrades are negative. The magnitudes of these returns are nontrivial. For example, the addition of a stock to the strong-buy list has an abnormal monthly return of about .875 percent, or about 2.62 percent over the 3-month period. The pattern is generally similar over longer windows. For example, over months 1–12, the abnormal monthly return for the added-to-strong-buy list is .679 percent, or about 8.15 percent over the 12-month period. The abnormal returns are significantly different from zero for upgrades in all cases; they are statistically insignificant for downgrades in all cases except one.

[29] Kenneth R. French, Fama/French Factors (file F-F_Research_Data_Factors.zip at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

Table 9
Medium-Term Investment Performance of Recommendation Revisions

	Months 1–3		Months 1–6		Months 1–12	
Portfolio	Abnormal Monthly Return (%)	t-Statistic	Abnormal Monthly Return (%)	t-Statistic	Abnormal Monthly Return (%)	t-Statistic
Added to strong buy	.875	6.12**	.758	6.12**	.679	5.70**
Added to buy or strong buy	.586	4.49**	.511	4.82**	.503	5.38**
Dropped from buy or strong buy	−.361	−1.60	−.260	−1.28	−.072	−.44
Dropped from strong buy	−.367	−1.58	−.395	−2.00*	−.231	−1.49

Note. Abnormal returns are reported for three event windows relative to the month of revision (month 0) and are computed using an approach similar to that in Barber, Lehavy, and Trueman (2007). The abnormal return is the estimated intercept from a time-series regression of 114 monthly portfolio returns using the Fama and French (1993) three-factor model.
* Statistically significant at the 5% level in two-tailed tests.
** Statistically significant at the 1% level in two-tailed tests.

6.2. *Cross-Sectional Analysis*

Table 10 shows the results of a regression similar to that in Section 5.1.2, except that the dependent variable here is the average monthly abnormal return for a firm over months 1–12 following the month of a recommendation revision. We compute this abnormal return by estimating a time-series regression similar to that in equation (4) over months 1–12 for each stock in a sample of recommendation revisions. The intercept from this regression is our estimate of the performance of the recommendation revision. Observations involving recommendation revisions on a stock that occur within 12 months of an earlier revision are omitted from each regression.[30]

In each regression result reported in Table 10, the coefficients of IB revenue percentage and commission revenue percentage are not statistically significantly different from zero. These results favor the rational discounting hypothesis, at least for the marginal investor. The performance of both groups of recommendation upgrades is negatively related to company size; the performance of one group of downgrades is positively related to the dummy variable for *WSJ* All-Star Analysts. None of the other variables is statistically significant.

7. Bubble versus Postbubble Periods

We next exploit the fact that our sample spans both the late-1990s U.S. stock bubble and a postbubble period. During the bubble period, initial public offerings, merger activities, and stock prices were near record highs, and media attention was focused on analysts' pronouncements. We therefore examine whether analysts' behavior and investors' responses to analysts' recommendations differed during the bubble and postbubble periods. Given the euphoria on Wall

[30] The results are qualitatively similar when we include these observations.

Table 10

Cross-Sectional Regressions of Average Monthly Abnormal Returns following Recommendation Revisions over Months 1–12

Explanatory Variable	Added to Strong Buy	Added to Buy or Strong Buy	Dropped from Buy or Strong Buy	Dropped from Strong Buy
Intercept	.0523	.0089	−.0646	−.0821
	(1.81)	(.49)	(−6.81)**	(−6.55)**
Investment banking revenue (%)	−.0089	−.0018	.0042	−.0068
	(−1.23)	(−.29)	(.64)	(−.87)
Brokerage commission revenue (%)	.0064	.0059	.0057	.0031
	(1.32)	(1.54)	(1.21)	(.75)
Large brokerage house dummy	.0009	−.0027	.0016	.0015
	(.38)	(−1.32)	(.72)	(.77)
Company size	−.0013	−.0017	−.0007	−.0007
	(−2.74)**	(−4.18)**	(−1.71)	(−1.54)
Institutional Investor All-America analyst dummy	−.0029	.0001	−.0016	−.0009
	(−.58)	(.01)	(−.44)	(−.23)
Wall Street Journal All-Star Analyst dummy	.0031	.0002	−.0029	.0056
	(1.24)	(.12)	(−1.42)	(2.29)*
Company-specific research experience	.0004	.0004	.0004	.0004
	(1.08)	(1.80)	(.76)	(.92)
Number of companies followed	−.0011	−.0008	−.0002	−.0002
	(−1.61)	(−1.79)	(−.45)	(−.47)
Observations	6,411	8,851	10,644	8,368
Adjusted R^2	.026	.023	.019	.020
p-Value of F-test	<.0001	<.0001	<.0001	<.0001

Note. Shown are the coefficient estimates and (in parentheses) t-statistics from ordinary least squares regressions. Month 0 is the month of recommendation revision. The abnormal return is the estimated intercept from a time-series regression of monthly portfolio returns in accordance with the Fama and French (1993) three-factor model. Data on recommendations are drawn from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendations History file for 1994–2003. Investment banking and brokerage commission revenue data refer to the percentage of the brokerage firm's total revenues derived from investment banking and brokerage commissions. The large brokerage house dummy is an indicator variable that equals one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing stock recommendations on I/B/E/S in a given calendar year. Company size is the natural logarithm of the market capitalization of the company followed, measured 12 months prior to the end of the current month. The *Institutional Investor* All-America Research Team and *Wall Street Journal* All-Star Analyst dummies are indicator variables that equal one if the recommending analyst was listed as an All-America Research Team member or All-Star Analyst in the most recent analyst ranking. Company-specific research experience is the natural log of one plus the number of days that an analyst has been issuing I/B/E/S research on a company. Number of companies followed equals the natural log of one plus the number of companies followed by an analyst in the current calendar year. All regressions include dummy variables for calendar-year and two-digit I/B/E/S sector industry group industries (not reported). The t-statistics are based on a robust variance estimator.

*Statistically significant at the 5% level in two-tailed tests.

**Statistically significant at the 1% level in two-tailed tests.

Table 11

Ordered Probit Regression of Recommendation Levels Net of the Consensus for Bubble versus Postbubble Periods

	Bubble	Postbubble	*p*-Value
Investment banking revenue (%)	.5103*	.3089*	<.001
Brokerage revenue (%)	−.1868*	.2286*	<.001

Note. The explanatory variables are as in Table 3, except that (*a*) the investment banking revenue and brokerage commission revenue percentage variables are interacted with dummy variables for the bubble or postbubble period and (*b*) calendar-quarter dummies are replaced with a postregulation indicator (which is equal to one for quarters after May 2002). Shown are the coefficient estimates of investment banking and brokerage revenue percentage variables for the bubble and postbubble periods and the *p*-value for the difference in the coefficient estimate between the two periods. All test statistics use robust variance estimators.
* Statistically significant at the 1% level in two-tailed tests.

Street and among investors during the bubble, analysts appear to have been under acute pressure to generate IB fees and brokerage commissions. As for the response of investors, the rational discounting hypothesis predicts greater discounting of analysts' opinions during this period in response to heightened conflicts, while the naive investor hypothesis predicts less discounting.

We estimate regressions similar to those for relative recommendation levels (Table 3), those for announcement abnormal returns (Table 6), those for announcement abnormal volumes (Table 8), and those for 12-month investment performance of recommendation revisions (Table 10), except that we now interact IB revenue percentage and commission revenue percentage with dummy variables for the bubble (January 1996–March 2000) and postbubble (April 2000–December 2003) periods. Accordingly, we restrict the sample period for these regressions to January 1996–December 2003. For regressions corresponding to those with results shown in Table 3, we also replace the calendar-quarter dummies with a postregulation indicator (equal to one for quarters ending after May 2002). In May 2002, both the NYSE and the National Association of Securities Dealers considerably tightened the regulations on the production and dissemination of sell-side analyst research.[31] The findings of Barber et al. (2006) and Kadan et al. (forthcoming) suggest that these regulations exerted a downward pressure on recommendation levels. The regression results are presented in Tables 11 and 12. To save space, we report only the coefficient estimates for IB revenue percentage and commission revenue percentage.

The results in Table 11 show that analysts appear to have inflated their recommendations in response to IB conflicts during both the bubble and postbubble periods. But the magnitude of this effect is substantially greater during the bubble period than during the postbubble period. This difference is statistically significant. The magnitude of the effect is smaller for brokerage conflicts than for IB conflicts during both periods. In fact, the effect for brokerage conflicts is negative

[31] See NYSE Amended Rule 472, "Communications with the Public," and National Association of Securities Dealers Rule 2711, "Research Analysts and Research Reports."

Table 12

Ordinary Least Squares Regressions of Abnormal Returns, Abnormal Volumes, and Abnormal Stock Performance for Bubble and Postbubble Periods

	Added to Strong Buy			Added to Buy or Strong Buy			Dropped from Buy or Strong Buy			Dropped from Strong Buy		
	Bubble	Postbubble	*p*-Value	Bubble	Postbubble	*p*-Value	Bubble	Postbubble	*p*-Value	Bubble	Postbubble	*p*-Value
CARs, days −1 to 1:												
Investment banking revenue (%)	−.0248**	−.0120	.083	−.0121**	−.0080	.517	−.0125	−.0379**	.027	−.0361**	−.0345**	.908
Brokerage revenue (%)	−.0114**	−.0105**	.827	−.0099**	−.0110**	.720	−.0063	−.0208**	.003	.0017	−.0114*	.024
CAVs, days −1 to 1:												
Investment banking revenue (%)	−.0076	−.0052	.655	−.0065	−.0082*	.699	.0257**	.0130	.214	.0555**	.0153	.002
Brokerage revenue (%)	−.0042	−.0008	.376	−.0054**	−.0031	.179	.0106*	.0139**	.521	.0046	.0141**	.056
Average monthly CARs, months 1–12:												
Investment banking revenue (%)	−.0016	−.0151	.273	.00001	.0083	.420	−.0085	.0223**	.003	−.0123	−.0051	.564
Brokerage revenue (%)	.0069	.0108	.511	.0086	.0096	.842	.0035	.0136	.101	−.0036	.0091	.019

Note. The explanatory variables are as in Tables 6, 8, and 10, except that the investment banking revenue and brokerage commission revenue percentage variables are interacted with dummy variables for the bubble or postbubble period. Shown are the coefficient estimates of the investment banking and brokerage revenue percentage variables for the bubble and postbubble periods and the *p*-value for the difference in the coefficient estimate between the two periods. Day (month) 0 is the recommendation revision date. All test statistics use robust variance estimators. CAR = cumulative abnormal return; CAV = cumulative abnormal volume.

* Statistically significant at the 5% level in two-tailed tests.

** Statistically significant at the 1% level in two-tailed tests.

during the bubble; it is positive and statistically significantly higher during the postbubble period.

Table 12 shows that, in regressions of 3-day abnormal returns, the coefficients of both IB revenue percentage and commission revenue percentage are negative and statistically significant during the bubble period for both groups of upgrades. For the added-to-strong-buy group, the coefficient of IB revenue percentage is significantly lower during the bubble period than during the postbubble period. For downgrades, the coefficients of both variables are generally negative in both periods, and they are statistically significantly lower during the postbubble period.

In regressions of 3-day abnormal volumes, the coefficients of IB revenue percentage and commission revenue percentage are negative for upgrades and positive for downgrades in all cases, both during and after the bubble. These coefficients are not statistically significantly different between the bubble and postbubble periods for both groups of upgrades and one group of downgrades. For the dropped-from-strong-buy group, the coefficient of IB revenue percentage is statistically significantly larger during the bubble period than during the postbubble period, but the coefficient of the commission revenue percentage is statistically significantly smaller. In regressions of 12-month postrecommendation stock performance, the coefficients of both variables are statistically insignificant both during and after the bubble period in nearly all cases, and this finding is consistent with the results shown in Table 10 for the full sample period.

Overall, analysts appear to respond to IB conflicts both during and after the bubble, but the magnitude of their response declines during the postbubble period. Perversely, while analysts do not seem to respond to brokerage conflicts during the bubble, they appear to do so after the bubble. Perhaps the intense regulatory and media focus on IB conflicts has led analysts to look for alternative avenues. Did investors discount conflicted analysts' opinions more during the bubble than in the postbubble period? The answer to this question is unclear. However, our evidence does not support the notion that investors threw caution to the wind during the bubble.

8. Summary and Conclusions

Following the collapse of the late-1990s U.S. stock market bubble, there has been a widespread hue and cry from investors and regulators over the conflicts of interest faced by Wall Street stock analysts. The discovery of e-mail messages, in which analysts were privately disparaging stocks that they were touting publicly, led to the landmark $1.4 billion settlement between a number of leading Wall Street firms and securities regulators in April 2003. The settlement requires the firms to disclose IB conflicts in analyst reports and imposes a variety of restrictions designed to strengthen the firewalls that separate research from IB. Part of the settlement funds are set aside for investor education and for research produced by independent firms. The settlement basically presumes that analysts

respond to the conflicts by inflating their stock recommendations and that investors take analysts' recommendations at face value.

Consistent with the view of the media and regulators, we find that optimism in stock recommendations is positively related to the importance of both IB and brokerage businesses to an analyst's employer. This pattern is more pronounced during the late-1990s stock market bubble with respect to IB conflicts. However, we provide several pieces of empirical evidence that suggest that investors are sophisticated enough to adjust for this bias. First, the short-term reactions of both stock prices and trading volumes to recommendation upgrades vary negatively with the magnitude of potential IB or brokerage conflicts faced by analysts. For instance, over the 3 days surrounding an upgrade to strong buy, a 1-standard-deviation increase in the proportion of revenue from IB is associated with a .31 percentage point decrease in abnormal returns and a .12 percentage point decrease in abnormal volume. These results suggest that investors ascribe lower credibility to an analyst's upgrade when the analyst is subject to greater pressures to issue an optimistic view. For downgrades, conflict severity varies negatively with the short-term stock price reaction and positively with the short-term trading volume impact. This pattern is consistent with the idea that investors perceive an analyst to be more credible if he or she is willing to voice an unfavorable opinion on a stock despite greater pressures to be optimistic.

Second, we find no evidence that the 1-year investment performance of recommendation revisions is related to the magnitude of analysts' conflicts, either for upgrades or for downgrades. This finding suggests that, on average, investors properly discount an analyst's opinions for potential conflicts at the time the opinion is issued. Finally, investors discounted conflicted analysts' opinions during the late-1990s stock bubble, even in the face of the prevailing market euphoria. This evidence does not support the popular view that recommendations of sell-side analysts led investors to throw caution to the wind during the bubble period.

Overall, our empirical findings suggest that while analysts do respond to IB and brokerage conflicts by inflating their stock recommendations, the market discounts these recommendations after taking analysts' conflicts into account. These findings are reminiscent of the story of the nail soup told by Brealey and Myers (1991), except that here analysts (rather than accountants) are the ones who put the nail in the soup and investors (rather than analysts) are the ones to take it out. Our finding that the market is not fooled by biases stemming from conflicts of interest echoes similar findings in the literature on conflicts of interest in universal banking (for example, Kroszner and Rajan 1994, 1997; Gompers and Lerner 1999) and on bias in the financial media (for example, Bhattacharya et al., forthcoming; Reuter and Zitzewitz 2006). Finally, while we cannot rule out the possibility that some investors may have been naive, our findings do not support the notion that the marginal investor was systematically misled over the last decade by analysts' recommendations.

Appendix

This Appendix describes the characteristics of disclosing and nondisclosing private securities firms, sheds some light on their decisions to publicly disclose their income statements, and examines whether the resulting selection bias affects our main results in Table 3. Table A1 provides summary statistics of recommendation levels and characteristics of disclosing and nondisclosing private securities firms. Compared with nondisclosing firms, disclosing firms tend to be smaller and more liquid and issue somewhat more optimistic stock recommendations. The mean recommendation level is slightly higher for disclosing firms than for nondisclosing firms. The median disclosing firm is smaller and holds more liquid assets than the median nondisclosing firm. All these differences are statistically significant. The two groups of firms have similar financial leverage ratios and 2-year growth rates in total assets.

We next examine cross-sectional determinants of a private securities firm's decision to disclose its income statement. In an excellent review of the corporate disclosure literature, Healy and Palepu (2001) point out that a firm is more willing to voluntarily disclose financial information when it needs to raise external financing and when it is less concerned that the disclosure would damage its competitive position in product markets. Ceteris paribus, firms with greater growth opportunities, higher financial leverage, and less liquid resources are more likely to need external financing. They are more likely to be open with potential investors by disclosing financial information, including their income statements. Similarly, smaller firms are likely to have greater need for external financing as they try to grow. In addition, given the intense competition in the securities business, smaller private firms are also likely to be more willing to disclose their profits and profitability because they have less business at stake. For both reasons, smaller firms are likely to be more willing to disclose financial information. We control for firm size by the natural logarithm of one plus total assets in millions of dollars, for growth opportunities by the 2-year growth rate of total assets, for financial leverage by the ratio of long-term debt to total assets, and for liquidity by the ratio of cash and equivalents to total assets. We estimate a probit regression of DISCLOSER, which equals one for a disclosing firm and is zero otherwise.

In accordance with the predictions of corporate disclosure theory, the coefficients on firm size and liquidity are negative, and the coefficient on growth is positive. Contrary to the prediction, however, the coefficient on leverage is negative. All of these coefficients are highly statistically significant. The pseudo-R^2-value of this model is .08. To save space, these results are not shown in a table.

Finally, we examine whether the selection bias caused by a private securities firm's disclosure choice (and, consequently, the availability of data on IB revenue percentage and commission revenue percentage) affects our main results in Table 3. While there is no Heckman selectivity correction for the ordered probit model, there is one for the regular probit model. So we define a binary variable to

Table A1

Summary Statistics for Disclosing and Nondisclosing Private Securities Firms

Variable	Mean			Median			Sample Size	
	Disclosers	Nondisclosers	*P*-Value of *t*-Test	Disclosers	Nondisclosers	*p*-Value of Rank Sum Test	Disclosers	Nondisclosers
Recommendation level:								
Level	3.902	3.810	<.001	4	4	<.001	62,417	181,068
Level minus median level	.036	.010	<.001	0	0	<.001	62,417	181,068
Firm size:								
Total assets ($ millions)	383.37	1,863.52	<.001	4.05	28.43	<.001	365	615
Book equity ($ millions)	26.40	68.98	<.001	1.97	10.56	<.001	365	615
Financial leverage:								
Long-term debt to total assets	.0539	.0653	.253	0	.002	.004	365	615
Total debt to total assets	.0685	.1823	.295	0	.018	<.001	365	615
Liquidity: cash and equivalents to total assets	.2392	.1816	.001	.101	.052	.0001	365	615
2-Year growth rate	.0849	.0697	.440	.052	.020	.099	246	541

Note. Disclosers are brokers that publicly disclose their income statements, while nondisclosers are brokers that do not disclose them. The statistics for recommendation level are computed from individual analysts' recommendation levels at the end of each quarter in the sample. The median recommendation level is computed at the end of each quarter and is based on all analysts recommending a stock. The statistics for broker characteristics are computed across broker years. The firm size statistics are inflation adjusted (with Consumer Price Index numbers and with 2003 as the base year). The 2-year growth rate is $(\text{Total assets}_t / \text{Total assets}_{t-2})^{1/2} - 1$.

measure an optimistic recommendation that equals one if an analyst's recommendation level on a stock exceeds the consensus level and equals zero otherwise. We then replace the dependent variable in the regression in Section 4 with this optimistic recommendation dummy. Using the subsample of private securities firms, we estimate the resulting equation in two ways: (*a*) with a regular probit model and (*b*) with a Heckman selectivity-corrected probit model, where we use the equation described in the second paragraph of this Appendix as the selection equation. When we use approach *b*, the coefficient of the selection term (that is, the inverse Mills ratio) is statistically significant in the second-stage probit regression. What is more important for our purposes is that the sign, magnitude, and statistical significance of our main explanatory variables, the IB revenue percentage and the commission revenue percentage, are similar in the regular probit and the Heckman-corrected probit regressions. These results do not support the idea that our main findings are driven by the selection bias caused by a private securities firm's decision to disclose its revenue breakdown. To save space, these results are not shown in a table.

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EXHIBIT
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BEFORE THE ARIZONA CORPORATION C(

Arizona Corporation Commission
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COMMISSIONERS

KRISTIN K. MAYES - Chairman
GARY PIERCE
PAUL NEWMAN
SANDRA D. KENNEDY
BOB STUMP

IN THE MATTER OF THE APPLICATION OF CHAPARRAL CITY WATER COMPANY, INC., AN ARIZONA CORPORATION, FOR A DETERMINATION OF THE FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASES IN ITS RATES AND CHARGES FOR UTILITY SERVICE BASED THEREON.	DOCKET NO. W-02113A-07-0551 DECISION NO. 71308 **OPINION AND ORDER**

DATES OF HEARING: December 5, 2008 (Pre-Hearing); December 8, 9, and 10, 2008, and January 8 and 9, 2009.

PLACE OF HEARING: Phoenix, Arizona

ADMINISTRATIVE LAW JUDGE: Teena Wolfe

APPEARANCES: Mr. Norman D. James and Mr. Jay L. Shapiro, FENNEMORE CRAIG, on behalf of Chaparral City Water Company;

Ms. Michelle L. Wood, Attorney, on behalf of the Residential Utility Consumer Office;

Ms. Robin Mitchell, Ms. Amanda Ho, and Mr. Wesley Van Cleve, Staff Attorneys, Legal Division, on behalf of the Utilities Division of the Arizona Corporation Commission.

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BY THE COMMISSION:

I. INTRODUCTION

On September 26, 2007, Chaparral City Water Company, Inc. ("Company" or "CCWC") filed with the Arizona Corporation Commission ("Commission") an application for a rate increase, based on a test year ended December 31, 2006.

On October 26, 2007, the Commission's Utilities Division ("Staff") filed a letter stating that the application was found sufficient and classifying the Applicant as a Class A utility.

On November 19, 2007, the Residential Utility Consumer Office ("RUCO") filed an Application to Intervene.

By Rate Case Procedural Order issued November 30, 2007, a hearing was set on the application to commence on July 8, 2008, associated procedural deadlines were set, and intervention was granted to RUCO.

On December 19, 2007, the procedural schedule set by the initial Rate Case Procedural Order was modified as requested by the Company, with the hearing set to commence on July 21, 2008.

On January 22, 2008, a Procedural Order was issued granting a January 3, 2008, motion by Staff to suspend the timeclock in this proceeding, until the Commission's final order in Docket No. W-02113A-04-0616, a pending matter in which the rates of Chaparral City Water Company, Inc. were also being considered. The parties were ordered to continue to conduct discovery and case preparation to the greatest extent possible during the duration of the continuance in order to minimize any delay in implementation of new rates pursuant to this application.

By the Second Amended Rate Case Procedural Order issued on July 24, 2008, the hearing was set to commence on December 8, 2008. The Second Amended Rate Case Procedural Order set the deadline for intervenor direct testimony at September 30, 2008, and the deadline for intervenor surrebuttal testimony at November 18, 2008.

On September 15, 2008, Pacific Life Insurance Company dba Eagle Mountain Golf Club ("Pacific Life"), a commercial customer of CCWC, filed a Motion to Intervene, which was granted by Procedural Order issued September 26, 2008.

On September 30, 2008, a Procedural Order Extending Filing Deadlines was issued, extending the deadline for intervenor direct testimony to October 3, 2008, and extending the deadline for intervenor surrebuttal testimony to November 20, 2008.

RUCO and Staff filed direct testimony on September 30, 2008, and October 3, 2008, respectively.

On October 24, 2008, Staff filed a Notice of Filing of Meeting on Settlement, and on October 28, 2008, Staff filed a Corrected Notice of Filing of Meeting on Settlement.

On October 31, 2008, the Company filed its rebuttal testimony.

On November 12, 2008, Pacific Life filed a Notice of Appearance of Counsel, indicating a change of counsel.

On November 21, 2008, Staff filed a Notice of Witness Substitution and Request for Procedural Order. Staff requested that it be allowed to file substitute witness Mr. Parcell's surrebuttal testimony on cost of capital on December 3, 2008, and requested a date certain of December 15, 2008, for Mr. Parcell's live testimony.

On November 24, 2008, the Company filed its Response objecting to Staff's November 21, 2008 filing, and on November 26, 2008, Staff filed a Reply to the Company.

On December 2, 2008, a Procedural Order was issued granting Staff's request to file the surrebuttal testimony of its substitute witness on December 3, 2008, and indicating that the dates certain requested by Staff for presentation of its expert witness were not available for hearing, but that a suitable schedule for proceeding with the parties' presentation of their cases on cost of capital would be discussed at the prehearing conference scheduled for December 5, 2008.

The prehearing conference was held as scheduled. The Company, RUCO and Staff appeared through counsel. Pacific Life did not enter an appearance. The Company stated an objection to Staff's substitute witness Parcell's prefiled surrebuttal testimony, and the objection was discussed. Staff agreed to make a filing regarding Mr. Parcell's adoption of Staff witness Mr. Chaves' testimony. A date for Mr. Parcell to appear for cross-examination was discussed, but not determined, during the prehearing conference.

On December 8, 2008, the hearing convened as scheduled and public comment was taken.

The Company, RUCO and Staff appeared through counsel, presented evidence and cross-examined witnesses on all issues with the exception of cost of capital and rate of return. Pacific Life did not appear. The hearing was recessed on December 10, 2008, and reconvened on January 8, 2009, for the purpose of taking evidence on the bifurcated issues of cost of capital and rate of return. The hearing concluded on January 9, 2009.

The parties subsequently submitted closing and reply briefs which were bifurcated in the same manner as the hearing, with the final round of reply briefs filed on February 27, 2009.

In its reply brief on the issue of cost of capital, Staff requested that in light of the Company's restating of arguments regarding the methodologies employed in Decision No. 70441, in order to have a complete record in this case, that either Staff's testimony in the proceeding leading to Decision No. 70441 ("Remand Proceeding") be admitted as a late-filed exhibit, or that administrative notice be taken of the complete record of Docket No. W-02113A-04-0616. Due to the continuing litigation on the issue of an appropriate fair value rate of return ("FVROR") methodology, administrative notice is taken of the complete record of Docket No. W-02113A-04-0616.

On February 18, 2009, Staff docketed an update to its February 10, 2009, Motion to Compel.[1] Staff indicated that Staff and the Company had agreed to extend the time period in which the Company has to respond, pending the outcome of ongoing negotiations to resolve the Motion to Compel.

On March 4, 2009, the Company filed a Notice of Filing Late-Filed Exhibit. The exhibit attached thereto is a rate case itemization spreadsheet showing a total for January 2007 - December 2008.

On June 3, 2009, a Procedural Order was issued directing Staff to file, by June 12, 2009, an update regarding its Motion to Compel and the progress made in its discovery regarding the CPUC investigation. The Procedural Order further directed that the update include a recommendation regarding an appropriate procedural means of addressing the CPUC investigation issue, including

[1] The Motion to Compel is related to an ongoing investigation by Staff. On January 5, 2009, Staff filed a Notice of Filing Regarding Investigation. The Notice stated that the California Public Service Commission ("CPUC") had contacted Staff regarding a CPUC investigation of Golden States Water Company ("Golden States"), an affiliate of CCWC. The CPUC had alerted Staff that in the course of a CPUC investigation into Golden States, the CPUC had discovered information relating to CCWC that it thought would be of interest to Staff.

whether it should be addressed in this docket, and directed the Company, Pacific Life and RUCO to file responses.

On June 11, 2009, Staff filed a Request for Extension of Time, requesting that it be allowed to file its update by June 19, 2009.

On June 12, 2009, the Company filed a Response in Opposition to Staff's Motion for Extension of Time. Therein, the Company stated that it had offered to stipulate to either (1) keep this docket open, pending conclusion of Staff's review of the CPUC investigation documents and a determination of whether any further proceedings or relief are warranted, or (2) to open a new docket for the same purpose, but that Staff had not definitively responded to the stipulation offer.

On June 17, 2009, RUCO filed a Response to Staff's Request for Extension of Time.

On June 17, 2009, a Procedural Order was issued granting Staff a one-week time extension, and extending the time for filing responses thereto.

On June 19, 2009, Staff filed its Update and Reply to Chaparral City Water Company's Response. Staff stated that ultimately, Staff and the Company had resolved their discovery dispute through the execution of a protective agreement, upon which the Company provided Staff with over 15,000 pages of documents. Staff stated that its investigation is ongoing, and that Staff had not yet determined whether the Company's activities rise to the level of impropriety or wrongdoing or impact the Company's rates or this pending rate case. Staff stated that it had retained an outside consultant to assist in Staff's review of the documents and to determine whether any alleged improprieties have impacts for this rate case. Staff stated that it found the Company's stipulation proposal acceptable, as long as all parties acknowledge that rates could be modified if the investigation yields circumstances which would warrant such action.

On June 23, 2009, RUCO filed its Response to Staff's Update Regarding the CPUC Investigation. RUCO agreed with Staff that there had been insufficient time to review and analyze the documentation which the Company produced on March 10, 13 and 16, 2009. RUCO stated that it did not object to having this matter proceed, but with the docket remaining open subject to reconsideration in the event that the investigation by Staff, RUCO, or the CPUC reflects impropriety by Chaparral or its parent, officers or employees.

On June 25, 2009, the Company filed a Response to Staff's Update. The Company asserted that there is no reason to delay rate relief, and requested the issuance of a decision in this matter as soon as possible.

This matter was subsequently taken under advisement, and a Recommended Opinion and Order was submitted for the Commission's consideration.

II. APPLICATION

CCWC, a California corporation in good standing in Arizona, is an Arizona public service corporation that holds a Certificate of Convenience and Necessity ("CC&N") authorizing it to provide water utility service within a service territory that is located in the northeastern portion of the Phoenix metropolitan area, in the Town of Fountain Hills and in a small portion of the City of Scottsdale.[2] During the test year, CCWC served 13,333 customers, including 12,431 residential, 375 commercial and 442 irrigation customers.[3] CCWC is in compliance with all federal, state, county and Commission requirements.[4]

On September 26, 2007, CCWC filed this rate increase application with the Commission based on a test year ended December 31, 2006. CCWC is currently charging rates approved in Decision No. 68176 (September 30, 2005), as modified by Decision No. 70441 (July 28, 2008), based on a test year ending December 31, 2003. The Company is requesting a gross revenue increase of $2,852,353, which is an increase of 38.01 percent over test year revenues of $7,505,010.[5] The Company's requested revenues are based on its proposed rate of return of 9.96 percent on a fair value rate base ("FVRB") of $27,751,113. The Company's FVRB is derived from a 50/50 weighting of an Original Cost Rate Base ("OCRB") of $22,647,882, and a Reconstruction Cost New Rate Base ("RCND") of $32,854,345. The Company proposes adjusted test year revenues of $7,505,010 and test year operating expenses of $7,646,730.

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[2] Direct Testimony of Company witness Robert N. Hanford (Exh. A-1) at 3-5.
[3] Direct Testimony of Company witness Thomas J. Bourassa (Exh. A-3), Schedule H-2 at 1.
[4] Direct Testimony of Staff witness Marlin Scott, Jr. (Exh. S-1) at 5-6.
[5] *These figures are from the Company's* Amended Final Schedule A-1. The Application originally sought a $3,063,400 increase in its revenue requirement, an increase of 41.14 percent over test year revenues.

III. RATE BASE ISSUES

A. Treatment of the FHSD Settlement Proceeds

The Fountain Hills Sanitary District ("FHSD") provides wastewater collection and treatment for most of CCWC's service area. FHSD needed to construct an Aquifer Storage and Recovery ("ASR") well in the vicinity of the Company's Well No. 9.[6] While CCWC's primary water supply is imported Colorado River water, which is delivered by means of the Central Arizona Project ("CAP"),[7] the Company blended CAP water with water from its Well No. 9 and two other wells.[8] The Company and FHSD entered into negotiations on a well exchange agreement, under which FHSD would supply CCWC with a new well similar in production and water quality to Well No. 9.[9] FHSD was unable to drill a well that yielded results satisfactory to the Company, and in January 2005, the parties entered a Well Transfer Agreement under which FHSD paid CCWC $1.52 million in consideration for CCWC ceasing use of Well No. 9 and Well No. 8 (a non-potable well), and CCWC giving FHSD an option to purchase the real property on which Well No. 8 is located.[10]

The Company proposes to treat the proceeds of the settlement in a manner that shares the benefit equally between ratepayers and shareholders.[11] The Company relied on the Commission's treatment of the Pinal Creek Group Settlement ("PCG Settlement") issue in Decision No. 66849 (March 19, 2004) as a guide for its proposal in this case.[12] CCWC contends that it acted in the public interest by protecting its interests and those of its ratepayers by turning two aged wells, one of which was never in service, into cash and seeking to share those proceeds with its ratepayers.[13] At the hearing, Staff's witness stated that for policy reasons, Staff agrees with the Company that the settlement proceeds should be shared equally between the shareholders and ratepayers so long as the Company shares the proceeds equally with the ratepayers in the event the wells are sold.[14] The

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[6] Direct Testimony of Company witness Robert N. Hanford (Exh. A-1) at 10; Tr. at 118.
[7] *Id.* at 3-5.
[8] *Id.* at 3; Tr. at 101.
[9] *Id.* at 10.
[10] *Id.*
[11] *Id.* at 10-11; Rebuttal Testimony of Company witness Thomas J. Bourassa (Exh. A-5) at 13-15; Rebuttal Testimony of Company witness Robert N. Hanford (Exh. A-2) at 1-4.
[12] Company Brief at 7; Company Reply Brief at 9. The PCG Settlement is discussed at pp. 32-37 of Decision No. 66849.
[13] Company Reply Brief at 9.
[14] Tr. at 351-52.

Company is willing share the gain with ratepayers in the event the wells are ever sold.[15]

RUCO disagrees with the Company's proposal, and recommends that the Company be required to distribute the $1.52 million settlement proceeds to ratepayers minus the associated legal fees.[16] While the Company argues that disallowing the sharing of the FHSD proceeds would serve as a disincentive to utilities to pursue litigation or settlement to protect assets,[17] RUCO responds that in some cases, sharing of settlement proceeds may be appropriate, and that it does not object to the Company recovering its legal expenses associated with the settlement in this case.[18] RUCO disagrees with Staff's position on this issue, contends that Staff's change in recommendation for policy reasons during the hearing is not supported by testimony or evidence,[19] and argues that the prefiled testimony of Staff's witness, entered into the record prior to Staff's changed position on the issue at the hearing, supports its position.[20] RUCO asserts that the FHSD settlement proceeds should be allocated 100 percent to CCWC's ratepayers because Well No. 8 and Well No. 9 were constructed over 36 years ago, have been fully depreciated, and have no impact on rate base in this case.[21] RUCO contends that the Company has fully recovered the cost of the wells and received a reasonable return thereon, and therefore is not entitled to any of the settlement proceeds.[22] RUCO argues that 100 percent of the settlement proceeds should go to ratepayers, because, according to RUCO, the FHSD settlement proceeds compensate CCWC for an equivalent cost of water to replace the amount Well No. 9 would have produced over the remainder of its useful life, and RUCO believes ratepayers will have to pay 100 percent of the cost of replacement water.[23] RUCO contends that this FHSD issue is distinguishable from the PCG Settlement issue, because "there is no evidence in Decision No. 66849 that the Company fully recuperated its investment of and on the contaminated wells."[24] RUCO also contends that this FHSD issue is distinguishable from the PCG Settlement issue, because Arizona

[15] Rebuttal Testimony of Company witness Robert N. Hanford (Exh. A-2) at 3-4; Tr. at 352-53.
[16] RUCO Brief at 9.
[17] Company Brief at 10.
[18] RUCO Brief at 9.
[19] RUCO Reply Brief at 10-11.
[20] RUCO Brief at 10; RUCO Reply Brief at 8-9, citing Tr. at 416-17 and Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 13
[21] RUCO Brief at 8; Exh. R-10 (Company Response to Staff Data Request MEM 7.3).
[22] RUCO Brief at 8.
[23] *Id.*
[24] *Id.* at 9.

Water received replacement water and wells in that case.[25]

As RUCO points out and the Company admits, Wells 8 and 9 are fully depreciated. The Company and its shareholders have received the full return of and on their investment in Wells 8 and 9 and are entitled to no more. We are cognizant, however, that the Company spent $30,000 in attorneys' fees and costs in pursuing the resolution with the FHSD. We hereby grant $30,000 of the proceeds to the Company for pursuing the matter on behalf of ratepayers and allocate the remaining settlement proceeds to the ratepayers.

B. Treatment of the Additional CAP Water Allocation Acquisition Cost

At the end of the test year, the Company had a CAP water allocation allowing it to take up to 6,978 acre-feet of Colorado River water annually.[26] Under that contract, the Company also has the right to buy excess CAP water,[27] and has exercised that right in each of the last two years.[28] As a result of the Arizona Water Settlement Act of 2004, CCWC had an opportunity to purchase an additional CAP allocation of 1,931 acre-feet per year.[29] CCWC states that when presented with the opportunity, it considered the unavailability of additional CAP water and other renewable water supplies, and paid $1.28 million for the additional CAP allocation in December, 2007.[30] As with its first CAP allocation, its contract for the additional CAP allocation requires the Company to pay annual Municipal and Industrial ("M&I") capital charges based on the size of the additional CAP allocation, and to pay purchased water charges based on annual water use.[31]

Parties' Positions

CCWC states that it acquired the additional CAP allocation to ensure its long-term water supply, including an increase to its drought buffer from both intrastate and interstate demand for Colorado River water supply,[32] and to reinforce and continue its reliance on renewable water supplies.[33] CCWC contends that full cost recovery is warranted because the additional CAP

[25] Decision No. 66849 at 34.
[26] Direct Testimony of Staff Witness Marlin Scott, Jr. (Exh. S-1), Engineering Report at 11.
[27] Tr. at 140-141.
[28] Company Brief at 10, fn 36 and Exhibit 1.
[29] Direct Testimony of Company witness Robert N. Hanford (Exh. A-1) at 5.
[30] Company Brief at 10.
[31] Direct Testimony of Company witness Thomas J. Bourassa (Exh. A-3) at 16 and Schedule C-2, page 6.
[32] Rebuttal Testimony of Company witness Robert N. Hanford (Exh. A-2) at 6.
[33] Direct Testimony of Company witness Robert N. Hanford (Exh. A-1) at 5-7.

allocation was offered only in a fixed amount and was a one-time only opportunity at a fixed price.[34] CCWC contends that the Colorado River is already overcommitted as a water source, and future reductions in CAP water deliveries are a real possibility.[35] CCWC asserts that it must plan for its water supply needs not only for the next year, but for the next several decades and longer.[36] CCWC believes that the acquisition of the additional CAP allocation should be viewed as an "indivisible whole" that produces benefits to the ratepayers that could not have been obtained had the Company not paid the $1.28 million acquisition price, and that the entire acquisition cost is therefore used and useful.[37]

Staff is in agreement with the Company that the entire acquisition cost of the additional CAP allocation should be included in rate base, classified as a plant-in-service component of Land and Land Rights, and not subject to amortization.[38] In its Engineering Report on the application, Staff found that approximately half the requested additional 1,931 acre-feet per year CAP allocation (966 acre-feet) would be used and useful within a five-year timeframe.[39] Based on that determination, Staff is recommending that the Company be allowed recovery of 50 percent of the associated annual M&I charges.[40] Staff contends that the full allocation should be included in rate base at this time, however, because reallocation of CAP water occurs infrequently, and CAP water is oversubscribed.[41] Staff states that it is imperative to secure an additional CAP allotment when it becomes available, and believes CCWC acted prudently in the $1.28 million purchase of the additional CAP allocation, based on the combination of two factors: the CAP reallocation opportunity was for all or nothing of a fixed amount, and the additional CAP allocation will allow CCWC to limit or eliminate the use of groundwater to serve its customers.[42]

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[34] Company Brief at 11.
[35] Company Brief at 12, citing Tr. at 131-133.
[36] *Id.*
[37] Company Brief at 12-13.
[38] Staff Brief at 3, Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 15-18; Company Brief at 11.
[39] Direct Testimony of Staff witness Marlin Scott, Jr. (Exh. S-1) at *ii*, and Engineering Report at 11.
[40] Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 27-28. As discussed in the Operating Income section below, the Company agrees with the operating expense treatment, and RUCO agrees that M&I expenses should be allowed in an amount commensurate with the portion of the additional CAP allocation that is determined to be used and useful.
[41] Staff Brief at 3, citing Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 18.
[42] *Id.*

RUCO disagrees with the recommendations of the Company and Staff, and makes several arguments against inclusion of the additional CAP allocation in rate base. RUCO argues that the additional CAP allocation should not be put in rate base at all, because doing so would allow the Company to expand its service area as requested in Decision No. 68238 (October 25, 2005) for the benefit of the State Land Department or a developer at the expense of current ratepayers.[43] RUCO argues that if the Company needs a drought buffer, it should "work more diligently to resolve its long-standing water loss issue."[44] RUCO contends that Staff's growth projections are unreliable,[45] and that the Company's demand estimates do not support placing 100 percent of the additional CAP allocation in rate base.[46] RUCO states that its witness' accounting analysis opinion is that the current used and useful portion of the additional CAP allocation "is only about in the single digits."[47] RUCO recommends, however, that "[i]f the Commission determines that some measure of the additional CAP allocation is needed for a drought buffer . . . RUCO's revised recommendation is that no more than 35% of the additional CAP allocation be treated as land and land rights in a non-depreciable account."[48] RUCO's arguments are addressed below.

Decision No. 68238 Order Preliminary

RUCO advances an argument that the additional CAP allocation should be totally excluded from rate base, because putting it in rate base "would allow the Company to expand its service area for the benefit of the State Land Department or a developer at the expense of current ratepayers."[49] RUCO is referring to Docket No. W-02113A-05-0178. On October 25, 2005, Decision No. 68238 in that docket granted CCWC an Order Preliminary for a Final Order granting an extension of CCWC's CC&N to include approximately 1,300 acres of state trust land located north of the Town of Fountain Hills, immediately adjacent to the Company's existing CC&N area.[50] The Staff Engineering Report in this case notes that one of the requirements Decision No. 68238, imposed for the issuance of a

[43] RUCO Reply Brief at 2.
[44] *Id* at 7.
[45] *Id.* at 3-4.
[46] *Id.* at 5.
[47] *Id.* at 7, citing Tr. at 301-02.
[48] *Id.* at 7.
[49] *Id.* at 2.
[50] Decision No. 70608 (November 12, 2008) extended the deadline for compliance with the Order Preliminary deadlines established in Decision No. 68238 to April 25, 2010.

Final Order in that docket is for CCWC to demonstrate sufficient water source capacity for its water system.[51] RUCO charges that the additional CAP allocation at issue in this case is needed not for the purpose of satisfying the demands of current customers, but instead to provide a 100-year assured water supply to permit the sale of the state trust land to a private subdivision developer.[52] RUCO argues that the Order Preliminary indicated that the Company had sufficient source and storage capacity to serve up to 18,000 customers,[53] and is concerned that ratepayers will bear the full cost of the additional CAP allocation "while the true beneficiaries, the subdivision developer and/or the State, receive the benefit."[54]

According to the Company, its request for inclusion of the additional CAP allocation acquisition costs in rate base was not based on benefiting a subdivision developer.[55] In response to RUCO's argument regarding the Order Preliminary requirements, the Company states that in the event the property covered by the Order Preliminary is developed at some future date, current customers would actually benefit from the potential expansion, both from the increase of the customer base over which the Company recovers its cost of service, and from the collection of hook-up fees from new customers.[56] Staff's witness testified that the Order Preliminary's requirement that the Company demonstrate an adequate water supply in order to receive a Final Order was only one item Staff considered in looking at whether the Company's acquisition of the additional CAP allocation was prudent.[57] The witness emphasized that Staff's main consideration in its prudence

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[51] Direct Testimony of Staff Witness Marlin Scott, Jr. (Exh. S-1), Engineering Report at 11. Decision No. 68238 orders the following:

> "IT IS FURTHER ORDERED that, prior to issuance of a Final Order, Chaparral City Water Company, Inc. shall be required to demonstrate to the satisfaction of the Commission's Director of Utilities that the Company is able to meet the water production needs for its system, PWS No. 07-017, for both its current customer base as well as expected demand for the proposed extension area. Sufficient capacity may be demonstrated by filing with Docket control a list of pending or future water sources, their anticipated production capacity in gallons per minute, and a time schedule for ADEQ approval of construction and operation."

Decision No. 68238 at 8.

[52] RUCO Reply Brief at 1-2, citing Decision No. 68238 at 3, fn 2.

[53] RUCO Reply Brief at 1. Decision No. 68238 states that "Staff indicated that Chaparral City currently has sufficient source and storage capacity to serve up to 18,000 customers." Decision No. 68238 at 3, Findings of Fact No. 6.

[54] RUCO Reply Brief at 3.

[55] Company Reply Brief at 13-1; *see also* Direct Testimony of Company witness Robert N. Hanford (Exh. A-1) at 5-7; Company Brief at 12, citing Tr. at 131-133.

[56] Company Reply Brief at 14.

[57] Tr. at 337.

analysis was ADWR's requirement that the acquisition be an all or nothing purchase.[58]

RUCO did not raise this issue in its prefiled testimony in this case, and therefore the factual record on the issue is limited. As stated above, Decision No. 68238 is an Order Preliminary, and not a Final Order. No request for a Final Order has yet been filed, and it therefore remains to be seen whether a Final Order will be considered in Docket No. W-02113A-05-0178. It is therefore inappropriate to base a determination on whether to allow rate base recovery of the additional CAP allocation acquisition cost on the existence of that docket. We agree with the Company that regardless of the outcome in Docket No. W-02113A-05-0178, all its customers will benefit from the additional CAP allocation.

Unaccounted-for Water

While RUCO recommends inclusion of 35 percent of the additional CAP allocation in rate base as a drought buffer if needed, RUCO simultaneously argues that if the Company needs a drought buffer, it should "work more diligently to resolve its long-standing water loss issue."[59] RUCO states that in 2007, the Company reported unaccounted-for water of 1,030 acre-feet, or 14 percent[60] as a result of metering inaccuracies either at the homes of ratepayers or at the CAP canal.[61] RUCO does not agree with Staff the fact that the Company's current CAP allocation was exceeded in 2006 shows a need for the additional CAP allocation.[62] RUCO argues that "if the Company accounted for the water in excess of the acceptable loss standard (10%), the Company would have an additional 4% or 315.5-plus acre-feet available to satisfy the needs of its customers" and "[i]f the Company accounted for unaccounted water there would be no need for additional CAP allocation for drought buffer."[63] RUCO's position fails to take into account that, as RUCO acknowledges,[64] the Company's test year unaccounted-for water was not due to "water loss," i.e., leaks, broken mains or maintenance issues. The non-account water issue is likely to be the result of a faulty CAP meter, an issue that the

[58] *Id.*
[59] RUCO Reply Brief at 7.
[60] RUCO Brief at 5, citing to Tr. at 62.
[61] *Id.* at 5-6, citing to Tr. at 67, 320.
[62] RUCO Reply Brief at 6, referring to Direct Testimony of Staff witness Marlin Scott, Jr. (Exh. S-1), Engineering Report at 11.
[63] RUCO Reply Brief at 6.
[64] RUCO Brief at 5-6.

Company is working to resolve with the Central Arizona Water Control District.[65] Staff's engineering witness testified that CCWC is well-operated, well-maintained and well-managed, and that CCWC is not ignoring water loss issues.[66] As the Company points out, resolution of the likely cause of the unaccounted-for water, a faulty CAP meter, will not result in any additional wet water for the Company to serve its customers.[67] We agree with the Company on this point, and find that RUCO's arguments regarding unaccounted-for water do not justify excluding the additional CAP allocation from rate base.

Staff's Engineering witness states that the Company is aware of its 15.9 percent unaccounted-for water/water loss amount, and that the Company informed Staff it will be installing its own CAP water meter at its Shea Water Treatment Plant to determine whether the CAP intake meter is accurately registering.[68] Staff recommends that the Company begin a 12-month monitoring exercise of its water system after the Company completes its own CAP water meter installation.[69] Staff further recommends that the Company docket the results of the system monitoring as a compliance item in this case by March 1, 2010.[70] Staff recommends that if the reported water loss for the period from February 1, 2009 through February 1, 2010 is greater than 10 percent, the Company be required to prepare a report containing a detailed analysis and plan to reduce water loss to 10 percent or less, or alternatively, if the Company believes it is not cost effective to reduce water loss to less than 10 percent, the Company should be required to submit a detailed cost benefit analysis to support its opinion.[71] Staff recommends that the Company be required to docket the report or alternative cost benefit analysis, if required, by April 30, 2010, as a compliance item for this proceeding for review and certification by Staff, and that in no case should water loss be allowed to remain at 15 percent or greater.[72] Staff's recommendations on this issue are reasonable and will be adopted.

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[65] Tr. at 38, 127-131.
[66] Tr. at 312, 319.
[67] Company Reply Brief at 13, citing Tr. at 130-31.
[68] Direct Testimony of Staff Witness Marlin Scott, Jr. (Exh. S-1) at *i*.
[69] Direct Testimony of Staff Witness Marlin Scott, Jr. (Exh. S-1) at *i*.
[70] *Id.*
[71] *Id.*
[72] *Id.*

Need for the Additional CAP Allocation

RUCO contends that CCWC's current water supplies, without the additional CAP allocation, are sufficient to meet the Company's its current and future demand.[73] At the same time, RUCO argues that if it is determined that some measure of the additional CAP allocation is needed to provide a drought buffer in the event of future curtailments of CAP water, only the used and useful portion of the additional CAP allocation should be included in rate base,[74] and that a current absence of growth in CCWC's service area and CCWC's unaccounted-for water should be considered in determining the amount of the additional CAP allocation that is used and useful.[75] RUCO recommends that "no more than 35%" of the additional CAP allocation be treated as Staff and the Company propose.[76] RUCO contends that the Company's demand estimates do not support placing 100 percent of the additional CAP allocation in rate base,[77] arguing on brief that "by Mr. Hanford's optimistic estimates, 18.17% of the additional CAP allocation will be needed by 2010 and 31.43% by 2016."[78] RUCO also expresses disagreement with Staff's projections, arguing that the growth projections Staff relied on in its determination that 50 percent of the additional CAP allocation is used and useful do not consider current economic circumstances in the Company's service territory.[79] RUCO argues that to reach Staff's projections, CCWC would have to establish 334 new accounts per year from 2007 through 2012,[80] but provided no alternative growth projections or evidence to support its claim other than the accounting analysis opinion of RUCO's witness that the current used and useful portion of the additional CAP allocation "is only about in the single digits."[81] RUCO's recommendation on this issue that "no more than 35 percent" of the additional CAP allocation should be allowed in rate base is difficult to reconcile with its arguments.

The Company states that if it is denied recovery for the additional CAP allocation, the Company would receive a message that it should rely on groundwater pumping if shortages occur,

[73] RUCO Reply Brief at 7.
[74] *Id.*
[75] *Id.*
[76] *Id.*
[77] *Id.* at 5.
[78] *Id.*, citing Tr. at 83-84.
[79] RUCO Reply Brief at 3-4.
[80] *Id.* at 4, referring to Direct Testimony of Staff Witness Marlin Scott, Jr. (Exh. S-1), Engineering Report at 5.
[81] *Id.* at 7, citing Tr. at 301-02.

instead of looking out for the long-term interests of its customers and the community of Fountain Hills by obtaining additional CAP water supplies.[82] RUCO argues that since the Company intends to file a rate case again in two to three years,[83] it is not imperative to include 100 percent of the additional CAP allocation in rate base.[84] The Company explains that if it is not accorded reasonable cost recovery for its purchase of the additional CAP allocation, it is unlikely that it will be able to keep the right that it believes it prudently acquired for the benefit of its customers.[85] The Company's witnesses testified that the Company has made an investment and expects a return on the investment, and that if full recovery of the acquisition costs is not allowed, the Company will be faced with a choice of how to otherwise recoup its investment.[86] If denied regulatory recovery of the investment made on behalf of its ratepayers, according to the Company, its choices will be to either: (1) retain the additional allocation and look for entities who wish to enter into wholesale water delivery arrangements from it; or (2) exchange or relinquish the additional acquisition and get its acquisition payment back.[87]

The application process for the available additional CAP allocations was a competitive one that considered the applicants' needs under the Third Management Plan.[88] Of fifty-three applicants seeking a portion of the 65,647 acre-feet of CAP water available for reallocation, only twenty-six applicants were considered in the first round, and CCWC was one of twenty who were subsequently given the opportunity to purchase an additional CAP allocation.[89] Based on the factual record in this case, we agree with Staff's reasoned recommendation, agreed to by the Company, that the entire acquisition cost of the additional CAP allocation be included in rate base, classified as a plant-in-service component of Land and Land Rights, and not subject to amortization. Our determination is based on the Company's need to provide its customers continued access to adequate renewable water supplies, and on the fact that CCWC acted prudently under the circumstances in the December, 2007,

[82] Rebuttal Testimony of Company witness Robert J. Sprowls (Exh. A-8) at 5.
[83] RUCO Reply Brief at 6, citing Tr. at 121.
[84] RUCO Reply Brief at 6.
[85] Company Reply Brief at 12.
[86] Direct Testimony of Company witness Robert N. Hanford (Exh. A-1) at 7.
[87] Direct Testimony of Company witness Robert N. Hanford (Exh. A-1) at 7.
[88] Direct Testimony of Staff witness Marlin Scott, Jr. (Exh. S-1), Engineering Report at 11; Tr. at 325-327.
[89] *Id.*

$1.28 million purchase of the additional CAP allocation.

C. Working Capital

The Company did not prepare a lead/lag study to quantify its cash working capital requirement.[90] Staff contends that in the absence of the cash working capital component of a lead/lag study, it is inappropriate to consider other components of working capital, and therefore disallowed prepayments and materials and supplies inventory from rate base.[91] Staff's proposed adjustment to rate base removes (1) Unamortized Debt Issuance Costs in the amount of $424,010, (2) Prepayments in the amount of $192,485, and (3) Materials and Supplies Inventory in the amount of $14,521, for a total reduction to rate base of $631,016.[92]

The Company argues that there is no requirement that it prepare a lead/lag study, and that it adopted the lead/lag study prepared by RUCO, along with the negative working capital allowance RUCO derived from its study.[93] RUCO's recommended total working capital is $95,400, which consists of a negative Cash Working Capital allowance of ($111,606), Prepayments in the amount of $192,485, and Materials and Supplies in the amount of $14,521.[94] The Company is critical of the fact that Staff did not analyze RUCO's lead/lag study, which was presented in RUCO's direct testimony, and argues that because Staff did not challenge RUCO's lead/lag study, it should therefore be adopted in lieu of Staff's disallowances.[95] Staff responds that if the Company had prepared a lead/lag study and submitted it with its application, Staff would have had an opportunity to review it and make a recommendation on it.[96]

The Company correctly states that Unamortized Debt Issuance Costs are actually not a part of working capital.[97]. Staff's witness testified at the hearing that while they are not, they should be removed from rate base nonetheless, because they are a below-the-line expense, and similar to

[90] A company's working capital requirement represents the amount of cash the company must have on hand to cover any differences in the time period between when revenues are received and expenses must be paid. The most accurate way to measure the working capital requirement is via a lead/lag study. The lead/lag study measures the actual lead and lag days attributable to the individual revenue and expenses. Staff Brief at 4.
[91] Staff Brief at 5, citing Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 23.
[92] Staff Brief at 5, citing Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 22.
[93] Company Reply Brief at 1.
[94] Direct Testimony of RUCO witness Timothy J. Coley (Exh. R-8) at 23-24.
[95] Company Reply Brief at 1.
[96] Staff Reply Brief at 2.
[97] Company Reply Brief at 2.

interest, are amortized over the life of the debt, and adds that it would also be improper to allow them as operating expenses.[98] The Company disagrees with Staff's assessment that the Unamortized Debt Issuance Costs are a below-the-line expense. The Company argues that no evidence was presented that the costs were improper or unreasonable, calls the idea "nonsensical,"[99] and argues that if Unamortized Debt Issuance Costs are removed from rate base, Staff should have included them in calculating the Company's cost of debt, but did not.[100] However, the Company provided no evidence controverting Staff's expert accounting testimony that Unamortized Debt Issuance Costs should be removed from rate base.[101]

A lead/lag study is the most accurate and appropriate means of measuring the working capital requirements of a utility of CCWC's size. The Company could have prepared and included with the application a lead/lag study to support its request for recovery of working capital allowance. If it had, all parties would have had adequate time for analysis and discovery related to the lead/lag study. The Company chose not to do so. In the absence of the cash working capital component of a lead/lag study, it is inappropriate to consider other components of working capital. The Company chose not to provide a lead/lag study for analysis, but wishes the Commission to allow recovery of working capital components nonetheless. The fact that a lead/lag study was presented by RUCO, and that Staff did not challenge it, does not compel its adoption. Neither does the fact that a lead/lag study was presented by RUCO compel the rejection of Staff's proposed adjustments. RUCO's accounting witness testified that "[s]hould the Commission reject RUCO's first recommendation, RUCO's second recommendation would be to disallow the Company the opportunity to recover materials & supplies and prepayments for which it seeks recovery, since those two items are components of a working capital allowance adjustment."[102] Staff's proposed disallowance of $192,485 in Prepayments and $14,521 in Materials and Supplies Inventory is appropriate, and will be adopted. In

[98] Tr. at 375-381.
[99] Company Brief at 2.
[100] Company Reply Brief at 14.
[101] The Company may be correct that the Unamortized Debt Issuance Costs should have been included in calculating the cost of debt, but if so, the Company also should have included them in its calculation. As discussed below, the parties are in general agreement on the cost of debt, with the cost of debt adopted in this proceeding slightly higher than that proposed by the Company.
[102] RUCO's Direct Testimony of RUCO witness Timothy J. Coley (Exh. R-8) at 24.

addition, the record supports removal of $424,010 in Unamortized Debt Issuance Costs from rate base. A total reduction to rate base of $631,016 is reasonable and will be adopted.

Staff recommends that the Company be ordered to perform and submit a lead/lag study in conjunction with its next rate adjustment request application in order to meet the sufficiency requirements of that filing. There was no objection to that recommendation, which is reasonable and will be adopted.

D. CIAC Amortization Rate

The Company and Staff agree regarding the method for amortization of Contributions in Aid of Construction ("CIAC"),[103] which includes computation of a composite CIAC amortization rate based on depreciation expense.[104] RUCO objects to the method, and recommends instead that the Company "be required to utilize the amortization rate established in the prior case or a rate established based on CIAC amounts and the corresponding plant depreciation rates to insure that plant and CIAC are properly matched."[105] Decision No. 68176 did not establish a specific CIAC amortization rate to be used on a going forward basis. The Company is correct that the reason specific CIAC amortization rates are not set on a going forward basis is that the amortization rate is expected to be adjusted to match the composite depreciation rate for each year, and using a fixed composite rate for amortization of CIAC over lengthy intervals between rate cases can result in significant mismatches between net plant-in-service and net CIAC.[106] Using the CIAC amortization rate utilized in that proceeding would not meet RUCO's goal of insuring that plant and CIAC are properly matched, whereas the methodology used by the Company and Staff in this proceeding does. The methodology used by the Company and Staff, which is based on CIAC amounts, depreciable plant, and depreciation expense in this case, properly matches net plant-in-service and net CIAC, and will be adopted.

E. Accumulated Depreciation

Staff proposes an adjustment to reduce Accumulated Depreciation by $2,031,950 from the

[103] Company Reply Brief at 14.
[104] Staff Reply Brief at 2-3.
[105] RUCO Reply Brief at 12.
[106] Company Brief at 15.

Company's amount of $15,877,022 to reflect Staff's Accumulated Depreciation of $13,845,072.[107] Staff states that the reason for the difference is related to Staff's use of the 4.0 percent General Office plant allocation factor and the plant additions and retirements of wells and other plant.[108] Staff contends that the 4.0 percent allocation factor is more correctly matched to the test year.[109] The Company agrees, and states that it accepted the 2.8 percent allocation factor proposed by RUCO as a compromise and to help minimize issues, even though it would result in a lower rate base and lower rates.[110] RUCO did not address the issue on brief. Staff's adjustment is reasonable and will be adopted.

IV. FAIR VALUE RATE BASE

Based on the foregoing discussion, we adopt an adjusted OCRB for the Company of $21,370,877, and an adjusted RCND of $32,181,951, weighted 50/50, for a FVRB of $26,776,414.

V. OPERATING INCOME ISSUES

A. Property Tax Expense Calculation

The Company and Staff propose to follow recent Commission Decisions to use adjusted test-year revenues in the application of the Arizona Department of Revenue ("ADOR") formula in order to determine allowed property tax expense.[111] As in many past rate cases, RUCO disagrees with this methodology, and proposes the use of either the "ADOR methodology of averaging three historical years, or RUCO's new alternative of adding the last known and measurable property tax expense and the property tax expense associated with the additional increment of adjusted proposed revenue approved by the Commission."[112] RUCO attached as an exhibit to its closing brief a new schedule showing the effect of RUCO's new alternative methodology on the proposed revenues of the parties.[113] RUCO states that the Company collected nearly $300,000 more property tax expense than it actually paid in the three years from 2006 to 2008, due to a decrease in the Company's property tax

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[107] Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 20.
[108] *Id.*
[109] *Id.*
[110] Company Reply Brief at 3.
[111] Direct Testimony of Staff witness Marvin E. Millsap (Exh. S-2) Schedule MEM-25; Rebuttal Testimony of Company witness Thomas J. Bourassa (Exh. A-5) at 17.
[112] RUCO Reply Brief at 12.
[113] RUCO Brief, Exhibit A.

assessment, which RUCO states was "due in great part to the reduction in tax rate and the tax assessment ratio, adopted by the Arizona Legislature in HB 2779 and codified at A.R.S. § 41-15002."[114] RUCO argues that if the methodology it advocates had been used in the prior rate case, averaging the three prior years of reported gross revenue by a factor of two, would have resulted in $19,000 less in allowed property tax expense.[115] The Company disagrees with RUCO's claim that it has overcollected property tax expense. The Company argues that having consistently failed to earn sufficient revenue to earn its authorized rate of return every year since the current rates went into effect, the Company has not over-recovered anything, rendering RUCO's argument illusory.[116] The Company contends that RUCO's claim demonstrates the danger of singling out one expense to evaluate over-or under-recovery, and that RUCO's contention that the Company "overcollected" property taxes is both misleading and untrue.[117] Staff argues that because RUCO has provided no other substantive basis for deviating from the methodology the Commission has consistently utilized in calculating property tax expense, that the Commission should adopt the methodology used by the Company and RUCO in this case.[118]

We agree with RUCO that the difference in the estimated property tax in the last rate case and the amount of property tax paid in the years from 2006 to 2008 was due largely to tax rate and tax assessment ratio changes, and not to the methodology used to estimate the Company's property tax expense.[119] And we agree with the Company that looking at a single expense allowance from a prior rate case in order to judge expense under- or over-collection, can be misleading and should be avoided, as should any other single-issue ratemaking exercise. Unlike many test year expenses, a determination of property tax expense involves a forward-looking estimation. Using the revenue-dependent methodology based on the ADOR formula that has repeatedly been approved by the Commission, Staff and the Company utilized adjusted test-year revenues in the application of the ADOR formula to estimate the Company's future property tax expense, in order to determine an

[114] RUCO Brief at 12, citing Surrebuttal Testimony of RUCO witness Timothy J. Coley (Exh. R-9) at 31-32.
[115] RUCO Brief at 12, citing Surrebuttal Testimony of RUCO witness Timothy J. Coley (Exh. R-9) at 38-41.
[116] Company Reply Brief at 15.
[117] Company Brief at 17, citing Tr. at 158-59.
[118] Staff Reply Brief at 9.
[119] RUCO Brief at 12.

appropriate allowed expense level based on that estimation. Staff's method calculates the appropriate level of ongoing property tax expense for the revenue requirement by including a component for property taxes that reflects known assessment ratios and tax rates in the gross revenue conversion factor.[120] RUCO's arguments in this case do not provide a basis for requiring any changes to the simple, accurate, reliable and reasonable methodology we have approved in past cases and again adopt in this case.

B. Expense Normalization

Staff proposes adjustments to normalize test year Chemical Expenses and Repairs and Maintenance Expenses. The Company opposes both normalization adjustments.

Chemical Expenses

Staff's proposed normalization of Chemical Expenses would reduce the test year expense level from $127,457 to $99,827, which is the three-year average of the Company's chemical expenses for 2004, 2005, and the test year, 2006. The expenses in 2004 were $66,210; in 2005, $105,814; and in 2006, $127,457. Staff asserts that the normalization is appropriate because the Company's chemical expenses have more than doubled subsequent to the Company's prior test year of 2003, and because there were two large invoices totaling approximately $17,000 for chemicals delivered in December, 2006 that Staff believes were to be used post test year.[121] Staff asserts that the December 2006 invoices were for deliveries not made on a monthly basis, but over longer time periods, and that Staff believed those chemicals were for use in the following year, not the test year, and should therefore not have been included in test year expenses.[122] Staff's witness also testified that he knew that a new treatment plant had come online during the three-year time period he used for the normalization averaging, so that he was aware that chemical expenses would increase.[123] The Company disagrees with the normalization adjustment, contending that the test year is presumed to be normal, and adjustments should be based on known and measurable changes.[124] We agree. In this instance, it was known to Staff that due to the new treatment plant, chemical expenses would have

[120] Staff Brief at 10.
[121] Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 33; Tr. at 384-85.
[122] Tr. at 384-85.
[123] *Id.*
[124] Company Brief at 19.

increased.[125] In regard to the December 2006 invoices, the record does not reflect any inquiry demonstrating that Staff's assumption that the chemicals were not properly a test year expense was correct. If so, it may have been proper to exclude them from test year expenses, but that is not what Staff proposed. Even if Staff had shown that the invoice amounts should have been excluded, the exclusion would not have justified a normalization adjustment. Because the record does not support the normalization of Chemical Expense proposed by Staff, the actual test year expense will be allowed instead.

Repairs and Maintenance Expense

Staff proposes a normalization adjustment to the Company's Repair and Maintenance Expense reducing the test year expense from $104,609 to $91,134. Staff believes that the fluctuation in this expense account, from $96,152 in 2004, to $72,640 in 2005, to $104,609 in the test year, called for a normalization adjustment, based on Staff's opinion that there "does not appear to be any upward trending in these expenses."[126] In addition, Staff proposes exclusion of $5,543 of test year expenses booked in this account for the Company's payments to Pepsi Cola Company of Dallas for beverages for the Company's employees. The Company does not dispute that the $5,543 should be disallowed. We agree with Staff that this is an expense that should be borne by the shareholders, not the ratepayers, and will not be allowed. The $5,543 disallowance to test year expenses brings the test year level of repair and maintenance expense down to a level close to the 2004 level of expense, which, based on the evidence presented, is a reasonable level. Because the record does not support Staff's proposed normalization of Repairs and Maintenance Expense, the actual test year expense, less Staff's proposed disallowance of $5,543, will be allowed.

C. Deferral of CAP M&I Charges

The Company and Staff agree that the Company should be allowed recovery of 50 percent of the CAP M&I charges related to the additional CAP allocation, or $20,306, as an operating expense, based on Staff's position that only 50 percent of the additional CAP allocation is used and useful at this time, and that 50 percent of the charges should be deferred.[127] Staff filed in this docket proposed

[125] Tr. at 384-85.
[126] Testimony of Staff witness Marvin E. Millsap (Exh. S-2) at 34; Staff Reply Brief at 4.
[127] Company Brief at 11, 20-21; Staff Reply Brief at 4.

accounting order language which would allow the deferral of the remaining 50 percent of the M&I charges.[128] RUCO states that if it is determined that some portion of the additional CAP allocation is used and useful, a commensurate portion of the associated annual water service capital charge should be included as an M&I expense in this case.[129] RUCO does not oppose the accounting order language as to form.[130] The Company disagrees with language in Staff's accounting order proposal allowing the Company a 36 month deferral period,[131] and included its own proposed accounting order language as an attachment to its closing brief.[132]

The Company and Staff disagree on two issues related to the deferral: (1) whether the Company should be allowed to defer interest or other carrying charges, and (2) whether the deferral should have a time limitation.

The Company asserts that until the recovery of interest or carrying costs can be considered in a future rate case, the Company should be allowed to accrue reasonable carrying costs.[133] Staff contends that it is inappropriate to allow the Company to accrue interest on the deferral, because 50 percent of the M&I charges are not currently used and useful.[134] As Staff notes, the interest and timeframe requirements of Staff's proposal are consistent with other Commission Accounting Orders.[135] Staff's language "excluding any interest or other carrying charges" is consistent with our other Accounting Orders and will therefore be adopted.

The Company contends that there is no reason for "preset, artificial limits" on the deferral period.[136] Staff argues that without a specified timeframe, the Company would be able to defer the charges indefinitely.[137] Staff contends that 36 months is a reasonable timeframe for the deferral period, and points out that its proposal also includes a provision allowing the Company to continue the deferral beyond its evaluation in the Company's next rate case, such that the Staff proposal does

[128] Staff Proposed Accounting Order Language docketed on January 6, 2009.
[129] RUCO Reply Brief at 7.
[130] RUCO Response to Proposed Accounting Order, docketed on January 13, 2009.
[131] Company Brief at 21-22 and Exhibit 2.
[132] Company Brief at Exhibit 2.
[133] Company Brief at 21-22 and Exhibit 2.
[134] Staff Reply Brief at 5.
[135] *Id.*
[136] Company Brief at 21-22 and Exhibit 2.
[137] Staff Reply Brief at 5.

not specifically limit the deferral to 36 months.[138] Staff states that it proposed the 36 month timeframe in order to permit time for Staff to evaluate whether the Company is properly accounting for the deferral, and also to determine if all or a portion of the deferred charges are used and useful, and therefore eligible to be placed in rates.[139] For the reasons provided by Staff, we agree that a definite timeframe should be placed on the deferral period, and find that under the circumstances of this case, a 48 month period is reasonable.

D. Rate Case Expense

The Company requests authority to recover rate case expense associated with this case in the amount of $280,000. The Company states that it based its request primarily on the $285,000 amount awarded in its last rate proceeding, and that it has incurred more than $280,000 in this proceeding.[140] RUCO did not brief the issue of rate case expense for this case. Staff proposes that the Company be allowed to recover no more than $150,000 in rate case expense for this proceeding, arguing that $150,000 in rate case expense is similar to amounts the Commission has allowed comparably-sized utilities to recover through just and reasonable rates.[141] Staff recommends that rate case expense be normalized, instead of amortized.[142] The Company argues that Staff's opposition to the Company's request for this proceeding is not supported by the evidence, because Staff gave no consideration to the specifics of this rate case, to the rate case process, or to the similar rate case expense awards relied on by the Company, and because Staff could not provide specifics regarding the cases its witness relied on in reaching his recommendation.[143] The Company requests that if its rate case expense recovery is normalized, as Staff recommends, rather than amortized, that it be granted authority to institute a surcharge instead "to ensure that recovery actually occurs."[144] Based on our review of the record, we find that it is reasonable to allow recovery of $280,000 for the expenses incurred by the Company in this proceeding. We agree with Staff that because rate case expense is a

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[138] *Id.*
[139] *Id.*
[140] Company Brief at 22, citing Rebuttal Testimony of Company witness Thomas J. Bourassa (Exh. A-5) at 15 and Rebuttal Testimony of Company witness Robert N. Hanford (Exh. A-2) at 10.
[141] Staff Brief at 8.
[142] *Id.*
[143] Company Brief at 24, citing Tr. at 390-98.
[144] Company Reply Brief at 6.

recurring expense, normalization is a more appropriate treatment than amortization, and that a surcharge for recovery of rate case expense would be inappropriate. The $280,000 allowed rate case expense related to this proceeding will therefore be normalized over three years.

E. Appeal and Remand Rate Case Expense

In addition to the Company's requested recovery of rate case expenses associated with this proceeding, the Company has requested recovery in this docket of its rate case expenses associated with the Remand Proceeding, as allowed by Decision No. 70441.[145] The Company originally requested recovery of $258,111 of the $500,000 of rate case expense it incurred in its appeal of Decision No. 68176 and the Remand Proceeding, which included expert witness fees, copying, mailing and publication costs, and discounted legal fees.[146] The Company currently requests recovery of $100,000 of these expenses through operating expenses, together with the $280,000 in expenses associated with this proceeding, discussed above, for a total recovery of $380,000, amortized over three years, resulting in a total annual expense of $126,667 reflected in the revenue requirement for this case.[147] Staff recommends that the Company be permitted to recover $100,000 in rate case expense related to the Remand Proceeding, normalized over a three year period, which, with its recommendation of recovery of $150,000 related to the current proceeding, would result in total rate case expense of $250,000, normalized over a three year period, for a total annual rate case expense of $83,333 reflected in the revenue requirement for this case.[148] RUCO recommends denial of any rate case expense recovery related to the Company's appeal of Decision No. 68176 and the Remand Proceeding, and RUCO's final schedules show total annual rate case expense of $93,333 reflected in the revenue requirement for this case.[149]

RUCO argues that the Company's request for legal fees for the appeal and remand of Decision No. 68176 should be denied "as a matter of law and public policy."[150] RUCO argues that

[145] Decision No. 70441 at 43.
[146] Supplemental Direct Testimony of Company witness Thomas J. Bourassa (Exh. A-4) at 2-7.
[147] Company Reply Brief at 6.
[148] Staff Brief at 7-8.
[149] RUCO Final Schedule TJC-27.
[150] RUCO Reply Brief at 12.

"[a]lthough the appeal and remand corrected the method by which the Commission determined FVRB rate of return, the Company pursued the appeal to obtain additional operating income for the benefit of its shareholders,"[151] and contends that the shareholders should therefore bear the costs associated with that lawsuit, and the Company should "pay the costs for its business decision to pursue an appeal."[152] RUCO argues that "[p]ermitting the Company to recover its rate case expense on a lawsuit to benefit shareholders would leave the utilities with the expectation that they can pursue any lawsuit with no worry of the costs associated therewith because captive ratepayers will pick up the tab."[153]

The Company contends that it is in the public interest to ensure the legality of Commission Decisions, and therefore the Company should not bear the entire burden of the expense it incurred to appeal a Decision for which the Company was not responsible, and which the court found unlawful.[154] The Company also states that contrary to RUCO's assertion that a utility "can pursue any lawsuit with no worry of the costs," a utility has no expectation of any expense recovery unless it prevails in its appeal, and that even if a Company is successful, full recovery of expenses is unlikely.[155]

RUCO advances the argument that that Arizona law does not permit recovery of attorney's fees on remand, citing A.R.S. § 12-348 and *Columbia Parcar Corp. v. Arizona Dept. of Transportation.*[156] *Columbia Parcar* held that plaintiffs did not prevail in adjudication "on the merits" on judicial review by securing reversal and remand for new hearing on procedural grounds, and thus were not entitled to award of fees. In *Columbia Parcar*, in the administrative proceeding leading to the appeal, plaintiffs were not allowed to present evidence on statutory requirements related to their claim.[157] The facts of *Columbia Parcar* are therefore distinguishable from the facts in

[151] RUCO Brief at 11.
[152] *Id.*
[153] *Id.* 11.
[154] Company Brief at 24.
[155] Company Reply Brief at 16.
[156] RUCO Brief at 10, citing *Columbia Parcar Corp. v. Arizona Dept. of Transportation,* 193 Ariz. 181, 971 P.2d 1042 (App. 1999).
[157] *Columbia Parcar,* 193 Ariz. at 183, 971 P.2d at 1043.

this case, as CCWC did not secure its remand of Decision No. 68176 on procedural grounds, but because it prevailed on the merits of its appeal of a specific ratemaking issue. We also agree with the Company that the statute cited by RUCO does not apply to this case, as A.R.S. § 12-348(H)(1) does not apply to actions "to establish or fix a rate."[158]

Although we find that the Commission has authority to award attorneys fees to the Company for the appeal and the remand proceeding, we decline to do under these circumstances. The Company spent more than $500,000 to recover an additional $12,000 in operating income. While no one disputes the Company's right to pursue whatever legal recourse it wants to pursue, we believe that Company should maintain a proper perspective of the costs and benefits associated therewith. In order to ensure the Company undertakes the appropriate analysis of the risks and benefits of litigation, we will not allow the Company to impose the costs of the appeal upon captive ratepayers.

F. Operating Income Summary

With the adjustments discussed above, we find the Company's test year operating expenses to be $6,561,825, on adjusted test year revenues of $7,505,010, for adjusted test year operating income of $943,185.

VI. COST OF CAPITAL

The parties to this case recommend a rate of return for the Company as follows: CCWC, 9.96 percent; RUCO, 6.38 percent;[159] and Staff, 7.6 percent.[160] For the reasons discussed below, we adopt a FVROR for the Company of 7.52 percent.

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[158] A.R.S. § 12-348(H)(1) provides:

> This section does not:
> 1. Apply to an action arising from a proceeding before this state or a city, town or county in which the role of this state or a city, town or county was to determine the eligibility or entitlement of an individual to a monetary benefit or its equivalent, to adjudicate a dispute or issue between private parties or to establish or fix a rate.

[159] RUCO Final Schedule TJC-36.

[160] Staff Final Schedule PMC-2.

A. Capital Structure and Cost of Debt

Capital Structure

The parties are generally in agreement regarding CCWC's capital structure. The Company proposes a capital structure consisting of 3.97 percent short-term debt, 19.45 percent long-term debt, and 76.58 percent equity. RUCO recommends a capital structure comprised of 4.08 percent short-term debt, 19.17 percent long-term debt, and 76.75 percent common equity. Staff proposes a capital structure of 75.6 percent equity and 24.4 percent debt. The minor differences in the parties' recommendations are attributable to the Company's use of the capital structure at the end of the test year, while Staff and RUCO used a more recent capital structure.[161] Based on the parties' proposals, we find that a capital structure of 24 percent debt and 76 percent equity is reasonable for the Company in this case.

Cost of Debt

The Company proposes a cost of short-term debt of 2.88 percent, which it based on the London Inter-Bank Offered Rate ("LIBOR") reported on November 21, 2008.[162] CCWC's short term debt is provided by its parent, American States Water Company, subject to variable interest rates based on the LIBOR.[163] CCWC's proposed cost of long-term debt, 5.33 percent, is based on the end of test year interest rate on its low-cost bonds issued in 1997,[164] for an overall cost of debt of 4.92 percent.[165] RUCO recommends a cost of short-term debt of 2.71 percent, and a cost of long-term debt of 5.34 percent. Staff proposes a composite cost of long-term and short-term debt of 5.0 percent, which takes into account changes to the Company's long-term debt occurring after the test year.[166] Based on the parties' proposals, we find that the 5.0 percent composite cost of debt recommended by Staff is reasonable, and will adopt it.

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[161] *See* Cost of Capital ("COC") Rejoinder Testimony of Company witness Thomas J. Bourassa (Exh. A-21) at 4-5.
[162] Company COC Brief ("Brief") at 31.
[163] *Id.*
[164] *See* Company Amended Final Sched. D-2.
[165] Staff COC Brief at 2.
[166] Staff Final Sched. PMC-10.

B. Cost of Equity

Using the DCF and CAPM models, the Company's cost of capital witness estimated the Company's cost of equity to be 12.7 percent. The Company states that although it believes its current cost of equity is 12.7 percent, it has requested a cost of equity of 11.5 percent in order to minimize disputes.[167] Staff's cost of equity estimate is 10.1 percent.[168] RUCO's unadjusted cost of equity estimate is 8.83 percent.[169]

While the Company and Staff used the same six publicly traded water companies as a sample group in their cost of equity analyses, RUCO's sample group differed. The Company disagrees with the group of publicly traded utilities RUCO used to estimate CCWC's cost of equity. In particular, CCWC disagrees with RUCO's substitution of Southwest Water Company for Connecticut Water Service, Middlesex Water Company, and SJW Corporation. RUCO asserts that Southwest Water Company is an appropriate comparable company because American States Water, CCWC's parent company, offers nearly identical service as Southwest Water Company, including unregulated services, and has an identical risk as Southwest Water Company, demonstrated by the fact that the two companies share the same market beta[170] of 1.05, as reported in Value Line Utility Reports.[171] CCWC argues that Southwest Water Company is not comparable to either CCWC or to the publicly traded water utilities in the sample group used by CCWC and Staff in their cost of equity estimates. CCWC states that according to AUS Utility Reports (November 2008) only 45 percent of Southwest Water Company's revenues are derived from regulated activities, whereas four of the six water utilities used by CCWC and Staff have at least 90 percent of their revenue derived from regulated activities, and the remaining two have 82 percent and 85 percent of their revenues derived from regulated activities.[172] CCWC argues that in comparison to Southwest Water's 45 percent of

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[167] Company COC Brief at 2.
[168] Staff Final Schedule PMC-1.
[169] RUCO Final Schedule TJC-36. RUCO refers to this as the "OCRB Weighted Cost of Capital."
[170] Beta measures the systematic risk of a particular entity's stock relative to the market's beta, which is 1.0. Since the market's beta is 1.0, a security with a beta higher than 1.0 is riskier than the market and a security with a beta lower than 1.0 is less risky than the market. *See* Direct Testimony of Staff Witness Pedro M. Chaves, (Exh. A-16) at 29.
[171] RUCO COC Brief at 8, RUCO COC Reply Brief at 4.
[172] COC Rejoinder Testimony of Company witness Thomas J. Bourassa (Exh. A-21) at 28.

revenues from regulated activities, 86 percent of CCWC's parent company American States Water's revenues and 96 percent of its net income were generated by its principal subsidiary, Golden State Water Company, which also owns 92 percent of American States Water's assets, but CCWC did not specify the percentage of those revenues derived from regulated services.[173] CCWC also argues that Southwest Water Company's earnings per share were negative for the twelve-month period ended June 30, 2008, and that RUCO's use of this financially troubled company in its proxy group depressed RUCO's cost of equity estimate by 60 basis points.[174] CCWC contends that *Sun City Water Co. v. Arizona Corp. Comm'n*[175] supports its position that Southwest Water should be excluded from RUCO's proxy group because it is "financially sick."[176] We disagree. The facts in the *Sun City* case are distinguishable from this case in two significant ways. First, the court in the *Sun City* case did not address the use of companies in a proxy group for either a DCF or CAPM analysis, and was instead criticizing the use of comparative earnings analysis for setting a rate of return for the water utility in question.[177] A comparative earnings analysis, which is not proposed by any party to this case, differs greatly from the DCF and CAPM analyses in the use of companies for comparison purposes. Second, the *Sun City* court referred not to an individual "financially sick" company, but to the "financially sick" condition of the water utility industry as a whole at that time, while criticizing the comparative earnings analysis used in that case as being particularly inappropriate "when evidence was presented that this industry was generally sick financially".[178]

The Company also disagrees with RUCO's use of a sample group of natural gas distribution utilities, and argues that an adjustment must be made to account for their use as proxies. RUCO states that gas utilities serve as an appropriate proxy for CCWC because gas and water companies have similar operating characteristics in terms of distribution and similar risks.[179] CCWC asserts that because RUCO's water utility proxy group, with an average beta of 0.82, has more systematic

[173] Company COC Reply Brief at 18-19.
[174] *Id.* at 35, citing Rigsby Dt., Sched. WAR-2.
[175] *Sun City Water Company v. Arizona Corp. Comm'n*, 26 Ariz. App. 304 , 310, 547 P.2d 1104, 1110 (App. 1976), *rev'd on other grounds*, 113 Ariz. 464, 556 P.2d 1126 (1976).
[176] Company COC Reply Brief at 19.
[177] *Sun City Water Company*, 26 Ariz. App. at 310, 547 P.2d at 1110.
[178] *Id.*
[179] RUCO COC Brief at 7.

(market) risk than its gas utility proxy group, with an average beta of 1.05, that the gas proxy group is not comparable to CCWC.[180] CCWC argues that because the gas proxy group's average beta is higher than the water proxy group's, an adjustment must be made to account for the current difference in risk between a typical water utility and a typical gas utility.[181] CCWC asserts that Commission Decision No. 66849 "rejected the use of gas companies as proxies for a water utility based on the difference between the average beta of the water utility sample group and average beta of the gas utility sample group," that "use of the gas utility sample as a proxy for the water utility would have increased the cost of equity,"[182] and that Staff's position in the case leading to Decision No. 66849 supports a 250 basis point upward adjustment in this case.[183] Decision No. 66849 does not support such an adjustment. Contrary to the Company's assertion, Decision No. 66849 did not reject Staff's use of a gas proxy group. However, it did reject Staff's position that its use of gas proxies necessitated a downward adjustment to Staff's cost of equity estimate. Decision No. 66849 instead adopted Staff's unadjusted average of its DCF and CAPM models. The use of a gas utility sample had the effect of increasing the cost of equity over Staff's recommendation in that case.[184] The Company's argument that a failure in this case to make an upward adjustment would constitute an arbitrary and capricious action[185] is simply wrong. In this case, as RUCO points out, CCWC itself used water utilities with the same range of beta as RUCO's gas proxy; one third of the companies in CCWC's water proxy group have the same range of betas as the companies in RUCO's gas proxy group; nine of the ten gas utilities in RUCO's gas proxy have betas between 0.80 and 0.90; the Company's proxy group of six water companies included Connecticut and Middlesex Water Companies, which have betas ranging between 0.80 and 0.90;[186] and testimony on the record indicates that there is movement toward using gas utility proxies to derive cost of capital for water

[180] Company COC Brief at 36.
[181] *Id.*
[182] Company COC Reply Brief at 19-20, citing Decision No. 66849 (March 19, 2004) *In the Matter of the Application of Arizona Water Company, an Arizona Corporation, for Adjustments to its Rates and Charges for Utility Service Furnished by its Eastern Group and for Certain Related Approvals* at 21.
[183] Company COC Reply Brief at 20.
[184] Decision No. 66849 at 23.
[185] *See* Company COC Reply Brief at 20.
[186] RUCO COC Brief at 6-7.

companies.[187] The record does not reflect a need for a special adjustment due to RUCO's use of natural gas distribution utilities as proxies.

While the Company arrived at its CAPM cost of equity estimate of 14.6 percent by averaging its historical market risk premium result of 9.8 percent with its 19.4 percent current market risk premium result, RUCO did not use a current market risk premium, but reached its CAPM estimate based on a historic market risk premium.[188] RUCO calculated a range for its CAPM cost of equity between 8.10 and 9.78 percent for its water sample, and between 6.94 and 8.25 percent for its gas sample.[189] RUCO contends that because reliance on past performance is a better indicator of future performance than reliance on analyst's projections of market return and treasury yields, RUCO's use of a historic market risk premium to derive a CAPM cost of equity capital is appropriate, particularly in the current economic circumstances.[190] While the Company argues that market volatility does not make the CAPM unstable or subject to manipulation,[191] RUCO concurs with Staff's witness David Parcell that the current risk premium CAPM is not a proper model in a very depressed market, and that the Company's CAPM analysis should be rejected because it is based, in part, on a current market risk premium.[192] RUCO agrees with Mr. Parcell that development of a growth rate from stocks priced in an extremely depressed market leads to a CAPM which is too high.[193] RUCO further argues that the Company's use of a 19.4 percent current market risk premium to determine a cost of equity capital is inconsistent with the most recently available market data, comparing it to Value Line's October 24, 2008 projections of 7.50 percent for the return on common equity for the water industry through the five year period through 2013, for a difference of 1,190 basis points.[194] We agree with RUCO and Staff that the Company's CAPM should be rejected because it is based, in part on a current market risk premium, which is inappropriate in a depressed market.

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[187] *Id.* at 7, citing Tr. at 776-77.
[188] RUCO COC Brief at 2.
[189] COC Direct Testimony of RUCO witness William A. Rigsby (Exh. R-14) at 333-34.
[190] RUCO COC Brief at 3, RUCO COC Reply Brief at 8.
[191] Company COC Reply Brief at 15.
[192] RUCO COC Brief at 4, citing David Parcell's testimony, Tr. at 746, 759-761.
[193] RUCO COC Reply Br at 7-8, citing Staff witness David Parcell's testimony, Tr. at 759.
[194] RUCO COC Reply Brief at 8, citing Company witness Thomas Bourassa's testimony, Tr. at 580.

The Company asserts that RUCO significantly reduced its CAPM cost of equity estimate by using a geometric mean to calculate the market risk premium, by using two different Treasury securities as its proxy for the risk-free rate of return, and by using the average total return, instead of the average income return, on risk-free Treasuries.[195] RUCO derived its historic market premium using both a geometric and an arithmetic mean of the historical returns on the Standard and Poor's 500 ("S&P 500") index from 1926 to 2007 as the proxy for the market rate of return.[196] RUCO states that the use of geometric mean is the industry standard, that geometric means are published in Morningstar, and that Value Line calculates both historic and prospective growth rates on a geometric or compound growth rate basis.[197] RUCO also argues that its historic market risk premium range of between 4.90 percent and 6.5 percent, for an average of 5.7 percent, falls close to the range of 4.0 to 5.0 percent identified as reasonable in a recent professional presentation,[198] and the range of 4.5 to 5.5 percent identified as reasonable in a recent publication cited in this case by both the Company and RUCO.[199] RUCO contends that because its historic market risk premium falls close to the range identified as reasonable by recent empirical research, and the Company's historic market risk premium using an arithmetic mean of 7.5 percent does not, the Company's cost of equity recommendation should be rejected.[200] CCWC argues, unconvincingly, that RUCO's use of an excerpt from the Koller, Goedhart, and Wessels text[201] (to which the Company cited as supporting a separate issue) fails to support RUCO's contention that its market risk premium of 5.7 percent, the average of its geometric and arithmetic mean, is reasonable, because the risk premium in this case is not being computed with short-term bonds, and because the Company's calculations are not found in a textbook.[202] The Company argues that its 7.5 percent historic market risk premium is not too high,

[195] Company COC Brief at 40-49.
[196] RUCO COC Brief at 4.
[197] *Id.* at 4-5.
[198] *Id.* at 5, citing opinions given by Dr. Aswarth Damdaran, New York University professor of finance and Dr. Felicia C. Marston, University of Virginia professor of finance during a panel discussion presentation at the 39th Annual Financial Forum of the Society of Utility and Regulatory Financial Analysts held April 19 and 20, 2007, at Georgetown University.
[199] RUCO COC Brief at 5, citing *Valuation: Measuring and Managing the Value of Companies*, 4th Ed., 2005, by McKinsey & Company, Inc., Koller, Goedhart, and Wessels, p. 306.
[200] RUCO COC Brief at 5.
[201] *Valuation: Measuring and Managing the Value of Companies*, 4th Ed., 2005, by McKinsey & Company, Inc., Koller, Goedhart, and Wessels, p. 306.
[202] Company COC Reply Brief at 17.

as RUCO contends, because both Staff and the Company used the arithmetic mean published in the *2008 Ibbotson SBBI Valuation Edition Yearbook* (Morningstar 2008), which calculates the historic risk premium by averaging the historic arithmetic differences between the S&P 500 and intermediate-term government bond income returns for the period 1926 through 2007, and RUCO "has presented no evidence that *Ibbotson*'s calculations are erroneous.[203] Staff's witness Mr. Parcell states that because investors use both arithmetic and geometric average returns, both should be considered in the development of a risk premium.[204] Mr. Parcell states that exclusive use of arithmetic averages leads to a higher, and potentially excessive risk premium, and thus CAPM results, because arithmetic averages exceed geometric averages.[205] Although Staff has traditionally used arithmetic averages as a component of its historic risk premium, Staff's witness Mr. Parcell's testimony supports RUCO's use of both arithmetic and geometric averages in the development of the historic market risk premium.

In response to CCWC's assertion that RUCO significantly reduced its CAPM cost of equity estimate by using two different Treasury securities as its proxy for the risk-free rate of return, and by using the average total return, instead of the average income return, on risk-free Treasuries, RUCO states that initially, it used both intermediate and long-term securities to estimate the risk-free rate of return, but then recalculated its historic market risk premium, using matching intermediate treasuries as advocated by the Company, and that the impact of recalculating its cost of equity capital estimate based on the Company's methodology would be an increase of 10 basis points, from 6.38 percent to 6.48 percent.[206] RUCO explains that it is not modifying its recommendation, because its recommendation of 6.38 percent is based on a market risk premium that already exceeds the market risk premium recommended by the authorities on which RUCO relied.[207]

CCWC asserts that RUCO's reliance on only the sustainable growth method to estimate the dividend growth component of its constant growth DCF estimate also causes RUCO's cost of equity

[203] *Id.*
[204] Surrebuttal Testimony of Staff witness David C. Parcell (Exh. S-7) at 10.
[205] *Id.*
[206] RUCO COC Reply Brief at 6.
[207] *Id.* at 7.

estimate to be understated.[208] CCWC argues that RUCO failed to disclose the key inputs necessary to estimate the internal or retention growth rate it used in the constant growth DCF model, and the estimate should be rejected because it cannot be reproduced or updated based on more current market data or information.[209] RUCO responds that this argument is a red herring, as there was essentially no difference between the parties' cost of capital experts' estimates of average sustainable growth for water utility proxies.[210] RUCO points out that CCWC's cost of capital expert estimated the average sustainable growth to be 6.39 percent for his water utility sample, leaving a difference of only 9 basis points between the Company's estimate and RUCO's estimate, which was 6.30 percent.[211]

CCWC argues that because Mr. Parcell testified that he was required to accept the models and inputs used by Staff's witness, Mr. Chaves, to estimate CCWC's cost of equity, Mr. Parcell's testimony has limited relevance to this case.[212] Until it filed its reply brief, the Company's arguments actually ignored Staff's recommended cost of equity of 10.1 percent, apparently preferring to argue that "Staff's final recommendation is 11.9 percent," and that Staff's recommendation is "not affected by recent market volatility and related events.[213] The Company also argued that the only aspect of Mr. Chaves' methods Mr. Parcell actually disagreed with was that Staff's current market risk premium estimate was too high due to current market volatility.[214] Because Staff filed surrebuttal testimony withdrawing its recommendation for a Hamada adjustment prior to the hearing,[215] The Company's post-hearing brief argument against the "recommended 180 basis point downward adjustment to [Staff's] 11.9 percent cost of equity estimate"[216] is misplaced and irrelevant.

Staff is critical of the Company's use, in the current economic environment, of spot stock prices in its DCF and CAPM models.[217] Staff argues that theses are not normal times, and that times

[208] Company COC Brief at 38.
[209] *Id.* at 38-39
[210] RUCO COC Reply Brief at 2.
[211] *Id.*
[212] Company COC Brief at 49.
[213] *Id.* at 50-51(emphasis in original).
[214] *Id.* at 50.
[215] Surrebuttal Testimony of Staff witness David C. Parcell (Exh. S-7) at 12.
[216] Company COC Brief at 52-55.
[217] Staff COC Brief at 6.

such as these may require a departure from methods the Commission has previously relied on.[218] Staff's witness testified that market models such as the DCF and CAPM are forward looking, and assume that stock prices and interest rates reflect current expectations of the future, but that such assumptions are not applicable in today's economic environment.[219]

The Company asserts that the riskiness of the sample water utilities the parties used to estimate cost of equity has increased since CCWC's last rate case, as shown by the sample companies' increase in their average beta, which the Company states is currently 0.93, while the average beta for the same proxy group was 0.68.[220] The Company argues that the fact that the markets are riskier now than in previous years requires a higher cost of equity than CCWC was authorized in its prior case, in order to allow it to continue to attract capital.[221] Staff notes that its cost of equity recommendation of 10.1 percent constitutes an 80 basis point increase from the 9.3 percent cost of equity as determined in Decision No. 68176 and upheld by the Court of Appeals, but that the Company's cost of equity estimate of 11.5 percent constitutes an increase of 220 basis points.[222] Staff contends that the Company has failed to justify such a large increase in its cost of equity.[223]

We certainly recognize that current market conditions present increased risks over recent years for many companies. However, we do not find that a general increased level of risk justifies the cost of equity requested by the Company. While the Company is critical of the inputs RUCO and Staff chose to use in their cost of equity estimation models, as discussed herein, several of the Company's arguments against them are unsupported by the facts. Taken in total, we find the methodologies Staff and RUCO used to be less biased than those used by the Company, and more reasonable and more reflective of current market conditions. Based on the analyses presented, we find a cost of common equity of 9.9 percent to be reasonable in this case.

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[218] *Id.*
[219] Tr. at 740.
[220] Company COC Brief at 1.
[221] Company COC Reply Brief at 10-11.
[222] Staff COC Reply Brief at 3.
[223] *Id.*

C. Cost of Capital Summary

	Percentage	Cost	Weighted Cost
Debt	24.0	5.0%	1.20%
Common Equity	76.0	9.9%	7.52%
Weighted Average Cost of Capital			**8.72%**

D. Fair Value Rate of Return

CCWC's most recent rate proceeding, which resulted in Decision No. 68176, was the subject of an Arizona Court of Appeals decision which ordered a remand to this Commission on the issue of the method used to calculate operating income. Decision No. 68176 determined operating income and set rates in a manner consistent with prior Commission decisions, by multiplying the weighted average cost of capital ("WACC") by the OCRB, and dividing the resulting product by the FVRB[224] in order to determine a FVROR. Under that method, the operating income, determined by multiplying the FVRB times the FVROR, provided the same operating income as multiplying the WACC by the OCRB.

Following the Remand Proceeding ordered by the Arizona Court of Appeals, a hearing was held and Decision No. 70441 (July 28, 2008) was issued. Decision No. 70441 did not adopt the Company's proposal to determine a FVROR by applying the WACC directly to the FVRB, but revised the method used in Decision No. 68176 to calculate operating income. The Commission found that applying the WACC to the FVRB would over-compensate the Company for inflation and calculated the FVROR by adjusting the WACC to reflect an inflation adjustment that reduced the cost of equity.[225] The FVROR was then applied to the FVRB to determine operating income. Decision No. 70441 found that the evidence presented in the Remand Proceeding was not sufficiently developed to make a determination of whether the cost of debt reflects the effects of inflation, and therefore Decision No. 70441 did not adopt an inflation adjustment to the cost of debt.

[224] In Decision No. 70441 and in this case, the FVRB reflects a 50/50 weighting of OCRB and RCND.
[225] Decision No. 70441 at 41.

The Company has appealed Decision No. 70441, and in this proceeding, continues to advocate applying the WACC directly to its FVRB, without any inflation adjustment, in order to calculate the Company's authorized operating income.[226] RUCO advocates using the same methodology in this case as that used in Decision No. 70441 to reach a FVROR, by deducting a general inflation component from the cost of equity in order to avoid double-counting inflation ("Method 1").[227] Staff's FVROR proposal in this case is based on the FVROR formula used in Decision No. 70441, but with a change to the application of the inflation adjustment. Staff's methodology removes the inflation component from both the cost of equity and the cost of debt to determine a FVROR ("Method 2"). Staff states that Method 1 remains a viable alternative for computing the FVROR,[228] but that Method 2 benefits a utility by providing higher returns when utility property appreciates at a rate exceeding the additional return required by investors due to inflation.[229]

The Company argues that application of the unadjusted WACC to FVRB is necessary to allow the utility to earn a fair return on the current value of its property.[230] CCWC charges that the recommendations of Staff and RUCO are predicated on the view that the rate of return must be reduced if the fair value of the utility's plant is used as its rate base, and that their FVROR approaches are "intended to deprive Chaparral City of the benefit of the increase in value of its property."[231] CCWC continues to argue that the WACC can be directly applied to FVRB because the WACC is a function of the ratio of debt in its capital structure, and does not depend on either the amount of invested capital or the size of the rate base used to set rates, and that a market-derived rate of return can appropriately be applied to a market-based rate base.[232] The Company also argues that application of the unadjusted WACC to FVRB is appropriate because the rate of return is not related

[226] Company COC Brief at 27. The Company continues to argue issues previously decided in Decision No. 70441, and some of those issues are discussed herein. The fact that this Decision does not again address some of the arguments re-proffered by the Company in this case, such as, for example, its arguments regarding market-based rate base and market-derived return, does not change our analysis and determination thereon as set forth in Decision No. 70441.
[227] RUCO COC Brief at 10, RUCO COC Reply Brief at 10.
[228] Staff COC Brief at 5.
[229] *Id.*
[230] Company COC Brief at 14.
[231] Company COC Brief at 26, 27.
[232] *Id.* at 20, 22-23.

to rate base, and because the inputs used to develop the WACC have no relationship to the type of rate base to which the WACC is applied.[233] CCWC argues that FVRB is not the "inflated" cost of its plant, but is the average of its OCRB and RCND,[234] and contends that the downward adjustment to the WACC as recommended by RUCO and Staff to determine a FVROR "undermines the use of fair value."[235]

We agree with the Company that there has been no dispute in this case that FVRB is the average of CCWC's OCRB and RCND. We disagree with the Company, however, that the FVROR methodologies proposed by RUCO and Staff "undermine" the use of fair value, or "deprive Chaparral City of the benefit of the increase in value of its property." There are many methods the Commission can use to determine an appropriate FVROR, and as we found in Decision No. 70441, one of those methods is adjusting the WACC to exclude the effect of inflation. RUCO and Staff's recommendations both adjust the WACC to exclude the effect of inflation in order to calculate a FVROR for the Company. CCWC claims that Staff and RUCO have focused on the effect of inflation on the cost of capital, but have ignored its effect on rate base, that neither provided a study or analysis of the impact of inflation on the Company's rate base.[236] CCWC contends that utilizing an inflation adjustment to reach a FVROR incorrectly assumes that general inflation in the economy affects both rate base and the cost of capital in the same way.[237] We disagree. The FVROR analyses provided by RUCO and Staff focused on the inflation component contained in cost of capital. The effect of inflation on rate base is separately calculated in determining the RCND, and the Company's proposed method has been accepted by the Commission.

As we determined after considering all the evidence in the Remand Proceeding in Docket No. W-02113A-04-0616, the FVRB, which was the average of OCRB and RCND, included an inflation component.[238] The FVRB in this case was determined in the same way as the FVRB we considered

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[233] *Id.* at 16, 21.
[234] *Id.* at 3.
[235] *Id.* at 57.
[236] *Id.* at 60-64.
[237] *Id.*
[238] *Decision No. 70441 at 41, Findings of Fact No. 14.*

in Decision No. 68176 and Decision No. 70441. The record in this proceeding contains essentially the same arguments CCWC made in the Remand Proceeding and affords no basis upon which to reverse our determination of fact on the issue. The Company acknowledges that the RCND is the current value of its plant based on its reconstruction cost, and there is no dispute in this case that FVRB is the average of OCRB and RCND. RUCO and Staff's FVROR recommendations in this case both take into consideration our determination in Decision No. 70441 that the FVRB, which is the average of OCRB and RCND, includes an inflation component. The Company provided no study or other evidence that controverts the existence of an inflation component in RCND rate base. We note that the Company used the Handy-Whitman Index and the Consumer Price Index to trend its OCRB to a RCND value.[239] Both of these indices are measures of inflation. Clearly, the RCND value proposed by the Company includes inflation, and that inflation component carries into the FVRB.

The Company's proposal in this case to determine a rate of return by applying the WACC directly to a FVRB comprised of an average of OCRB and RCND does not include an adjustment to account for inflation. CCWC contends that the fact that application of the WACC to FVRB may produce return dollars greater or less than would be produced using the "prudent investment" approach is irrelevant, because fair value ratemaking is intended to recognize increases (and decreases) in property values.[240] The Company continues its argument from the Remand Proceeding that *Duke Power*[241] supports its position on FVROR, [242] because the *Duke Power* court determined that North Carolina's ratemaking statutes required the North Carolina Utilities Commission to treat the difference between the OCRB and the FVRB as equity.[243] Staff points out that in North Carolina, the state's police power regarding ratemaking resides with the legislature, in contrast to Arizona, where the Arizona Constitution places Arizona's ratemaking authority exclusively with this Commission, and that *Duke Power* involved interpretation of a statute governing the treatment of

[239] Direct Testimony of Thomas J. Bourassa (Exh. A-3) at 7-8; Decision No. 70441 at 31-32.
[240] Company COC Brief at 14.
[241] *State ex rel. Utilities Comm'n v. Duke Power Company*, 206 S.E.2d 269 (N.C. 1974).
[242] Company COC Brief at 25-26.
[243] *State ex rel. Utilities Comm'n v. Duke Power Company*, 206 S.E.2d 269 (N.C. 1974).

FVRB.[244] As noted in Decision No. 70441, the Company's reliance on *Duke Power* is misplaced, because the North Carolina Supreme Court indicated that the North Carolina Commission could consider the effect of inflation in computing the cost of capital, and remanded that case to the North Carolina Commission because the fair rate of return determination had been made "through a misunderstanding" of another decision by the North Carolina Supreme Court.[245] The Company also continues to argue in this case that the Illinois case *City of Alton*[246] supports its position.[247] As Decision No. 70441 states, the methods addressed in that case are not helpful in setting rates in Arizona, as they seem to be after the fact, "fall-out numbers" determinations.[248] CCWC has not presented any legal arguments that convince us to change our determination made in Decision No. 70441.

Staff and RUCO are in agreement that, as Decision No. 68176 and Decision No. 70441 have already found, the Company's proposal to adopt the WACC as the FVROR and apply it to the FVRB would produce excessive returns.[249] RUCO takes issue with the Company's assertion[250] that the WACC is the fair rate of return regardless of the rate base to which it is applied.[251] RUCO argues that an appropriate rate of return is one that compensates, but does not overcompensate, the Company for its costs.[252] RUCO states that Decision No. 70441 determined that the double counting of inflation in rate base and the rate of return would unfairly overcompensate investors,[253] and Staff contends that rates producing an excessive return would be neither just nor reasonable.[254] In response to the Company's assertion that the results of the Remand Proceeding are "anomalous,"[255] Staff responds that this Commission, in the Remand Proceeding resulting in Decision No. 70441, was

[244] Staff COC Reply Brief at 5-6.
[245] Decision No. 70441 at 24-25.
[246] *City of Alton v. Commerce Comm'n, 165 N.E.2d 513 (Ill. 1960).*
[247] Company COC Brief at 23-26.
[248] Staff COC Reply Brief at 6, citing Decision No. 70441 at 25-26.
[249] Staff COC Reply Brief at 4, RUCO COC Reply Brief at 10.
[250] Company COC Brief at 20-24.
[251] RUCO COC Reply Brief at 9.
[252] *Id.*
[253] RUCO COC Brief at 10, RUCO COC Reply Brief at 10.
[254] Staff COC Reply Brief at 4.
[255] Company COC Brief at 6.

completely within its constitutional authority to craft a FVROR methodology that removed the effects of inflation.[256]

The Company's extensive arguments on brief in this case repeat the arguments made in the Remand Proceeding, and provide no basis for a deviation from our finding in those Decisions that applying WACC to the FVRB would inappropriately allow inflation to be reflected in both the WACC and in the FVRB, thus overstating inflation.[257] The Company is correct that fair value ratemaking recognizes increases or decreases in property values, which in this case is accomplished through the use of a FVRB that includes an RCND component. In addition, fair value ratemaking also recognizes the need for a fair return on the fair value of utility property. The Company's proposal must be rejected, because a rate of return reached by applying the WACC directly to its FVRB which includes inflation would overcompensate for inflation, and would produce an excessive return on FVRB, thereby resulting in rates and charges that would be excessive, and therefore not just and reasonable.

In order to calculate the inflation factor in the WACC, both Staff and RUCO's methods subtracted the yields on Treasury inflation protected securities ("TIPS") from the yields on Treasury securities with constant maturities. Staff used the 2.4 percent difference between the spot yields on a 20-year Treasury and a 20-year TIPS as a proxy for expected inflation.[258] Because one half of the FVRB includes OCRB, which does not include inflation, Staff adjusted the 2.4 percent inflation

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[256] Staff COC Reply Brief at 4.
[257] *See* Decision No. 70441 at 36.
[258] Staff calculated its inflation adjustment as follows:

20-year Treasury Yield (as of 8/6/08)	4.7%
less: 20-year Treasury Real Yield (as of 8/6/08)	2.3%
Return required by investors due to inflation*	2.4%
Times a 50% factor (to account for lack of inflation in OCRB)	0.5
Inflation adjustment	**1.2%**

* Staff's Final Schedule PMC-2 showed 2.5%, presumably due to rounding, which is corrected here to 2.4%.

Staff Final Schedule PMC-2; Direct Testimony of Staff witness Pedro M. Chaves adopted by Staff witness David C. Parcell (Exh. S-8) at 36-37; Direct Testimony of Staff witness Gordon L. Fox (Exh. S-5) at 4-11.

factor by one-half, resulting in an inflation adjustment to the WACC of 1.2 percent.[259] RUCO used historic average Treasury yields for the period 2001 through the first half of 2008 to reach its inflation estimate and deducted 200 basis points from its unadjusted cost of equity to derive the return that RUCO recommends be applied to the Company's FVRB.[260]

The Company disagrees with RUCO's 200 basis point inflation adjustment.[261] CCWC argues that any inflation adjustment should be reduced by one-half to account for the fact that one-half of the FVRB is comprised of plant valued at its historic cost, and that if an inflation adjustment is found appropriate in this case, the adjustment should not exceed 100 basis points.[262] The Company contends that Staff's methodology is more appropriate than RUCO's, arguing that because RUCO's inflation adjustment is based on historical information, it is not a good proxy for any future inflation contained in investors' expected equity returns.[263] While the Company finds Staff's methodology preferable, it disagrees with Staff's inputs, and argues that Staff should have used 5-year Treasuries instead of 20-year Treasuries, and that Staff failed to update its estimate to take into account current inflationary expectations.[264] At the hearing on January 9, 2009, Staff's witness Mr. Parcell testified that during the current economic climate, economists' opinions of projected inflation would be a much better indicator of expected inflation, and stated that in recent testimony, he had found that the consensus forecast for inflation was 2 to 2.5 percent.[265] Mr. Parcell's testimony corroborates and validates Staff's earlier 2.4 percent estimate, obtained using the Treasury yields as of August 6, 2008.

CCWC disagrees with Staff's Method 2 for calculating the FVROR. CCWC argues that it is improper to apply an inflation adjustment to both the debt and equity portions of the Company's capital structure, and that Method 2 erroneously treats the cost of its long-term debt as if it increases

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[259] *Id.*
[260] RUCO Final Schedule TJC-36; Direct Testimony of RUCO witness William A. Rigsby (Exh. R-14) at 62.
[261] Company COC Reply Brief at 24.
[262] *Id.*
[263] Company COC Brief at 62.
[264] *Id.*
[265] Tr. at 748-749. Mr. Parcell's testimony was in response to a Federal Reserve Statistical Release ("FRSR") dated January 7, 2009, which the Company introduced at the hearing (Exh. A-17). Mr. Parcell testified that in normal times, looking at the differential between long-term Treasury bonds and long-term interest rate swaps using the same maturity may be a reasonable way to develop a proxy for inflation, but that in the current economic environment using the differential is problematic because both instruments have been driven to such low levels.

or decreases based on current market conditions.[266] CCWC argues that because its cost of debt is determined based not on current market debt costs, but on its pre-existing, embedded cost of debt, which does not increase or decrease in response to future inflation or other economic conditions, Method 2 should be rejected.[267] CCWC is correct that its cost of debt is determined based not on current market debt costs, but on its pre-existing, embedded cost of debt, which does not increase or decrease in response to future inflation or other economic conditions. However, as CCWC itself acknowledges, inflation is a component of the cost of debt. The Company states in a footnote that "[i]n some cases, there may be a secondary market for bonds, notes and other debt instruments. The price that a purchaser is willing to pay for a particular debt instrument is affected by a number of different factors, including expected inflation."[268] The Company's footnote goes on to state that despite the existence of secondary markets, "the borrower's obligation to pay interest in accordance with the terms of the debt instrument is unaffected by such secondary sales and remains fixed."[269] While this is true, it does not change the fact that debt includes an inflation component. The cost of debt includes the investors' expectations regarding inflation, and, as Staff explains, a change in purchase price of debt instruments on the secondary market reflects the change in debt cost that the investor requires due to inflation.[270] While the Company is correct that the inflation component embedded in its existing debt does not change unless it is refinanced, the inflation component is nonetheless there, and the Company failed to provide an estimate of that inflation component embedded its existing debt. Accordingly, the best evidence available on the record is Staff's. Staff's proposed Method 2 applies the inflationary adjustment to the entire cost of capital, including equity and debt, in recognition of the fact, demonstrated in the record in this case,[271] that inflation is a component of debt as well as equity.

The Company contends that RUCO's proposed rate of return of 6.38 percent is too low and attempts to support its position by comparing it to the 9 percent interest rate on investment grade

[266] Company COC Brief at 67, 69.
[267] *Id.*
[268] Company COC Brief at 68, fn 279.
[269] *Id.*
[270] Staff COC Reply Brief at 8.
[271] *See, e.g.*, Direct Testimony of Staff witness Gordon L. Fox (Exh. S-5) at 5-7.

(Baa) bonds.[272] RUCO argues in response that the Company's reliance on a FRSR showing the interest rate on investment grade bonds at 9 percent is misplaced because the FRSR does not distinguish the rates of return for utilities bonds from other corporate bonds.[273] RUCO believes that the Company's rate of return comparison should be based on the returns of regulated utilities as opposed to the returns of other corporations, and recommends that the Commission consider, instead of the January 7, 2009, FRSR,[274] the January 9, 2009 Value Line Investment Survey,[275] which contains statistical analysis of corporate bond yields, but distinguishes yields on utility bonds from yields on other corporate bonds, and shows the return on corporate utility bonds for 25-30 year grade Baa/BBB to be 6.58 percent.[276] Our FVROR determination in this proceeding is not based on any comparable earnings analysis, but on the market-based analyses performed by the parties. However, we note that the Company's argument that a 6.38 percent FVROR is too low because the interest rate on investment grade (Baa) bonds is 9 percent is not convincing, and that RUCO is correct that if such a comparison were to be made, it would be more appropriate to compare the recommended rates of return to yields on utility bonds rather than on the FRSR produced by the Company at the hearing.

The Company again asserts that if adjustments are made to components of the WACC to account for inflation, inflation must also be considered in relation to operating expenses,[277] and contends that the normalization of test year operating expenses using expense levels from 2004 and 2005 as recommended by RUCO and Staff ignores inflationary effects.[278] The Company argues that considering the impact of inflation only on the cost of capital ignores the impact of inflation on the Company's overall earnings, and argues that adjusting cost of equity estimates to account for inflation in determining the rate of return while ignoring the impact of inflation on the Company's overall cost of providing service amounts to "piecemeal regulation."[279] The Company contends that if an inflation adjustment is used to determine its rate of return, an upward adjustment using the same

[272] *See* Exh. A-17, FRSR dated January 7, 2009.
[273] RUCO COC Brief at 10.
[274] Exh. A-17.
[275] Exh. R-16.
[276] RUCO COC Brief at 10.
[277] Company COC Brief at 3-4.
[278] *Id.*
[279] *Id.*

percentage should be made to its test year operating expenses, in order to account for the impact of inflation during 2007 and 2008, and during the time rates will be in effect.[280] The "matching" adjustment to operating expenses proposed by the Company is unsupported by the evidence and inappropriate. We disagree with the Company's assertion that adjusting the WACC to arrive at a FVROR "ignores the impact of inflation on the Company's overall earnings," or amounts to "piecemeal regulation." As Staff explains, an adjustment to the WACC to arrive at the FVROR is not an adjustment to reflect matching, but is necessary to avoid double counting of inflation that is found in the RCND rate base and in the cost of capital.[281] As we noted in Decision No. 70441, removing inflation from the return no more amounts to "piecemeal regulation" than does adding inflation to the rate base.[282] In contrast to FVROR, which is forward-looking, operating expenses are matched with associated revenues.[283] Inflation in operating expenses is already inherently recognized in the ratemaking framework, which encourages utilities to seek operating efficiencies[284] and allows modifications to test year expenses based on known and measurable changes in costs during the test year. There is no basis in the record to support the Company's proposed inflationary adjustment to operating expenses.

The rate of return applied to a utility's FVRB is designed to (1) allow the utility to attract capital on reasonable terms; (2) maintain the utility's financial integrity; and (3) permit the utility to realize a return that is commensurate with the returns earned by enterprises with commensurate risks. CCWC states that in setting its rate of return, this Commission must take into account the risks associated with the particular rate-setting methodologies used in Arizona and their impact on the Company's ability to earn a reasonable return on the fair value of its utility plant used to provide service.[285] CCWC contends that a lack of adjustment mechanisms and inability to obtain rate relief outside a general rate case create additional business risk and requires a "higher return on equity,"[286]

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[280] *Id.*
[281] Staff COC Brief at 4, citing Tr. at 461.
[282] Decision No. 70441 at 32.
[283] Tr. at 461.
[284] Tr. at 461.
[285] *Id.*
[286] *Id.* at 19.

and that the regulatory lag related to Arizona's use of a historic test year impacts the Company's ability to earn a reasonable return.[287] The Company states that operating expenses reflected in its current rates are based on the 12-month period ended December 31, 2003, and that it is not currently earning a return on the increased value of its plant since its rates were set in Decision No. 68176, or on plant constructed and placed in service since December 31, 2003.[288] The Company complains that when rates are set in this case, they will be based on operating expenses for the year ended December 31, 2006, and will not provide the Company with a return on plant constructed and placed in service after December 31, 2006.[289] The Company's argument ignores the fact that in this case, we are allowing $1.28 million in post-test year plant to be included in rate base. The issues the Company raises here related to the regulatory lag and Arizona's constitutional constraints affecting the ratemaking process are issues that apply to all Arizona utilities, and not just CCWC. As RUCO acknowledges, the fundamental premise of the return on rate base ratemaking approach is to allow utilities an opportunity to recover their actual costs, including their actual cost of capital, consistent with competitive industries.[290] Applying the WACC directly to a utility's FVRB when the WACC includes an inflation component would not accomplish this ratemaking goal. As Staff contends, the Company is advocating for a rate of return methodology which would produce comparably higher rates, which conflicts with the most basic tenet of rate regulation, which is that a utility should be provided with rates that will allow it an opportunity to earn a return that is comparable to those of similarly situated enterprises.[291] We addressed these arguments in Decision No. 70441, and nothing presented in this case causes us to change our determination therein.

In determining an appropriate and equitable level for the FVROR in this case, we are mindful of the need for the Company to have the ability to attract capital and obtain a fair return, and we are also mindful of the need to take into account the interests of the ratepayers. As we found in Decision No. 68176 and Decision No. 70441, using the Company's proposed methodology would produce

[287] *Id.* at 19-20.
[288] *Id.* at 65.
[289] *Id.*
[290] RUCO COC Reply Brief at 9.
[291] Staff COC Reply Brief at 5, citing *Federal Power Comm'n v. Hope Natural Gas*, 320 U.S. 591, 64 S.Ct. 281 (1944).

excessive returns, and it must therefore be rejected. Because there is an inflation component in the Company's FVRB, all inflation must be removed from the rate of return, whether in debt or equity. While further refinements to methodologies to accomplish this necessity may be possible, and are encouraged, we find that Staff's Method 2 appropriately matches an inflation-free rate of return to FVRB. The Method 2 recommendation of Staff to apply an inflation adjustment to both the equity and debt components of the WACC is a reasoned and sound approach to determining a FVROR that equitably balances the needs of the Company and its ratepayers, and results in the setting of just and reasonable rates. We therefore adopt a FVROR of 7.52 percent in this case.

E. Fair Value Rate of Return Summary

Weighted Average Cost of Capital	8.72%
Inflation Adjustment	-1.20%
Fair Value Rate of Return	7.52%

VII. AUTHORIZED INCREASE

Based on our findings herein, we determine that the Company's gross revenue should increase by $1,764,371.

Fair Value Rate Base	$26,776,414
Adjusted Operating Income	943,185
Required Fair Value Rate of Return	7.52%
Required Operating Income	$2,013,586
Operating Income Deficiency	$1,070,401
Gross Revenue Conversion Factor	1.6483
Gross Revenue Increase	$1,764,371

VIII. RATE DESIGN

A. Irrigation and Construction Rates

The Company is proposing the same rate design approved in Decision No. 68176, with the exception of increasing the commodity rate for Irrigation and Construction water. Zero gallons are included in the monthly minimum charge, and the commodity rate has three inverted tier blocks, with the first breakover point at 3,000 gallons, and the second breakover point at 9,000 gallons. In order to eliminate the disparity in the current rate design between Irrigation and Construction water customers and other customers, and to promote water conservation,[292] the Company proposes to

[292] Company Brief at 25.

charge Irrigation and Construction water customers the same monthly minimum charges as other customers according to meter size, with a single Irrigation and Construction commodity rate equal to the first tier commodity charge for commercial and industrial customers, for all usage. Staff proposes a rate design similar to the Company's for Irrigation and Construction water.[293] Currently, the Irrigation Service commodity charge is a flat $1.56 per 1,000 gallons, which is lower than the first tier commodity rate for 3/4-inch metered residential customers. The Company believes that from a water conservation standpoint, customers using potable water for irrigating turf and landscaping should be charged more.[294] Under the rates proposed by the Company, RUCO, and Staff in their final schedules, the commodity charge would increase to $3.34, $2.65, and $2.95, respectively, with the differences being due to differing recommended revenue requirements. Staff states that the purpose of its proposal is to move the rates for Irrigation and Construction water closer to the commodity rates paid by other customers, and that it believes the approach will help in promoting water conservation.[295]

Pacific Life argues that the Company's proposed increase for Irrigation and Construction water customers was not properly noticed.[296] Staff states that CCWC published notice in compliance with the rate case procedural order issued in this case, and that Pacific Life filed for intervention on September 15, 2008, which was granted on September 26, 2008. Staff notes that Pacific Life did not raise any issues regarding notice once it was granted intervenor status, or during the time leading up to the date for filing direct testimony.[297] As Staff notes, Pacific Life did not file direct testimony or actively participate during the evidentiary hearings.[298] The Company points out that, as Pacific Life discusses in its brief, a discussion of the increases in specific rates for specific customer classes was set forth in the Company's filing in the direct testimony of its accounting witness,[299] and that the direct testimony of the Company's witness Mr. Hanford also addressed the Company's requested change in the irrigation rate. Those direct testimonies were filed with the Company's application,

[293] Staff Final Schedule MEM-27.
[294] Company Brief at 25.
[295] Staff Brief at 12-13; Staff Reply Brief at 6.
[296] Pacific Life Brief at 1-4.
[297] Staff Reply Brief at 9-10.
[298] *Id.* at 10.
[299] Company Reply Brief at 19.

and the published notice directed interested parties how to view a copy of the application. The notice, which was published on August 6 and August 13, 2008, also specifically stated that "[t]he actual percentage rate increase for individual customers would vary depending on the type and quantity of service provided. You may contact Chaparral City to determine what the effect of its rate proposal may be on your individual bill." The record in this proceeding reflects the fact that while Pacific Life may have chosen not to take advantage of its procedural opportunities to present a case and cross examine witnesses in this proceeding, the opportunity was available to it, and Pacific Life was not procedurally disadvantaged.

Pacific Life argues that the Company's proposed increase for Irrigation and Construction water customers could be detrimental to golf course and residential users.[300] The Company contends that this claim by Pacific Life on brief is unsupported by any evidence on record in this case, and that the two possible explanations for the lack of evidence are (1) the evidence does not exist; or (2) Pacific Life failed to avail itself of the opportunity to present evidence.[301] Staff states that it is concerned about the effect a rate increase will have on all customers, including irrigation customers, and that in making its recommendations, Staff must balance the interests of the Company and the interests of all customers.[302] Staff notes that currently, irrigation customers have the lowest commodity charge, that the disparity between the commodity rates of the classes should be minimized to encourage water conservation, and that Staff believes its approach is fair and balances the interests of the Company and its customers.[303]

Pacific Life argues that a similar proposed increase for Irrigation and Construction water customers was rejected in the Company's last rate case.[304] Staff states that each case that comes before the Commission requires independent analysis and a determination based on the facts of the specific case, and therefore the fact that the Commission considered and rejected a similar increase to irrigation customers in a prior case is not binding on a determination in this case.[305] The Company

[300] Pacific Life Brief at 4-6.
[301] Company Reply Brief at 20.
[302] Staff Reply Brief at 11.
[303] *Id.*
[304] Pacific Life Brief at 6.
[305] *Id.*

also argues that Decision No. 68176 is not dispositive on the issue, and that Pacific Life offers no reason that the Company could not again raise the issue in this rate case for Commission consideration based on fair treatment of all its customers and to promote conservation.[306]

Pacific Life argues that without a cost-of-service study, there is no evidentiary basis to increase rates for one class of customers more than for another customer class.[307] The Company disagrees, stating that it is not requesting a change to its rate design in this case, but is seeking to address what appeared to be an anomaly in its rate design, given the Commission's decision to adopt Staff's proposed inverted tier rate design in the last rate case for the purpose of promoting conservation.[308] The Company contends that Pacific Life's assertions concerning the need for a cost of service study are unsupported and irrelevant, because the Company's current rate design is not based on a cost of service study. Staff contends that because the Company's proposed rate design is not different than the one approved in its last rate case, a cost of service study is not required.[309]

Pacific Life argues that the Company admits that test year revenues reflect that irrigation customers have already been successful in conserving water, and that "[t]here is no evidence that further conservation is needed, or even wise."[310] The Company states that it is proposing to raise the rate structure for Irrigation and Construction water because the current rate design is inconsistent with and contrary to the premise of the inverted tier rate design adopted in Decision No. 68176 to promote water conservation.[311] The Company believes the Commission should consider whether it is appropriate to impose inverted tier rates on residential and commercial customers, while allowing Irrigation and Construction water customers to purchase potable water for landscape irrigation at a rate that is substantially below the first tier commodity rate applicable to other customers.[312]

We agree with the Company that the current rates for potable irrigation water are inconsistent with and contrary to the premise of the inverted tier rate design adopted in Decision No. 68176 to promote water conservation. The disparity between the commodity rate for Irrigation and

[306] Company Reply Brief at 21.
[307] Pacific Life Reply Brief at 1-3.
[308] *Id.*
[309] *Id.*
[310] Pacific Life Brief at 6-8; Pacific Life Reply Brief at 2.
[311] Company Reply Brief at 22.
[312] *Id.*

Construction water customers and other customers needs to be addressed, and the rate designs proposed by the parties fairly address the issue. While we are cognizant of the fact that bringing the Irrigation and Construction commodity rates closer to those for other customers will affect golf courses and other customers who purchase potable water for turf and landscape purposes and construction, we find that a correction to the rate design approved in Decision No. 68176 is in order. We will adopt the parties' proposals to charge Irrigation and Construction water customers the monthly minimum charges by meter size and a flat commodity rate equal to the first tier commodity rate for other commercial and industrial customers.

B. Low Income Tariff

Staff states that the Commission has approved low income tariffs for a number of utilities, and with the recent downturn in our economy, there is an even greater need for these types of tariffs.[313] The Company has proposed a low income tariff to provide an opportunity for those customers that need assistance to lower their cost of water utility service. The Company proposes that customers meeting the necessary qualifications would receive a 15 percent discount off their water bill.[314] The primary criteria would be based on the combined gross annual income of all persons living in the household. For example, a 4-person household with a total gross annual income of less than or equal to $31,800 would meet the criteria.[315] Customers would sign up for the program by completing an application and eligibility declaration and submitting proof of income to the Company.[316] The income guidelines are based on 150 percent of the 2008 federal poverty guidelines.[317] The Company would update its gross annual household income limits annually.[318]

The program costs (the discounts given to participants plus a 10 percent fee for administration and carrying costs) would be recovered from non-participants via a commodity surcharge.[319] The Company would maintain a balancing account to keep track of the program costs and the collections made from non-participants, and the commodity surcharge to non-participants would begin one year

[313] Staff Reply Br. at 13.
[314] Supplemental Rebuttal Testimony of Company witness Thomas J. Bourassa (Exh. A-6) at 2.
[315] *Id.*
[316] *Id.*
[317] *Id.*
[318] *Id.* at 3.
[319] *Id.*

after the program begins.[320] CCWC will track the program costs for 12 months, and upon completion of the 12 month period, the Company will compute a surcharge intended to collect the prior year's program costs over the next 12 months.[321] CCWC would submit an annual report to the Commission showing the number of participants for the year, the discounts given to participants, administration fee and carrying costs, and the collection made from non-participants through the surcharge.[322] Based on the existing bill for median usage on a 3/4-inch meter currently at $24.94, the low income program would result in a reduction of $3.74.[323] The surcharge impact for non-participants, based on the 2006 gallons sold, would be about 4 cents on the average 3/4-inch customer bill.[324]

Staff recommends that the Company's low income tariff proposal be adopted.[325] Staff's recommendation is reasonable and will be adopted. We will direct the Company to file, along with the tariff of rates and charges approved herein, a copy of the Low Income Tariff it provided with its brief and reproduced and attached hereto as Exhibit A, and to implement the Low Income Tariff as described in the Supplemental Rebuttal Testimony of Company witness Thomas J. Bourassa (Exh. A-6).

C. Delay Surcharge Request

The Company proposes on brief that a "surcharge for delay" should be imposed on its customers to allow it to recover revenue increases it did not recover during the six-month stay of proceedings in this case granted at Staff's request pending the outcome of the Remand Proceeding.[326] The Company requests that the surcharge include "appropriate carrying costs."[327] The Company contends that it should be compensated both for that delay and for the additional delay caused by Staff's decision to bring in an outside consultant three days prior to the hearing, and the subsequent bifurcation of the hearing to hear cost of capital issues separately from the other issues.[328]

Staff responds that while there were delays in this case, CCWC has not demonstrated, other

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[320] *Id.*
[321] *Id.*
[322] *Id.* at 4.
[323] *Id.* at 5.
[324] *Id.* at 6.
[325] Staff Brief at 14.
[326] Company Brief at 26-27.
[327] *Id.*
[328] *Id.*

than by the assertions made on brief, any harm that should be ameliorated.[329] Staff contends that delays can be common in rate cases where the issues are complex, and that the Company's ratepayers should not bear the burden of the delays.[330] Staff argues that the surcharge proposed by the Company is not supported by the record and it should therefore be rejected.[331]

After the parties made their arguments on the appropriateness of Staff's requested suspension of the Commission's Time Clock Rule[332] in this matter, a Procedural Order was issued in this case on January 22, 2008. The January 22, 2008, Procedural Order outlined the parties' positions and the consideration of the issue, and ultimately found that the timing of this rate case, in conjunction with the uncommon nature, and the timing, of the Remand Proceeding that was pending at the time, constituted an extraordinary circumstance, pursuant to A.A.C. R14-2-103(B)(11)(e)(ii), requiring suspension of the Timeclock Rule. The January 22, 2008, Procedural Order called for the hearing to continue in this proceeding as soon as practicable following the Commission's final order in the Remand Proceeding, and directed the parties to continue to conduct discovery and case preparation to the greatest extent possible during the duration of the continuance in order to minimize any delay in implementation of new rates pursuant to this application.

We agree with Staff that the Company has not demonstrated the "injury due to this delay" it alleges on brief. Neither has the Company quantified the extent of the alleged injury. The delay was necessary to resolve the issues in the Remand Proceeding, which directly affects this case. We agree with Staff that under the circumstances of this case, the Company's ratepayers should not be asked to bear any additional burden due to the extraordinary circumstances that led to the suspension of the Timeclock Rule in this proceeding, and will deny the Company's request.

* * * * * * * * * *

Having considered the entire record herein and being fully advised in the premises, the Commission finds, concludes, and orders that:

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[329] Staff Reply Brief at 6.
[330] *Id.*
[331] *Id.*
[332] A.A.C. R14-2-103(B)(11).

FINDINGS OF FACT

1. On September 26, 2007, CCWC filed a rate increase application with the Commission based on a test year ended December 31, 2006.

2. On October 26, 2007, the Staff filed a letter finding the application sufficient and classifying CCWC as a Class A utility.

3. By Procedural Order issued November 30, 2007, a hearing was set on the application to commence on July 8, 2008, associated procedural deadlines were set, and intervention was granted to RUCO.

4. On December 7, 2007, the Company filed a Request to Modify Procedural Schedule in which the Company requested a continuation of the hearing due to a conflict on the part of counsel.

5. A telephonic procedural conference was held on December 13, 2007, for discussion of the need for an extension of the deadline for a Commission Decision in this matter pursuant to A.A.C. R14-3-103(B)(11) (the Commission's "Time Clock Rule") in conjunction with the Company's requested schedule modification.

6. An Amended Rate Case Procedural Order was issued on December 19, 2007, continuing the hearing on this matter from July 8, 2008, to July 21, 2008, and continuing associated procedural deadlines.

7. On January 3, 2008, Staff filed a Motion to Suspend Time Clock.

8. On January 8, 2008, CCWC filed its Response in Opposition to the Motion to Suspend Time Clock.

9. On January 10, 2008, RUCO filed its Response to the Utilities Division's Motion to Suspend Time Clock.

10. On January 14, 2008, Staff filed its Reply to Company's Response to Staff's Motion to Suspend Time Clock.

11. On January 22, 2008, a Procedural Order was issued granting Staff's Motion to Suspend Timeclock. The Procedural Order continued the hearing pursuant to the Time Clock Rule, and ordered that the hearing would be reset to continue as soon as practicable following the Commission's final order in Docket No. W-02113A-04-0616, the remand of Decision No. 68176

(September 30, 2005), a pending matter in which the rates of CCWC were also being considered. The Procedural Order directed all parties to continue to conduct discovery and case preparation to the greatest extent possible during the duration of the continuance, in order to minimize any delay in implementation of new rates pursuant to the application.

12. On January 24, 2008, the Company filed a Motion for Reconsideration by the Commission of Procedural Order Staying Rate Application.

13. On January 28, 2008, Staff filed Staff's Response to Chaparral City Water Company's Motion for Reconsideration.

14. On June 30, 2008, a Recommended Opinion and Order for Commission consideration was filed in Docket No. W-02113A-04-0616.

15. On July 7, 2008, the Company filed a Notice of Implementation of Interim Rates Pursuant to A.R.S. § 40-256.

16. On July 8, 2008, RUCO filed its Opposition to the Company's Implementation of Interim Rates and Motion to Prohibit the Company from Implementing Interim Rates.

17. On July 11, 2008, the Company filed a Notice of Postponement of Implementation of Interim Rates Pursuant to A.R.S. § 40-256.

18. On July 16, 2008, Staff filed Staff's Response to the Company's Notice of Implementation of Interim Rates Pursuant to A.R.S. § 40-256 and Notice of Postponement. Therein, Staff stated that it would oppose an attempt by the Company to notice and implement a rate increase without an order by the Commission. Staff included legal arguments in support of its position, and requested that a procedural conference be scheduled to address the issues raised by the Company's notices regarding interim rates.

19. On July 17, 2008, at an Open Meeting of the Commission, the Commission voted to adopt, as amended, the Recommended Opinion and Order filed in Docket No. W-02113A-04-0616 on June 30, 2008. The Commission subsequently issued Decision No. 70441 (July 28, 2008) in that docket.

20. On July 18, 2008, a procedural order was issued setting a procedural conference for the purpose of allowing the parties to discuss an appropriate procedural schedule, including the

resetting of a hearing date so that the case could proceed as quickly as possible, and to discuss the Company's filings regarding the implementation of interim rates.

21. On July 21, 2008, the Procedural Conference was convened as scheduled. Counsel for the Company, RUCO and Staff appeared and discussed procedural deadlines for the filing of Staff and intervenor direct testimony and also briefly discussed their positions regarding the Company's filings regarding implementation of interim rates. Counsel for RUCO withdrew its Motion to Prohibit the Company from Implementing Interim Rates.

22. On July 24, 2008, a Second Amended Rate Case Procedural Order was issued, continuing the hearing date to commence on December 8, 2008.

23. On September 4, 2008, the Company filed its Certification of Publication and Proof of Mailing, indicating that it provided notice of the hearing as required.

24. On September 8, 2008, the Company submitted a Notice of Filing requesting, as authorized in Decision No. 70441, recovery of the Company's rate case expense in connection with the appeal and remand of Decision No. 68176.

25. Also on September 8, 2008, the Company filed a Motion for Approval of Interim Rates (Expedited Action Requested).

26. On September 12, 2008, the Company filed a Request for Procedural Conference.

27. On September 23, 2008, Staff filed its Response to the Company's Motion for Approval of Interim Rates.

28. On September 23, 2008, RUCO filed its Opposition to the Company's Motion for Interim Rates.

29. On September 26, 2008, by procedural order, Pacific Life's September 15, 2008, Motion to Intervene was granted.

30. On September 30, 2008, the Company filed its Reply in Support of Motion for Approval of Interim Rates (Expedited Action Requested).

31. On September 30, 2008, a Procedural Order Extending Filing Deadlines was issued, granting Staff's request to extend the deadline for Staff and intervenor direct testimony to October 3, 2008, and extending the deadline for intervenor surrebuttal testimony to November 20, 2008.

32. RUCO and Staff filed direct testimony on September 30, 2008, and October 3, 2008, respectively.

33. On October 2, 2008, the Company filed its Second Request for Procedural Conference.

34. On October 7, 2008, a procedural order was issued setting a procedural conference for October 20, 2008, for the purpose of allowing the parties to discuss the Company's Motion for Approval of Interim Rates.

35. A procedural conference was held as scheduled. The Company, RUCO and Staff appeared through counsel. At the procedural conference, the Company stated that it wished to proceed with the rate application in lieu of the alternative option of suspending the rate proceeding in favor of proceeding to hearing on the Motion for Approval of Interim Rates.

36. On October 24, 2008, Staff filed a Notice of Filing of Meeting on Settlement, and on October 28, 2008, Staff filed a Corrected Notice of Filing of Meeting on Settlement.

37. On October 31, 2008, the Company filed its rebuttal testimony, and filed supplemental rebuttal testimony on November 19, 2008.

38. On November 12, 2008, Pacific Life filed a Notice of Appearance of Counsel, indicating a change of counsel.

39. On November 20, 2008, RUCO filed surrebuttal testimony. An Errata thereto was filed on November 25, 2008.

40. On November 20, 2008, Staff filed surrebuttal testimony of two witnesses.

41. On November 21, 2008, Staff filed a Notice of Witness Substitution and Request for Procedural Order. Staff requested that it be allowed to file substitute witness Mr. Parcell's surrebuttal testimony on cost of capital on December 3, 2008, and requested a date certain of December 15, 2008, for Mr. Parcell's live testimony.

42. On November 24, 2008, the Company filed its Response objecting to Staff's November 21, 2008 filing.

43. On November 24, 2008, the Town of Fountain Hills filed a public comment letter requesting that the Commission not approve the Company's requested rate increase.

44. On November 26, 2008, Staff filed a Reply to the Company.

45. On December 2, 2008, a Procedural Order was issued granting Staff's request to file the surrebuttal testimony of its substitute witness on December 3, 2008, and indicating that the dates certain requested by Staff for presentation of its expert witness were not available for hearing, but that a suitable schedule for proceeding with the parties' presentation of their cases on cost of capital would be discussed at the prehearing conference scheduled for December 5, 2008.

46. On December 3, 2008, Staff filed a Notice of Filing Surrebuttal Testimony of David C. Parcell.

47. On December 4, 2008, the Company filed rejoinder testimony. An Errata thereto was filed on December 5, 2008.

48. On December 5, 2008, the prehearing conference was held as scheduled. The Company, RUCO and Staff appeared through counsel. Pacific Life did not enter an appearance. The Company stated an objection to Staff's substitute witness Parcell's prefiled surrebuttal testimony, and after discussion, Staff agreed to make a filing regarding Mr. Parcell's adoption of Staff witness Chaves' testimony.

49. 241 written public comments were filed in opposition to the Company's requested rate increase between August 20, 2008, and March 9, 2009.

50. On December 8, 2008, the hearing convened as scheduled. Prior to the presentation of evidence, members of the public provided comments for the record. Commenters included Fountain Hills Mayor Jay T. Schlum, Stephen Dausch, Marianne Wiggishoff, Richard V. Kloster, Richard Baurle, Leona Johnston, Jerry Butler, Beth Mulcahy, and Ken Watkins. Commenters indicated a concern that the proposed rate increase would affect homeowners in the Company's service area not only by increasing individual homeowners' water bills, but also by increasing community associations' water utility costs.[333] Commenter Ken Watkins stated that he believes the Company's rate proposal has an unfair effect on the Company's golf course customers.[334]

51. The Company, RUCO and Staff appeared at the hearing through counsel. Pacific Life

[333] Tr. at 6-23.
[334] Tr. at 19-23.

did not appear. The Company, RUCO and Staff presented evidence and cross-examined witnesses on all issues with the exception of cost of capital and rate of return. The hearing was recessed on December 10, 2008, and was scheduled to reconvene on January 8 and 9, 2009, for the purpose of taking evidence on the bifurcated issues of cost of capital and rate of return.

52. On December 9, 2008, Staff filed the portions of Pedro M. Chaves' direct testimony adopted by David C. Parcell, and an Errata thereto was filed on December 15, 2008.

53. On December 11, 2008, Pacific Life filed a Motion for Leave to Present Testimony, requesting leave to present testimony on the issue of the impact of the Company's proposed increase in irrigation rates.

54 On December 16, 2008, the Company filed a Response to Pacific Life's Motion. The Company opposed granting Pacific Life's request. The Company stated that the Motion was filed substantially beyond the deadlines set for prefiled intervenor testimony, after the prehearing conference, and following the completion of the hearing on all issues with the exception of the bifurcated cost of capital and rate of return issues. The Company argued that Pacific Life had not provided a legitimate basis for its request to file testimony at the late date, following the completion of the parties' rate design witnesses' testimony. The Company further argued that the hearing had already been delayed, and that allowing the requested untimely filing of rate design testimony would prejudice the Company.

55. On December 17, 2008, RUCO filed its Response to the Motion. Therein, RUCO requested that the current witness schedule not be disrupted, and stated that if Pacific Life's testimony was allowed, RUCO reserved the right to present rebuttal testimony.

56. On December 17, 2008, Staff filed its Response to the Motion. Therein, Staff stated that it was not opposed to the filing of testimony by Pacific Life's proposed witness, but that it would reserve the right to recall its witness on rate design. Staff filed an Errata to its Response on December 18, 2008.

57. On December 17, 2008, Pacific Life filed a Reply to the Company's Response to the Motion. Pacific Life contended that presentation of the testimony of its witness would not delay this case, because it was not asking to reopen the record, but wished to take advantage of an additional

hearing day that had already been scheduled.

58. On December 23, 2008, the Company filed supplemental rejoinder testimony on cost of capital. An Errata thereto was filed on December 30, 2008.

59. On December 24, 2009, a Procedural Order was issued denying Pacific Life's Motion, finding that granting the Motion would require reopening the completed first segment of the bifurcated hearing, resulting in a time delay and prejudice to the parties, and that Pacific Life had failed to avail itself of numerous opportunities to either conform to the same procedural schedule as the other parties to this case, or to request accommodation in a timely manner.

60. On January 5, 2009, Staff filed a Notice of Filing Regarding Investigation. The Notice stated that the CPUC had contacted Staff regarding a CPUC investigation of Golden States, an affiliate of CCWC. The CPUC had alerted Staff that in the course of a CPUC investigation into Golden States, the CPUC had discovered information relating to CCWC that it thought would be of interest to Staff. The Notice stated that Staff was working with the CPUC on a confidentiality agreement that would allow Staff to obtain information from the CPUC regarding the investigation.

61. On January 6, 2009, Staff filed a Notice of Filing to which was attached a copy of a November 15, 2007, complaint filed in Los Angeles Superior Court against Golden States Water Company, American States Water Company, et al.

62. On January 6, 2009, Staff filed proposed accounting order language for the treatment of the deferred Municipal and Industrial charges related to the Company's 2997 CAP allocation purchase.

63. On January 8, 2009, the hearing reconvened. The Company, RUCO and Staff appeared, presented evidence, and cross-examined witnesses. The hearing concluded on January 9, 2009.

64. On January 13, 2009, RUCO filed a response to Staff's Proposed Accounting Order.

65. On January 16, 2009, the Company filed its Final Schedules. On February 13, 2009, the Company filed a Notice of Errata that included corrected Final Schedules reflecting its final position in this case regarding rate case expense.

66. On January 16, 2009, RUCO filed its Final Schedules.

67. On January 16, 2009, RUCO filed a Notice of Errata with corrections to Hearing Exhibits R-17 and R-18.

68. On January 21, 2009, Staff filed its Final Schedules.

69. On January 21, 2009, the Company filed its Response to Staff's Proposed Accounting Order.

70. On January 21, 2009, the Company, Pacific Life, RUCO, and Staff filed a Stipulation to Extend Briefing Schedule.

71. On January 28, 2009, the Company, Pacific Life, RUCO, and Staff filed initial closing briefs on all issues with the exception of cost of capital and rate of return.

72. On January 29, 2009, Staff filed a Notice of Filing. The Notice stated that on January 12, 2009, the Company had provided responses to Staff's data requests related to the CPUC investigation of Golden States, and that based on the responses, Staff concluded that additional discovery was necessary, and that Staff would continue to provide updates on the issue in this docket.

73. On February 10, 2009, Staff filed a Motion to Compel requesting that the Commission order the Company to promptly provide information requested by Staff related to the CPUC investigation of Golden States.

74. On February 13, 2009, the Company, Pacific Life, RUCO, and Staff filed reply briefs on all issues with the exception of cost of capital and rate of return.

75. On February 13, 2009, the Company, RUCO, and Staff filed closing briefs on cost of capital and rate of return.

76. On February 18, 2009, Staff docketed an update to its February 10, 2009, Motion to Compel. Staff indicated that Staff and the Company had agreed to extend the time period in which the Company has to respond, pending the outcome of ongoing negotiations to resolve the Motion to Compel.

77. On February 27, 2009, the Company, RUCO and Staff filed reply briefs on cost of capital and rate of return.

78. On March 4, 2009, the Company filed a Notice of Filing Late-Filed Exhibit. The exhibit attached thereto is a rate case expense itemization spreadsheet showing a total for January

2007 - December 2008.

79. On June 3, 2009, a procedural order was issued directing Staff to file an update on its Motion to Compel and the progress made in its discovery related to the CPUC investigation of Chaparral City Water Company's parent, Golden States Water Company. The procedural order directed Staff to include in the update a recommendation regarding an appropriate procedural means of addressing the CPUC investigation issue, including whether it should be addressed in this docket. The procedural order also directed the Company, Pacific Life, and RUCO to file responses to Staff's update.

80. On June 11, 2009, Staff filed a Request for Extension of Time. Therein, Staff stated that all three of the attorneys assigned to this case had time constraint conflicts with appellate matters and settlement negotiations in other cases to which they are assigned that prevent them from meeting the June 12, 2009 deadline.

81. On June 12, 2009, the Company filed a Response in Opposition to Staff's Motion for Extension of Time. The Company objected to Staff's request for a one-week extension of time because, according to the Company, the update is not needed. The Company argued that the Motion to Compel is moot because the Company provided all the documents Staff requested by mid-March, 2009. The Company stated that it had offered to stipulate to either (1) keep this docket open, pending conclusion of Staff's review of the CPUC investigation documents and a determination of whether any further proceedings or relief are warranted, or (2) to open a new docket for the same purpose, but that Staff had not definitively responded to the stipulation offer.

82. On June 17, 2009, RUCO filed a Response to Staff's Request for Extension of Time, indicating support for Staff's request.

83. On June 17, 2009, a procedural order was issued granting a one week time extension for Staff's update.

84. On June 19, 2009, Staff filed its Update and Reply to Chaparral City Water Company's Response. Staff stated that ultimately, Staff and the Company had resolved their discovery dispute through the execution of a protective agreement, upon which the Company provided Staff with over 15,000 pages of documents. Staff stated that its investigation was ongoing,

and that Staff had not yet determined whether the Company's activities rise to the level of impropriety or wrongdoing or impact the Company's rates or this pending rate case. Staff stated that it had retained an outside consultant to assist in Staff's review of the documents and to determine whether any alleged improprieties have impacts for this rate case. Staff stated that it found the Company's stipulation proposal acceptable, as long as all parties acknowledge that rates could be modified if the investigation yields circumstances which would warrant such action.

85. On June 23, 2009, RUCO filed its Response to Staff's Update Regarding the CPUC Investigation. RUCO agrees that there has been insufficient time to review and analyze the documentation which the Company produced on March 10, 13 and 16, 2009. RUCO stated that it does not object to having this matter proceed, but with the docket remaining open subject to reconsideration in the event that the investigation by Staff, RUCO, or the CPUC reflects impropriety by Chaparral or its parent, officers or employees.

86. On June 25, 2009, the Company filed a Response to Staff's Update. The Company asserted that there is no reason to delay rate relief, and requested the issuance of a decision in this matter as soon as possible.

87. It is reasonable to require Staff to file by January 15, 2010, with docket control, as a compliance item in this docket, a report documenting its review of the CPUC investigation documents, and to require Staff to indicate in the report its findings and a recommendation regarding whether any further proceedings or relief are warranted in this docket.

88. It is reasonable under the circumstances to make the rates approved herein interim rates subject to modification in the event the ongoing Staff investigation reveals the existence of circumstances which would warrant such action.

89. Under the circumstances of this case, it is not reasonable or in the public interest to grant the Company's request for a "delay surcharge."

90. As discussed herein, an appropriate and reasonable capital structure for the Company is 24 percent debt and 76 percent equity. The cost of debt is 5.0 percent, and an appropriate and reasonable cost of equity is 9.9 percent.

91. In the test year ended December 31, 2006, the Company experienced Operating

Income of $943,185, on total revenues of $7,505,010 for a 3.52 percent rate of return on FVRB.

92. The Company requested rates that would result in total revenues of $10,357,363, a revenue increase of $2,852,353, or 38.01 percent. RUCO recommended rates that would yield total revenues of $8,649,874, an increase of $1,144,864 or 15.25 percent. Staff recommended total revenues of $9,350,843 an increase of $1,904,143 or 25.57 percent.

93. As discussed herein, the Company's FVRB is determined to be $26,776,414.

94. A FVROR on FVRB of 7.52 percent is reasonable and appropriate.

95. The revenue increase requested by the Company would produce an excessive return on FVRB.

96. The Company's gross revenue should increase by $1,764,371.

97. Under the Company's proposed rates, an average usage (8,400 gallons/month) residential customer on a 3/4-inch meter would experience an increase of $10.90, approximately 34 percent, from $32.28 per month to $43.27 per month.

98. Under the rates adopted herein, an average usage (8,400 gallons/month) residential customer on a 3/4-inch meter would experience a monthly rate increase of $5.14, approximately 15.88 percent, from $32.37 per month to $37.51 per month.

99. It is reasonable and in the public interest to correct the rate design disparity for irrigation customers adopted in Decision No. 68176 by charging Irrigation and Construction water customers the monthly minimum charges by meter size and a flat commodity rate equal to the first tier commodity rate for other commercial and industrial customers.

100. The Company should be required to perform a monitoring exercise of its water system as recommended by Staff, to docket the results by March 10, 2010, and to comply with the filing requirements recommended by Staff and ordered herein, in the event the reported water loss is greater than 10 percent. In no case should water loss be allowed to remain at 15 percent or greater.

101. The Company should be required to perform and submit a lead/lag study in conjunction with its next rate application in order to meet the sufficiency requirements of that filing.

102. The property tax expense calculation methodology recommended by Staff is reasonable and should be adopted.

103. Because CCWC acted prudently under the circumstances in its December, 2007, $1.28 million purchase of the additional CAP allocation, the acquisition cost of the additional CAP allocation should be included in rate base, classified as a plant-in-service component of Land and Land Rights, and not subject to amortization.

104. CCWC should be allowed recovery of fifty percent of the CAP M&I charges related to the additional CAP allocation, or $20,306, as an operating expense.

105. CCWC should be allowed to defer, for possible later recovery through rates, the other fifty-percent of its costs, excluding any interest or other carrying charges, incurred for the annual CAP M&I charges.

106. CCWC should be authorized to create a deferral account to accrue these charges beginning on January 1, 2008, which is the first time the CAP M&I charges are applicable according to the contract.

107. The cost deferral authorization granted herein will allow consideration of, but not guarantee recovery of these costs in future ratemaking proceedings.

108. CCWC should be required to prepare and retain accounting records sufficient to permit detailed review of all deferred costs in a rate proceeding.

109. CCWC's deferral authority is limited to 48 months from January 1, 2008, unless Chaparral City Water Company, Inc. has a general rate case pending at the end of the 48 month period, in which case Chaparral City Water Company, Inc. may continue to defer these costs until such rate case is concluded. Chaparral City Water Company, Inc. shall address the deferred amounts recorded as of ninety days before the due date for filing Staff's Direct Testimony in the rate case. Any additional properly deferred amounts recorded after that date may be considered in subsequent rate case(s).

110. CCWC should be allowed to seek to include the accumulated deferred balance associated with all amounts deferred pursuant to this Decision in the cost of service for rate-making purposes in Chaparral City Water Company, Inc.'s next general rate case. Nothing in this Decision shall be construed to limit this Commission's authority to review such balance and to make disallowances thereof due to imprudence, errors or inappropriate application of the requirements of

this Decision.

111. This Decision should not be construed in any way to limit this Commission's authority to review the entirety of the acquisition and to make any disallowances thereof due to imprudence, error or inappropriate application of the requirements of this Decision.

112. ADEQ's formally delegated agent, the Maricopa County Environmental Services Department ("MCESD") has determined that the CCWC drinking water system, PWS #07-017, is currently delivering water that meets quality standards required by the Arizona Administrative Code, Title 18, Chapter 4.

113. The Company's service territory is within the Phoenix Active Management Area ("AMA"), and the Arizona Department of Water Resources ("ADWR") has reported that the Company is in compliance with its requirements governing water providers.

114. The Company has no delinquent Arizona Corporation Commission compliance issues.

115. The Company has an approved curtailment plan tariff that became effective on October 1, 2005.

116. The Company has an approved backflow prevention tariff that became effective on October 1, 2005.

117. The Company should be required to use, on a going-forward basis, the depreciation rates set forth at Table J-1 of the Engineering Report attached to the Direct Testimony of Staff witness Marlin Scott, Jr.

CONCLUSIONS OF LAW

1. CCWC is a public service corporation pursuant to Article XV of the Arizona Constitution and A.R.S. §§ 40-250 and 40-251.

2. The Commission has jurisdiction over CCWC and the subject matter of the application.

3. Notice of the proceeding was provided in conformance with law.

4. The fair value of CCWC's rate base is $26,776,414, and applying a 7.52 percent fair value rate of return on this fair value rate base produces rates and charges that are just and reasonable.

5. The rates and charges approved herein are reasonable.

6. Administrative notice is taken of the complete record of Docket No. W-02113A-04-0616.

7. It is reasonable to require Staff to file by January 15, 2010, with docket control, as a compliance item in this docket, a report documenting its review of the CPUC investigation documents, and to require Staff to indicate in the report its findings and a recommendation regarding whether any further proceedings or relief are warranted in this docket and when interim rates become permanent.

8. It is reasonable under the circumstances to make the rates approved herein interim rates subject to modification in the event the ongoing Staff investigation reveals the existence of circumstances which would warrant such action.

9. It is reasonable and in the public interest to require the Company to perform a monitoring exercise of its water system as recommended by Staff, to docket the results by March 10, 2010, and to comply with the filing requirements recommended by Staff and ordered herein, in the event the reported water loss is greater than 10 percent. It is reasonable and in the public interest to require that in no case shall water loss be allowed to remain at 15 percent or greater.

10. It is reasonable and in the public interest to adopt the property tax expense calculation methodology recommended by Staff.

11. It is reasonable and in the public interest to allow CCWC to defer fifty percent of the CAP M&I charges subject to the requirements and conditions set forth herein.

12. It is reasonable and in the public interest to require CCWC to perform and submit a lead/lag study in conjunction with its next rate adjustment request application in order to meet the sufficiency requirements of that filing.

13. It is reasonable and in the public interest to correct the rate design disparity adopted in Decision No. 68176 by charging Irrigation and Construction water customers the monthly minimum charges by meter size and a flat commodity rate equal to the first tier commodity rate for other commercial and industrial customers.

ORDER

IT IS THEREFORE ORDERED that Chaparral City Water Company, Inc. is hereby

authorized and directed to file with the Commission, on or before October 15, 2009, the following schedules of rates and charges, which shall be effective for all service rendered on and after October 15, 2009:

MONTHLY USAGE CHARGE:

3/4" Meter	$ 16.50
1" Meter	27.50
1 ½" Meter	55.00
2" Meter	88.00
3" Meter	176.00
4" Meter	275.00
6" Meter	550.00
8" Meter	880.00
10" Meter	1,265.00
12" Meter	2,365.00
Fire Hydrants Used for Irrigation	Per Meter Size
Irrigation and Construction	Per Meter Size

Monthly Service Charge for Fire Sprinkler	
4" or smaller Meter	10.00
6" Meter	10.00
8" Meter	10.00
10" or larger Meter	10.00

COMMODITY RATES

Per 1,000 Gallons	
(Residential, Commercial, Industrial)	
3/4-inch Meter - Residential	
0-3,000 Gallons	$2.19
3,001 – 9,000 Gallons	2.65
Over 9,000 Gallons	3.15
3/4-inch Meter – Commercial and Industrial	
0 – 9,000 Gallons	2.65
Over 9,000 Gallons	3.15
1-inch Meter	
0 to 24,000 Gallons	2.65
Over 24,000 Gallons	3.15
1 1/2- inch Meter	
0 to 60,000 Gallons	2.65
Over 60,000 Gallons	3.15
2-inch Meter	

0 to 100,000 Gallons	2.65
Over 100,000 Gallons	3.15
3-inch Meter	
0 to 225,000 Gallons	2.65
Over 225,000 Gallons	3.15
4 - inch Meter	
0 to 350,000 Gallons	2.65
Over 350,000 Gallons	3.15
6-inch Meter	
0 to 725,000 Gallons	2.65
Over 725,000 Gallons	3.15
8 - inch Meter	
0 to 1,125,000 Gallons	2.65
Over 1,125,000 Gallons	3.15
10 -inch Meter	
0 to 1,500,000 Gallons	2.65
Over 1,500,000 Gallons	3.15
12 - inch Meter	
0 to 2,250,000 Gallons	2.65
Over 2,250,000 Gallons	3.15
Irrigation and Construction /Bulk – All Gallons	2.65
Fire Hydrant Irrigation/Construction – All Gallons	2.65
Standpipe (Fire Hydrants) – All Gallons	2.65
Fire Sprinklers – All Gallons	2.65

SERVICE CHARGES:

Establishment of Service:	
Regular Hours	$25.00
After Hours	35.00
Reestablishment of Service (within 12 months)	*
Reconnection of Service (Delinquent):	
Regular Hours	35.00
After Hours	50.00
Water Meter Test (If Correct)	35.00
Water Meter relocation at Customer Request (Per ACC Rule 14-2-405(B))	Cost
Meter Re-Read (If Correct)	$25.00
NSF Check Charge	25.00
Late Fee Charge	1.5% per month
Deferred Payment Finance Charge	1.5% per month
Service Call – After Hours (Per ACC Rule 14-2-403(D))	Refer to charges above
Deposit Requirements Residential	**

Deposit Requirements Non-Residential **
Deposit Interest ***

* Monthly Minimum times Months Disconnected From the Water System (Per A.A.C. Rule 14-2-403(D))

**Residential – two times the average bill.
Non-residential – two and one-half times the estimated maximum bill.

***Interest per (Per ACC Rule 14-2-403(B)).

OFF-SITE FACILITIES HOOK-UP FEE:

5/8" x 3/4" Meter	****
3/4" Meter	****
1" Meter	****
1 1/2" Meter	****
2" Meter	****
3" Meter	****
4" Meter	****
6" or Larger Meter	****

**** The fee shall be variable, fixed on January 1 of each calendar year, computed by dividing $369,404.50 by the number of hook-ups during the previous calendar year. However, in no event shall the hook-up fee be higher than $1,000 nor less than $500.
2006 filing – New water installations. May be assessed only once per parcel, service connection, or lot within a subdivision. Purpose is to equitably apportion the costs of construction additional off-site facilities to provide water production, delivery, storage, and pressure among all new service connections.

SERVICE LINE AND METER INSTALLATION CHARGES:

	Service Line Charge	Meter Charge	Total Charge
5/8" x 3/4" Meter	$ 385.00	$ 135.00	$ 520.00
3/4" Meter	385.00	215.00	600.00
1" Meter	435.00	255.00	690.00
1-1/2" Meter	470.00	465.00	935.00
2" Turbine	630.00	965.00	1,595.00
2" Compound	630.00	1,690.00	2,320.00
3" Turbine	805.00	1,470.00	2,275.00
3" Compound	845.00	2,265.00	3,110.00
4" Turbine	1,170.00	2,350.00	3,520.00
4" Compound	1,230.00	3,245.00	4,475.00
6" Turbine	1,730.00	4,545.00	6,275.00
6" Compound	1,770.00	6,280.00	8,050.00
8" or Larger	At Cost	At Cost	At Cost

> In addition to the collection of regular rates, the utility will collect from its customers a proportionate share of any privilege, sales, use and franchise tax. Per Commission Rule 14-2-408(D)(5).
>
> All advances and/or contributions are to include labor, materials, overheads, and all applicable taxes, including all gross-up taxes for income taxes, if applicable.

IT IS FURTHER ORDERED that the Low Income Tariff attached hereto as Exhibit A is hereby adopted and shall be included with the tariffs filed in accordance with the Ordering Paragraph above.

IT IS FURTHER ORDERED that this docket shall remain open, pending conclusion of the parties' review of the California Public Utilities Commission investigation documents.

IT IS FURTHER ORDERED that the rates approved herein are interim rates subject to modification in the event the ongoing Staff investigation related to the California Public Utilities Commission investigation documents reveals the existence of circumstances which would warrant such action.

IT IS FURTHER ORDERED that Staff shall file by January 15, 2010, with Docket Control, as a compliance item in this docket, a report documenting its review of the California Public Utilities Commission investigation documents. The report shall indicate Staff's findings and a recommendation regarding whether any further proceedings or relief are warranted in this docket.

IT IS FURTHER ORDERED that the property tax expense calculation methodology recommended by Staff is hereby adopted

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc. shall begin a 12-month monitoring exercise of its water system after the Company completes its own Central Arizona Project water meter installation, and shall docket the results of the system monitoring as a compliance item in this case by March 1, 2010. If the reported water loss for the period from February 1, 2009 through February 1, 2010 is greater than 10 percent, the Company shall prepare, and file, by April 30, 2010, as a compliance item for this proceeding for review and certification by Staff, a report containing a detailed analysis and plan to reduce water loss to 10 percent or less, or alternatively, if the Company believes it is not cost effective to reduce water loss to less than 10 percent, the

Company shall submit a detailed cost benefit analysis to support its opinion. In no case shall water loss be allowed to remain at 15 percent or greater.

IT IS FURTHER ORDERED that because Chaparral City Water Company, Inc. acted prudently under the circumstances in its December, 2007, $1.28 million purchase of the additional Central Arizona Project allocation, the acquisition cost of the additional allocation should be included in rate base, classified as a plant-in-service component of Land and Land Rights, and not subject to amortization.

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc. shall be allowed recovery of fifty percent of the Central Arizona Project Municipal and Industrial charges related to the additional Central Arizona Project allocation, or $20,306, as an operating expense in this case.

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc. is hereby authorized to defer, for possible later recovery through rates, the remaining fifty-percent of its costs, excluding any interest or other carrying charges, incurred for the annual Central Arizona Project Municipal and Industrial charges, and absolutely nothing in this Decision shall be construed in any way to limit this Commission's authority to review the entirety of the acquisition and to make any disallowances thereof due to imprudence, error or inappropriate application of the requirements of this Decision.

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc. is authorized to create a deferral account to accrue the authorized deferral charges beginning on January 1, 2008, which is the first time the Municipal and Industrial charges are applicable according to the contract.

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc. shall prepare and retain accounting records sufficient to permit detailed review, in a rate proceeding, of all deferred costs recorded as authorized above.

IT IS FURTHER ORDERED that the cost deferral authorization granted herein will allow consideration of, but not guarantee recovery of these costs in future ratemaking proceedings.

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc.'s deferral authority is limited to 48 months from January 1, 2008, unless Chaparral City Water Company, Inc. has a general rate case pending at the end of the 48 month period, in which case Chaparral City Water Company, Inc. may continue to defer these costs until such rate case is concluded. Chaparral City Water

Company, Inc. shall address the deferred amounts recorded as of ninety days before the due date for filing Staff's Direct Testimony. Any additional properly deferred amounts recorded after that date may be considered in subsequent rate case(s).

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc. may seek to include the accumulated deferred balance associated with all amounts deferred pursuant to this Decision in the cost of service for rate-making purposes in Chaparral City Water Company, Inc.'s next general rate case. Nothing in this Decision shall be construed to limit this Commission's authority to review such balance and to make disallowances thereof due to imprudence, errors or inappropriate application of the requirements of this Decision.

IT IS FURTHER ORDERED that Chaparral City Water Company, Inc. shall perform and submit a lead/lag study in conjunction with its next rate adjustment request application in order to meet the sufficiency requirements of that filing.

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IT IS FURTHER ORDERED that administrative notice is hereby taken in this docket of the complete record of Docket No. W-02113A-04-0616.

IT IS FURTHER ORDERED that this Decision shall become effective immediately.

BY ORDER OF THE ARIZONA CORPORATION COMMISSION.

CHAIRMAN

COMMISSIONER

COMMISSIONER

COMMISSIONER

COMMISSIONER

IN WITNESS WHEREOF, I, ERNEST G. JOHNSON, Executive Director of the Arizona Corporation Commission, have hereunto set my hand and caused the official seal of the Commission to be affixed at the Capitol, in the City of Phoenix, this ~~Oct~~ 21st day of October 2009.

ERNEST G. JOHNSON
EXECUTIVE DIRECTOR

DISSENT

DISSENT

SERVICE LIST FOR: CHAPARRAL CITY WATER COMPANY, INC.

DOCKET NO.: W-02113A-07-0551

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Phoenix, AZ 85007

EXHIBIT A

CHAPARRAL CITY WATER COMPANY (CCWC)
ALTERNATE RATES FOR WATER (ARW)
DOMESTIC SERVICE – SINGLE FAMILY ACCOMMODATION

APPLICABILITY

Applicable to residential water service for domestic use rendered to low-income households where customer meets all the Program Qualifications and Special Conditions of this rate schedule.

TERRITORY

Within all Customer Service Areas served by the Company.

RATES

Fifteen percent (15%) discount applied to the regular filed tariff.

PROGRAM QUALIFICATIONS

1. The CCWC bill must be in your name and the address must be your primary residence or you must tenant receiving water service by a sub-metered system in a mobile home park.
2. You may not be claimed as a dependent on another person's tax return.
3. You must reapply each time you move.
4. You must renew your application every two years, or sooner, if requested.
5. You must notify CCWC within 30 days if you become ineligible for ARW.
6. Your total gross annual income of all persons living in your household cannot exceed the income le below:

Effective October 15, 2009

No. of Person In Household	Total Gross Annual Income
1	$15,600
2	21,000
3	26,400
4	31,800
5	37,200
6	42,600

For each additional person residing in the household, add $5,400.

(Continued)

EXHIBIT A

For the purpose of the program the "gross household income" means all money and non cash benefits, available for living expenses, from all sources, both taxable and non taxable, before deductions for all people who live in my home. This includes, but is not limited to:

Wages or salaries
Interest or dividends from:
Savings accounts, stocks or bonds
Unemployment benefits
TANF(AFDC)
Pensions
Gifts

Social Security, SSI, SSP
Scholarships, grants, or other aid used for living expenses
Disability payments
Food Stamps
Insurance settlements

Rental or royalty income
Profit from self-employment (IRS form Schedule C, Line 29)
Worker's Compensation
Child Support
Spousal Support

SPECIAL CONDITIONS

1. Application and Eligibility Declaration: An Application and eligibility declaration on a form authorized by the Commission is required for each request for service under this schedule. Renewal of a customer's eligibility declaration will be required, at least, every two years.

2. Commencement of Rate: Eligible customers shall be billed on this schedule commencing with the next regularly scheduled billing period that follows receipt of application by the Utility.

3. Verification: Information provided by the applicant is subject to verification by the Utility. Refusal or failure of a customer to provide documentation of eligibility acceptable to the Utility, upon request by the Utility, shall result in removal from this rate schedule.

4. Notice From Customer: It is the customer's responsibility to notify the Utility if there is a change of eligibility status.

5. Rebilling: Customers may be re-billed for periods of ineligibility under the applicable rate schedule.

6. Mobile home Park and Master-metered: A reduction will calculated in the bill of mobile home park and master-metered customers, who have sub-metered tenants that meet the income eligibility criteria, so an equivalent discount (15%) can be passed through to eligible customer(s).

EXHIBIT
A-14
ADMITTED

BEFORE THE ARIZONA CORPORATION COMMISSION

GARY PIERCE
Chairman
BOB STUMP
Commissioner
SANDRA D. KENNEDY
Commissioner
PAUL NEWMAN
Commissioner
BRENDA BURNS
Commissioner

IN THE MATTER OF THE APPLICATION OF RIO RICO UTILITIES, INC., AN ARIZONA CORPORATION, FOR A DETERMINATION OF THE FAIR VALUE OF ITS UTILITY PLANTS AND PROPERTY AND FOR INCREASES IN ITS WATER AND WASTEWATER RATES AND CHARGES FOR UTILITY SERVICE BASEDTHEREON.	)	DOCKET NO. WS-02676A-12-0196

DIRECT

TESTIMONY

OF

JOHN A. CASSIDY

PUBLIC UTILITIES ANALYST

UTILITIES DIVISION

ARIZONA CORPORATION COMMISSION

DECEMBER 31, 2012

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EXECUTIVE SUMMARY
RIO RICO UTILITIES, INC.
DOCKET NO. WS-02676A-12-0196

The Direct Testimony of Staff witness John A. Cassidy addresses the following issues:

Capital Structure – Staff recommends that the Commission adopt a capital structure for Rio Rico Utility Company ("Company") for this proceeding consisting of 0.0 percent debt and 100.00 percent equity.

Cost of Equity – Staff recommends that the Commission adopt an 8.4 percent return on equity ("ROE") for the Company. Staff's estimated ROE for the Company is based on the average of its discounted cash flow ("DCF") method and capital asset pricing model ("CAPM") cost of equity methodology estimates for the sample companies of 8.8 percent for the CAPM and 8.8 percent for the DCF. To this 8.8 percent preliminary figure, Staff made an upward adjustment of 60 basis points, bringing its overall cost of equity estimate to 9.4 percent. Staff then made a downward financial risk adjustment of 100 basis points to arrive at its recommended 8.4 percent cost of equity.

Cost of Debt – Staff recommends that the Commission adopt a 0.0 percent cost of debt for the Company, as Rio Rico has no debt in its capital structure.

Overall Rate of Return – Staff recommends that the Commission adopt an 8.4 percent overall rate of return.

Mr. Bourassa's Testimony – The Commission should reject the Company's proposed 10.7 percent ROE for the following reasons:

> Mr. Bourassa's Future Growth DCF estimates rely exclusively on analysts' forecasts of earnings per share growth. When calculating the dividend growth (g) component, he overstates his estimate of dividend growth by imputing a higher forecasted growth rate for one sample company than is justified by his analysis. This overstatement also flows through to the dividend growth estimate in his Past and Future Growth DCF model. In both DCF models, he overstates the current dividend yield (D_0/P_0) by using a 12-month average stock price value for (P_0). Mr. Bourassa's CAPM estimates are inflated due to use of a forecasted risk-free rate.

I. INTRODUCTION

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

A. My name is John A. Cassidy. I am a Public Utilities Analyst employed by the Arizona Corporation Commission ("Commission") in the Utilities Division ("Staff"). My business address is 1200 West Washington Street, Phoenix, Arizona 85007.

Q. Briefly describe your responsibilities as a Public Utilities Analyst.

A. I am responsible for the examination of financial and statistical information included in utility rate applications and other financial matters, including studies to estimate the cost of capital component in rate filings used to determine the overall revenue requirement, and for preparing written reports, testimonies and schedules to present Staff's recommendations to the Commission on these matters.

Q. Please describe your educational background and professional experience.

A. I hold a Bachelor of Arts degree in History from Arizona State University, a Master of Library Science degree from the University of Arizona, and an MBA degree with an emphasis in Finance from Arizona State University. While pursuing my MBA degree, I was inducted into Beta Gamma Sigma, the National Business Honor Society. I have passed the CPA exam, but opted not to pursue certification. I have worked professionally as a librarian, financial consultant and tax auditor, and, as a former Commission employee, served as Staff's cost of capital witness in rate case evidentiary proceedings.

Q. What is the scope of your testimony in this case?

A. My testimony provides Staff's recommended capital structure, return on equity ("ROE") and overall rate of return ("ROR") for establishing the revenue requirements for Rio Rico Utilities, Inc. ("Rio Rico" or "Company") pending water and wastewater applications.

Q. Please provide a brief description of Rio Rico.

A. Rio Rico is a public service corporation engaged in providing water and wastewater utility services in portions of Santa Cruz County, Arizona pursuant to certificates of convenience and necessity granted by the Arizona Corporation Commission. During the Test Year, Rio Rico served approximately 6,303 water and 2,037 wastewater service customers.

Summary of Testimony and Recommendations

Q. Briefly summarize how Staff's Cost of Capital Testimony is organized.

A. Staff's Cost of Capital Testimony is presented in eleven sections. Section I is this introduction. Section II discusses the concept of weighted average cost of capital ("WACC"). Section III presents the concept of capital structure and presents Staff's recommended capital structure for Rio Rico in this proceeding. Section IV presents Staff's cost of debt for Rio Rico. Section V discusses the concepts of ROE and risk. Section VI presents the methods employed by Staff to estimate Rio Rico's ROE. Section VII presents the findings of Staff's ROE analysis. Section VIII presents Staff's final cost of equity estimates for Rio Rico. Section IX presents Staff's ROR recommendation. Section X presents Staff's comments on the Direct Testimony of the Company's witness, Mr. Thomas J. Bourassa. Finally, section XI presents the conclusions.

Q. Have you prepared any exhibits to accompany your testimony?

A. Yes. I prepared nine schedules (JAC-1 to JAC-9) that support Staff's cost of capital analysis.

Q. What is Staff's recommended rate of return for Rio Rico?

A. Staff recommends an 8.4 percent overall ROR, as shown in Schedule JAC-1. Staff's ROR recommendation is based on cost of equity estimates for the sample companies of 8.8

percent for both the capital asset pricing method ("CAPM") and the discounted cash flow method ("DCF"). Staff recommends adoption of a 100 basis point downward financial risk adjustment and a 60 basis point upward Economic Assessment Adjustment resulting in an 8.4 percent overall ROR.

Rio Rico's Proposed Overall Rate of Return

Q. Briefly summarize Rio Rico's proposed capital structure, cost of debt, ROE and overall ROR for this proceeding.

A. Table 1 summarizes the Company's proposed capital structure, cost of debt, ROE and overall ROR in this proceeding:

Table 1

	Weight	Cost	Weighted Cost
Long-term Debt	20.0%	5.7%	1.1%
Common Equity	80.0%	10.7%	8.6%
Cost of Capital/ROR			**9.7%**

Rio Rico is proposing an overall rate of return of 9.7 percent.

II. THE WEIGHTED AVERAGE COST OF CAPITAL

Q. Briefly explain the cost of capital concept.

A. The cost of capital is the opportunity cost of choosing one investment over others with equivalent risk. In other words, the cost of capital is the return that stakeholders expect for investing their financial resources in a determined business venture over another business venture.

Q. What is the overall cost of capital?

A. The cost of capital to a company issuing a variety of securities (i.e., stock and indebtedness) is an average of the cost rates on all issued securities adjusted to reflect the relative amounts for each security in the company's entire capital structure. Thus, the overall cost of capital is the WACC.

Q. How is the WACC calculated?

A. The WACC is calculated by adding the weighted expected returns of a firm's securities. The WACC formula is:

Equation 1.

$$WACC = \sum_{i=1}^{n} W_i * r_i$$

In this equation, W_i is the weight given to the ith security (the proportion of the ith security relative to the portfolio) and r_i is the expected return on the ith security.

Q. Can you provide an example demonstrating application of Equation 1?

A. Yes. For this example, assume that an entity has a capital structure composed of 60 percent debt and 40 percent equity. Also, assume that the embedded cost of debt is 6.0 percent and the expected return on equity, i.e., the cost of equity, is 10.5 percent. Calculation of the WACC is as follows:

WACC = (60% * 6.0%) + (40% * 10.5%)

WACC = 3.60% + 4.20%

WACC = 7.80%

The weighted average cost of capital in this example is 7.80 percent. The entity in this example would need to earn an overall rate of return of 7.80 percent to cover its cost of capital.

III. CAPITAL STRUCTURE

Background

Q. Please explain the capital structure concept.

A. The capital structure of a firm is the relative proportions of each type of security:--short-term debt, long-term debt (including capital leases), preferred stock and common stock--that are used to finance the firm's assets.

Q. How is the capital structure expressed?

A. The capital structure of a company is expressed as the percentage of each component of the capital structure (capital leases, short-term debt, long-term debt, preferred stock and common stock) relative to the entire capital structure.

As an example, the capital structure for an entity that is financed by $20,000 of short-term debt, $85,000 of long-term debt (including capital leases), $15,000 of preferred stock and $80,000 of common stock is shown in Table 2.

Table 2

Component			%
Short-Term Debt	$20,000	($20,000/$200,000)	10.0%
Long-Term Debt	$85,000	($85,000/$200,000)	42.5%
Preferred Stock	$15,000	($15,000/$200,000)	7.5%
Common Stock	$80,000	($80,000/$200,000)	40.0%
Total	$200,000		100%

The capital structure in this example is composed of 10.0 percent short-term debt, 42.5 percent long-term debt, 7.5 percent preferred stock and 40.0 percent common stock.

Rio Rico's Capital Structure

Q. What capital structure does Rio Rico propose?

A. The Company proposes a pro forma capital structure composed of 20.0 percent debt and 80.0 percent common equity. Rio Rico's proposed capital structure reflects the hypothetical capital structure approved of in the Company's last rate case.[1]

Q. How was the hypothetical capital structure used in the Company's last rate case determined?

A. At open meeting,[2] Rio Rico committed to file a financing application with the Commission in 2011, wherein debt equivalent to 20 percent of its capital structure would be infused into the Company by Rio Rico's parent company (Algonquin Power and Utilities Corporation), with the debt having a cost of 5.7 percent.[3]

[1] Docket No. WS-02676A-09-0257.
[2] Held December 14 and 15, 2010.
[3] Decision No. 72059, dated January 6, 2011.

Q. Did Rio Rico follow up on its commitment to file a financing application in 2011 to effectuate the infusion of 20 percent debt into its capital structure at a cost of 5.7 percent from its parent company?

A. No. A check of Docket Control records shows that Rio Rico has not filed a financing application requesting approval for the debt infusion as contemplated in the prior docket.

Q. Does this mean that the Company's actual capital structure currently consists of 100 percent equity?

A. Yes, at present, Rio Rico's actual capital structure consists of 100 percent equity.

Q. How does Rio Rico's pro forma capital structure compare to capital structures of publicly-traded water utilities?

A. Schedule JAC-4 shows the capital structures of six publicly-traded water companies ("sample water companies" or "sample water utilities") as of December 2011. The average capital structure for the sample water utilities is comprised of approximately 51.6 percent debt and 48.4 percent equity.

Staff's Capital Structure

Q. What is Staff's recommended capital structure for Rio Rico?

A. Staff recommends a capital structure composed of 0.0 percent debt and 100.0 percent equity. Staff's recommended capital structure reflects the Company's actual capital structure as of the February 29, 2012, test year end.

Q. Does Staff consider the use of a hypothetical pro forma capital structure to be appropriate in this proceeding?

A. No. As discussed below, Staff recommends a financial risk adjustment to the ROE to appropriately address Rio Rico's use of an equity-rich, uneconomical capital structure. Staff's financial risk adjustment is calculated based on financial theory; therefore, it is preferred over use of a subjectively derived hypothetical capital structure.

IV. COST OF DEBT

Q. What is the basis for the Company's proposed 5.7 percent cost of debt?

A. The Company's proposed 5.7 percent cost of debt is the cost of debt approved of in Rio Rico's prior rate case.

Q. Does the Company have any debt outstanding?

A. No. As noted previously, Rio Rico has no outstanding debt. The Company's proposed debt and 5.7 percent cost are hypothetical and based on the Commission-adopted amounts in the prior rate case predicated on a commitment by Rio Rico to file a financing application in 2011, requesting authorization for a debt infusion by its parent equal to 20 percent of its capital structure at a cost of 5.7 percent. However, Rio Rico never filed the anticipated financing application, and its parent made no debt infusion. Accordingly, the Company's actual capital structure presently consists of 100 percent equity.

V. RETURN ON EQUITY

Background

Q. Please define the term "cost of equity capital."

A. The cost of equity is the rate of return that investors expect to earn on their investment in a business entity given its risk. In other words, the cost of equity to the entity is the

EXHIBIT
A-15
ADMITTED

BEFORE THE ARIZONA CORPORATION COMMISSION

BOB STUMP
Chairman
GARY PIERCE
Commissioner
BRENDA BURNS
Commissioner
SUSAN BITTER SMITH
Commissioner
BOB BURNS
Commissioner

IN THE MATTER OF THE APPLICATION OF NEW RIVER UTILITY COMPANY, AN ARIZONA CORPORATION, FOR A DETERMINATION OF THE FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASES IN ITS WATER RATES AND CHARGES FOR UTILITY SERVICE BASED THEREON.	)	DOCKET NO. W-01737A-12-0478

DIRECT

TESTIMONY

OF

JOHN A. CASSIDY

PUBLIC UTILITIES ANALYST

UTILITIES DIVISION

ARIZONA CORPORATION COMMISSION

JUNE 26, 2013

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EXECUTIVE SUMMARY
NEW RIVER WATER & SEWER, INC.
DOCKET NO. WS-03478A-12-0307

The Direct Testimony of Staff witness John A. Cassidy addresses the following issues:

Capital Structure – Staff recommends that the Commission adopt a capital structure for New River Utility Company ("Company") for this proceeding consisting of 0.0 percent debt and 100.0 percent equity.

Cost of Equity – Staff recommends that the Commission adopt an 8.8 percent return on equity ("ROE") for the Company. Staff's estimated ROE for the Company is based on the average of its discounted cash flow ("DCF") method and capital asset pricing model ("CAPM") cost of equity methodology estimates for the sample companies of 8.6 percent for the DCF and 7.7 percent for the CAPM. Staff's recommended ROE includes an upward economic assessment adjustment of 60 basis points.

Cost of Debt – Staff recommends that the Commission adopt a 0.0 percent cost of debt, as the Company has no debt in its capital structure.

Fair Value Rate of Return – Staff recommends that the Commission adopt a fair value rate of return ("FVROR") of 7.6 percent.

Mr. Jones' Testimony – The Commission should reject the 10.0 percent cost of equity proposed by Mr. Jones because it is not supported by any market based cost of equity estimation analysis.

I. INTRODUCTION

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

A. My name is John A. Cassidy. I am a Public Utilities Analyst employed by the Arizona Corporation Commission ("Commission") in the Utilities Division ("Staff"). My business address is 1200 West Washington Street, Phoenix, Arizona 85007.

Q. Briefly describe your responsibilities as a Public Utilities Analyst.

A. I am responsible for the examination of financial and statistical information included in utility rate applications and other financial matters, including studies to estimate the cost of capital component in rate filings used to determine the overall revenue requirement, and for preparing written reports, testimonies and schedules to present Staff's recommendations to the Commission on these matters.

Q. Please describe your educational background and professional experience.

A. I hold a Bachelor of Arts degree in History from Arizona State University, a Master of Library Science degree from the University of Arizona, and a Master of Business Administration degree with an emphasis in Finance from Arizona State University. While pursuing my MBA degree, I was inducted into Beta Gamma Sigma, the National Business Honor Society. I have passed the CPA exam, but opted not to pursue certification. I have worked professionally as a librarian, financial consultant and tax auditor and served as Staff's cost of capital witness in rate case evidentiary proceedings in my current as well as in a past tenure as a Commission employee.

Q. What is the scope of your testimony in this case?

A. My testimony provides Staff's recommended capital structure, return on equity ("ROE") and overall fair value rate of return ("FVROR") for establishing the revenue requirements for New River Utility Company's ("New River" or "Company") pending rate application.

Q. Please provide a brief description of New River.

A. New River is a public service corporation engaged in providing water utility service in portions of Maricopa County, Arizona, pursuant to certificates of convenience and necessity granted by the Commission in Decision No. 33131 (May 24, 1961) and Decision No. 33354 (August 15, 1961). During the Test Year ended December 31, 2012, New River served approximately 2,900 water service connections.

Summary of Testimony and Recommendations

Q. Briefly summarize how Staff's Cost of Capital Testimony is organized.

A. Staff's Cost of Capital Testimony is presented in eleven sections. Section I is this introduction. Section II discusses the concept of weighted average cost of capital ("WACC"). Section III presents the concept of capital structure and presents Staff's recommended capital structure for New River in this proceeding. Section IV presents Staff's cost of debt for New River. Section V discusses the concepts of ROE and risk. Section VI presents the methods employed by Staff to estimate New River's ROE. Section VII presents the findings of Staff's ROE analysis. Section VIII presents Staff's final cost of equity estimates for New River. Section IX presents Staff's FVROR recommendation. Section X presents Staff's comments on the Direct Testimony of the Company's witness, Mr. Ray L. Jones, pertaining to cost of capital. Finally, section XI presents the conclusions.

Q. Have you prepared any exhibits to accompany your testimony?

A. Yes. I prepared nine schedules (JAC-1 to JAC-9) that support Staff's cost of capital analysis.

Q. What is Staff's weighted average cost of capital ("WACC") for New River?

A. Staff's WACC is 8.8 percent, as shown in Schedule JAC-1. Staff's WACC is based on cost of equity estimates for the proxy group of sample companies of 8.6 percent from the discounted cash flow ("DCF") method and 7.7 percent from the capital asset pricing model ("CAPM"). As shown in Schedule JAC-3, Staff recommends adoption of a 60 basis point upward economic assessment adjustment to the cost of equity.

Q. What is Staff's recommended FVROR for New River?

A. Staff recommends a 7.6 percent FVROR. The calculation of Staff's recommended 7.6 percent FVROR is presented in Schedule JAC-1.

New River's Proposed Overall Rate of Return

Q. Briefly summarize New River's proposed capital structure, cost of debt, ROE and overall FVROR for this proceeding.

A. Table 1 summarizes the Company's proposed capital structure, cost of debt, ROE and overall cost of capital / FVROR in this proceeding:

Table 1

	Weight	Cost	Inflation Adj.	Adjusted Cost	Weighted Cost
Long-term Debt	0.0%	0.0%	-1.28%	-1.28%	0.0%
Common Equity	100.0%	10.0%	-1.28%	8.72%	8.72%
Cost of Capital (FVROR)					**8.72%**

New River is proposing an overall fair value cost of capital, i.e., FVROR of 8.72 percent.[1]

II. THE WEIGHTED AVERAGE COST OF CAPITAL

Q. Briefly explain the cost of capital concept.

A. The cost of capital is the opportunity cost of choosing one investment over others with equivalent risk. In other words, the cost of capital is the return that stakeholders expect for investing their financial resources in a determined business venture over another business venture.

Q. What is the overall cost of capital?

A. The cost of capital to a company issuing a variety of securities (i.e., stock and indebtedness) is an average of the cost rates on all issued securities adjusted to reflect the relative amounts for each security in the company's entire capital structure. Thus, the overall cost of capital is the WACC.

Q. How is the WACC calculated?

A. The WACC is calculated by adding the weighted expected returns of a firm's securities. The WACC formula is:

Equation 1.

$$\text{WACC} = \sum_{i=1}^{n} W_i * r_i$$

In this equation, W_i is the weight given to the ith security (the proportion of the ith security relative to the portfolio) and r_i is the expected return on the ith security.

[1] *See* Jones Direct, p. 15 (lines 12-13), and Exhibit RLJ-DT2, Schedule D-1 (page 1).

Q. Can you provide an example demonstrating application of Equation 1?

A. Yes. For this example, assume that an entity has a capital structure composed of 60 percent debt and 40 percent equity. Also, assume that the embedded cost of debt is 6.0 percent and the expected return on equity, i.e., the cost of equity, is 10.5 percent. Calculation of the WACC is as follows:

WACC = (60% * 6.0%) + (40% * 10.5%)

WACC = 3.60% + 4.20%

WACC = 7.80%

The weighted average cost of capital in this example is 7.80 percent. The entity in this example would need to earn an overall rate of return of 7.80 percent to cover its cost of capital.

III. CAPITAL STRUCTURE

Background

Q. Please explain the capital structure concept.

A. The capital structure of a firm is the relative proportions of each type of security—short-term debt, long-term debt (including capital leases), preferred stock and common stock—that are used to finance the firm's assets.

Q. How is the capital structure expressed?

A. The capital structure of a company is expressed as the percentage of each component of the capital structure (capital leases, short-term debt, long-term debt, preferred stock and common stock) relative to the entire capital structure.

As an example, the capital structure for an entity that is financed by $20,000 of short-term debt, $85,000 of long-term debt (including capital leases), $15,000 of preferred stock and $80,000 of common stock is shown in Table 2.

Table 2

Component			%
Short-Term Debt	$20,000	($20,000/$200,000)	10.0%
Long-Term Debt	$85,000	($85,000/$200,000)	42.5%
Preferred Stock	$15,000	($15,000/$200,000)	7.5%
Common Stock	$80,000	($80,000/$200,000)	40.0%
Total	$200,000		100%

The capital structure in this example is composed of 10.0 percent short-term debt, 42.5 percent long-term debt, 7.5 percent preferred stock and 40.0 percent common stock.

New River's Capital Structure

Q. What capital structure does New River propose?

A. The Company proposes a test-year end capital structure composed of 0.0 percent long-term debt and 100.0 percent common equity.

Q. How does New River's proposed capital structure compare to capital structures of publicly-traded water utilities?

A. Schedule JAC-4 shows the capital structures of six publicly-traded water companies ("sample water companies" or "sample water utilities") as of December 2012. The average capital structure for the sample water utilities is comprised of approximately 51.2 percent debt and 48.8 percent equity.

Staff's Capital Structure

Q. What is Staff's recommended capital structure for New River?

A. Staff recommends a capital structure composed of 0.0 percent debt and 100.0 percent equity. Staff's recommended capital structure reflects the Company's actual capital structure as of the December 31, 2011, test-year end.

IV. COST OF DEBT

Q. What is the overall cost of debt proposed by the Company?

A. As shown in the Company's Schedule D-2, New River has no debt in its capital structure; thus, its cost of debt is 0.0 percent.

V. RETURN ON EQUITY

Background

Q. Please define the term "cost of equity capital."

A. The cost of equity is the rate of return that investors expect to earn on their investment in a business entity given its risk. In other words, the cost of equity to the entity is the investors' expected rate of return on other investments of similar risk. As investors have a wide selection of stocks to choose from, they will choose stocks with similar risks but higher returns. Therefore, the market determines the entity's cost of equity.

Q. Is there a correlation between interest rates and the cost of equity?

A. Yes, there is a positive correlation between interest rates and the cost of equity, as the two tend to move in the same direction. This relationship is reflected in the CAPM formula. The CAPM is a market-based model employed by Staff for estimating the cost of equity. The CAPM is further discussed in Section VI of this testimony.

Q. What has been the general trend of interest rates in recent years?

A. A chronological chart of interest rates is a good tool to show interest rate history and identify trends. Chart 1 graphs intermediate U.S. treasury rates from January 4, 2002, to May 31, 2013.

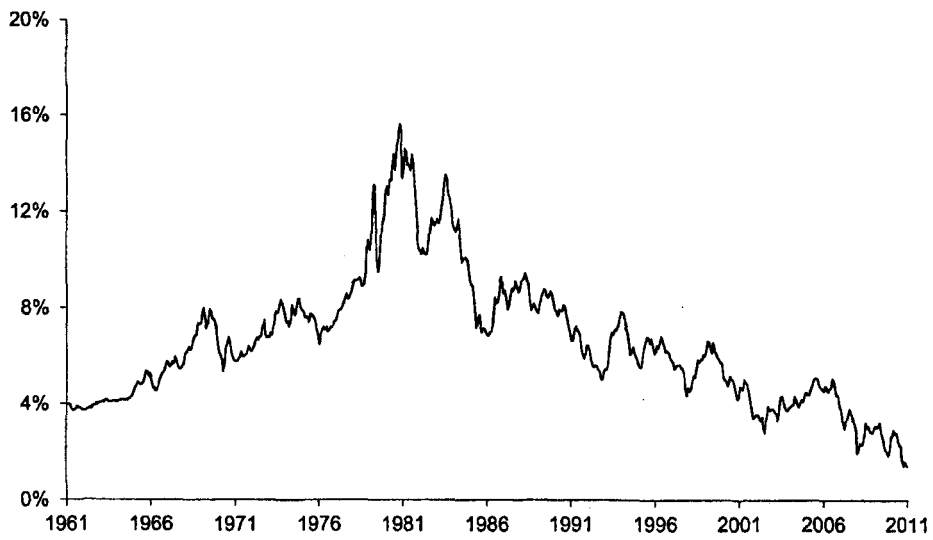
Chart 1: Average Yield on 5-, 7-, & 10-Year Treasuries

Chart 1 shows that intermediate-term interest rates trended downward from 2002 to mid-2003, then trended upward through mid-2007, and have since generally trended downward.

Q. What has been the general trend in interest rates longer term?

A. U.S. Treasury rates from January 1962 - May 2013 are shown in Chart 2. The chart shows that interest rates trended upward through the early-1980s, and have trended downward over the last 30 years.

Chart 2: History of 5- and 10-Year Treasury Yields



Source: Federal Reserve

Q. Do these trends suggest anything in terms of cost of equity?

A. Yes. As previously noted, interest rates and cost of equity tend to move in the same direction; therefore, the cost of equity has declined in the past 30 years.

Q. Do actual returns represent the cost of equity?

A. No. The cost of equity represents investors' *expected* returns and not realized returns.

Q. Is there any information available that leads to an understanding of the relationship between the equity returns required for a regulated water utility and those required in the market as a whole?

A. Yes. A comparison of betas, a component of the CAPM discussed in Section VI, for the water utility industry and the market, provide insight into this relationship. In theory, the market has a beta value of 1.0, with stocks bearing greater risk (less risk) than the market having beta values higher than (lower than) 1.0, respectively. Furthermore, in accordance with the CAPM, the cost of equity capital moves in the same direction as beta. Therefore, because the average beta value (0.71)[2] for a water utility is less than 1.0, the required return on equity for a regulated water utility is below that of the market as a whole.

Risk

Q. Please define risk in relation to cost of capital.

A. Risk, as it relates to an investment, is the variability or uncertainty of the returns on a particular security. Investors are risk averse and require a greater potential return to invest in relatively higher risk opportunities, i.e., investors require compensation for taking on additional risk. Risk is generally separated into two components. Those components are market risk (systematic risk) and non-market risk (diversifiable risk or firm-specific risk).

Q. What is market risk?

A. Market risk or systematic risk is the risk of an investment that cannot be reduced through diversification. Market risk stems from factors that affect all securities, such as recessions, war, inflation and high interest rates. Since these factors affect the entire market they cannot be eliminated through diversification. Market risk does not impact each security to the same degree. The degree to which a given security's return is affected

[2] See Schedule JAC-7.

by market fluctuations can be measured using Beta. Beta reflects the business risk and the financial risk of a security.

Q. Please define business risk.

A. Business risk is the fluctuation of earnings inherent in a firm's operations and environment, such as competition and adverse economic conditions that may impair its ability to provide returns on investment. Companies in the same or similar line of business tend to experience the same fluctuations in business cycles.

Q. Please define financial risk.

A. Financial risk is the fluctuation of earnings, inherent in the use of debt financing, that may impair a firm's ability to provide adequate returns; the higher the percentage of debt in a company's capital structure, the greater its exposure to financial risk.

Q. Do business risk and financial risk affect the cost of equity?

A. Yes.

Q. Is a firm subject to any other risk?

A. Yes. Firms are also subject to unsystematic or firm-specific risk. Examples of unsystematic risk include losses caused by labor problems, nationalization of assets, loss of a big client or weather conditions. Investors can eliminate firm-specific risk by holding a diverse portfolio; thus, it is not of concern to diversified investors.

Q. How does New River's financial risk exposure compare to that of Staff's sample group of water companies?

A. JAC-4 shows the capital structures of the six sample water companies as of December 31, 2012, and New River's capital structure as of its December 31, 2011 test-year end date. As shown, the sample water utilities were capitalized with approximately 51.2 percent debt and 48.8 percent equity, while New River's capital structure consists of 0.0 percent debt and 100.0 percent equity. Thus, unlike Staff's sample group of companies, New River has no exposure to financial risk.

Q. Is firm-specific risk measured by beta?

A. No. Firm-specific risk is not measured by beta.

Q. Is the cost of equity affected by firm-specific risk?

A. No. Since firm-specific risk can be eliminated through diversification, it does not affect the cost of equity.

Q. Can investors expect additional returns for firm-specific risk?

A. No. Investors who hold diversified portfolios can eliminate firm-specific risk and, consequently, do not require any additional return. Since investors who choose to be less than fully-diversified must compete in the market with fully-diversified investors, the former cannot expect to be compensated for unique risk.

VI. ESTIMATING THE COST OF EQUITY

Introduction

Q. Did Staff directly estimate the cost of equity for New River?

A. No. Since New River is not a publicly-traded company, Staff is unable to directly estimate its cost of equity due to the lack of firm-specific market data. Instead, Staff estimated the Company's cost of equity indirectly, using a representative sample group of publicly traded water utilities as a proxy, taking the average of the sample group to reduce the sample error resulting from random fluctuations in the market at the time the information is gathered.

Q. What companies did Staff select as proxies or comparables for New River?

A. Staff's sample consists of the following six publicly-traded water utilities: American States Water, California Water, Connecticut Water Services, Middlesex Water, Aqua America and SJW Corp. Staff chose these companies because they are publicly-traded and receive the majority of their earnings from regulated operations.

Q. What models did Staff implement to estimate New River's cost of equity?

A. Staff used two market-based models to estimate the cost of equity for New River: the DCF model and the CAPM.

Q. Please explain why Staff chose the DCF and CAPM models.

A. Staff chose to use the DCF and CAPM models because they are widely-recognized market-based models and have been used extensively to estimate the cost of equity. An explanation of the DCF and CAPM models follows.

Discounted Cash Flow Model Analysis

Q. Please provide a brief summary of the theory upon which the DCF method of estimating the cost of equity is based.

A. The DCF method of stock valuation is based on the theory that the value of an investment is equal to the sum of the future cash flows generated from the aforementioned investment discounted to the present time. This method uses expected dividends, market price and dividend growth rate to calculate the cost of capital. Professor Myron Gordon pioneered the DCF method in the 1960s. The DCF method has become widely used to estimate the cost of equity for public utilities due to its theoretical merit and its simplicity. Staff used the financial information for the relevant six sample companies in the DCF model and averaged the results to determine an estimated cost of equity for the sample companies.

Q. Does Staff use more than one version of the DCF?

A. Yes. Staff uses two versions of the DCF model: the constant-growth DCF and the multi-stage or non-constant growth DCF. The constant-growth DCF assumes that an entity's dividends will grow indefinitely at the same rate. The multi-stage growth DCF model assumes the dividend growth rate will change at some point in the future.

The Constant-Growth DCF

Q. What is the mathematical formula used in Staff's constant-growth DCF analysis?

A. The constant-growth DCF formula used in Staff's analysis is:

Equation 2:

$$K = \frac{D_1}{P_0} + g$$

where:

K = the cost of equity
D_1 = the expected annual dividend
P_0 = the current stock price
g = the expected infinite annual growth rate of dividends

Equation 2 assumes that the entity has a constant earnings retention rate and that its earnings are expected to grow at a constant rate. According to Equation 2, a stock with a current market price of $10 per share, an expected annual dividend of $0.45 per share and an expected dividend growth rate of 3.0 percent per year has a cost of equity to the entity of 7.5 percent reflected by the sum of the dividend yield ($0.45/ $10 = 4.5 percent) and the 3.0 percent annual dividend growth rate.

Q. How did Staff calculate the expected dividend yield (D_1/P_0) component of the constant-growth DCF formula?

A. Staff calculated the expected yield component of the DCF formula by dividing the expected annual dividend (D_1) by the spot stock price (P_0) after the close of market on May 29, 2013, as reported by *MSN Money*.

Q. Why did Staff use the May 29, 2013, spot price rather than a historical average stock price to calculate the dividend yield component of the DCF formula?

A. The current, rather than historic, market price is used in order to be consistent with financial theory. In accordance with the Efficient Market Hypothesis, the current stock price is reflective of all available information on a stock, and as such reveals investors' expectations of future returns. Use of historical average stock prices illogically discounts

the most recent information in favor of less recent information. The latter is stale and is representative of underlying conditions that may have changed.

Q. How did Staff estimate the dividend growth (g) component of the constant-growth DCF model represented by Equation 2?

A. The dividend growth component used by Staff is determined by the average of six different estimation methods, as shown in Schedule JAC-8. Staff calculated historical and projected growth estimates on dividend-per-share ("DPS"),[3] earnings-per-share ("EPS")[4] and sustainable growth bases.

Q. Why did Staff examine EPS growth to estimate the dividend growth component of the constant-growth DCF model?

A. Historic and projected EPS growth are used because dividends are related to earnings. Dividend distributions may exceed earnings in the short run, but cannot continue indefinitely. In the long term, dividend distributions are dependent on earnings.

Q. How did Staff estimate historical DPS growth?

A. Staff estimated historical DPS growth by calculating a compound annual DPS growth rate for each of its sample companies over the 10-year period, 2002-2012. As shown in Schedule JAC-5, the average historical DPS growth rate for the sample was 3.4 percent.

Q. How did Staff estimate projected DPS growth?

A. Staff calculated an average of the projected DPS growth rates for the sample water utilities from *Value Line* through the period, 2016-2018. The average projected DPS growth rate is 5.2 percent, as shown in Schedule JAC-5.

[3] Derived from information provided by *Value Line.*
[4] Derived from information provided by *Value Line.*

Q. How did Staff estimate historical EPS growth rate?

Staff estimated historical EPS growth by calculating a compound annual EPS growth rate for each of its sample companies over the 10-year period, 2002-2012. As shown in Schedule JAC-5, the average historical EPS growth rate for the sample was 4.9 percent.

Q. How did Staff estimate projected EPS growth?

A. Staff calculated an average of the projected EPS growth rates for the sample water utilities from *Value Line* through the period, 2016-2018. The average projected EPS growth rate is 4.7 percent, as shown in Schedule JAC-5.

Q. How does Staff calculate its historical and projected sustainable growth rates?

A. Historical and projected sustainable growth rates are calculated by adding their respective retention growth rate terms (br) to their respective stock financing growth rate terms (vs), as shown in Schedule JAC-6.

Q. What is retention growth?

A. Retention growth is the growth in dividends due to the retention of earnings. The retention growth concept is based on the theory that dividend growth cannot be achieved unless the company retains and reinvests some of its earnings. The retention growth is used in Staff's calculation of sustainable growth shown in Schedule JAC-6.

Q. What is the formula for the retention growth rate?

A. The retention growth rate is the product of the retention ratio and the book/accounting return on equity. The retention growth rate formula is:

Equation 3:

$$\text{Retention Growth Rate} = br$$

where: b = the retention ratio (1 – dividend payout ratio)
r = the accounting/book return on common equity

Q. How did Staff calculate the average historical retention growth rate (br) for the sample water utilities?

A. Staff calculated the mean of the 10-year average historical retention rate for each sample company over the period, 2002-2012. As shown in Schedule JAC-6, the historical average retention (br) growth rate for the sample is 2.8 percent.

Q. How did Staff estimate its projected retention growth rate (br) for the sample water utilities?

A. Staff used the retention growth projections for the sample water utilities for the period, 2016-2018, from *Value Line.* As shown in Schedule JAC-6, the projected average retention growth rate for the sample companies is 3.8 percent.

Q. When can retention growth provide a reasonable estimate of future dividend growth?

A. The retention growth rate is a reasonable estimate of future dividend growth when the retention ratio is reasonably constant and the entity's market price to book value ("market-to-book ratio") is expected to be 1.0. The average retention ratio has been reasonably constant in recent years. However, the market-to-book ratio for the sample water utilities is 2.1, notably higher than 1.0, as shown in Schedule JAC-7.

Q. Is there any financial implication of a market-to-book ratio greater than 1.0?

A. Yes. A market-to-book ratio greater than 1.0 implies that investors expect an entity to earn an accounting/book return on its equity that exceeds its cost of equity. The relationship between required returns and expected cash flows is readily observed in the fixed securities market. For example, assume an entity contemplating issuance of bonds with a face value of $10 million at either 6 percent or 8 percent and, thus, paying annual interest of $600,000 or $800,000, respectively. Regardless of investors' required return on similar bonds, investors will be willing to pay more for the bonds if issued at 8 percent than if the bonds are issued at 6 percent. For example, if the current interest rate required by investors is 6 percent, then they would bid $10 million for the 6 percent bonds and more than $10 million for the 8 percent bonds. Similarly, if equity investors require a 9 percent return and expect an entity to earn accounting/book returns of 13 percent, the market will bid up the price of the entity's stock to provide the required return of 9 percent.

Q. How has Staff generally recognized a market-to-book ratio exceeding 1.0 in its cost of equity analyses in recent years?

A. Staff has assumed that investors expect the market-to-book ratio to remain greater than 1.0. Given that assumption, Staff has added a stock financing growth rate (vs) term to the retention ratio (br) term to calculate its historical and projected sustainable growth rates.

Q. Do the historical and projected sustainable growth rates Staff uses to develop its DCF cost of equity in this case continue to include a stock financing growth rate term?

A. Yes.

Q. What is stock financing growth?

A. Stock financing growth is the growth in an entity's dividends due to the sale of stock by that entity. Stock financing growth is a concept derived by Myron Gordon and discussed in his book *The Cost of Capital to a Public Utility.*[5] Stock financing growth is the product of the fraction of the funds raised from the sale of stock that accrues to existing shareholders (v) and the fraction resulting from dividing the funds raised from the sale of stock by the existing common equity (s).

Q. What is the mathematical formula for the stock financing growth rate?

A. The mathematical formula for stock financing growth is:

Equation 4:

$$\text{Stock Financing Growth} = vs$$

where: v = Fraction of the funds raised from the sale of stock that accrues to existing shareholders

s = Funds raised from the sale of stock as a fraction of the existing common equity

Q. How is the variable v presented above calculated?

A. Variable v is calculated as follows:

Equation 5:

$$v = 1 - \left(\frac{book\ value}{market\ value} \right)$$

[5] Gordon, Myron J. *The Cost of Capital to a Public Utility.* MSU Public Utilities Studies, Michigan, 1974. pp 31-35.

For example, assume that a share of stock has a $30 book value and is selling for $45. Then, to find the value of *v*, the formula is applied:

$$v = 1 - \left(\frac{30}{45}\right)$$

In this example, *v* is equal to 0.33.

Q. How is the variable *s* presented above calculated?

A. Variable *s* is calculated as follows:

Equation 6:

$$s = \frac{\text{Funds raised from the issuance of stock}}{\text{Total existing common equity before the issuance}}$$

For example, assume that an entity has $150 in existing equity, and it sells $30 of stock. Then, to find the value of *s*, the formula is applied:

$$s = \left(\frac{30}{150}\right)$$

In this example, *s* is equal to 20.0 percent.

Q. What is the *vs* term when the market-to-book ratio is equal to 1.0?

A. A market-to-book ratio of 1.0 reflects that investors expect an entity to earn a book/accounting return on their equity investment equal to the cost of equity. When the market-to-book ratio is equal to 1.0, none of the funds raised from the sale of stock by the entity accrues to the benefit of existing shareholders, i.e., the term *v* is equal to zero (0.0). Consequently, the *vs* term is also equal to zero (0.0). When stock financing growth is zero, dividend growth depends solely on the *br* term.

Q. What is the effect of the *vs* term when the market-to-book ratio is greater than 1.0?

A. A market-to-book ratio greater than 1.0 reflects that investors expect an entity to earn a book/accounting return on their equity investment greater than the cost of equity. Equation 5 shows that, when the market-to-book ratio is greater than 1.0, the *v* term is also greater than zero. The excess by which new shares are issued and sold over book value per share of outstanding stock is a contribution that accrues to existing stockholders in the form of a higher book value. The resulting higher book value leads to higher expected earnings and dividends. Continued growth from the *vs* term is dependent upon the continued issuance and sale of additional shares at a price that exceeds book value per share.

Q. What *vs* estimate did Staff calculate from its analysis of the sample water utilities?

A. Staff estimated an average stock financing growth of 1.9 percent for the sample water utilities, as shown in Schedule JAC-6.

Q. What would occur if an entity had a market-to-book ratio greater than 1.0 as a result of investors expecting earnings to exceed its cost of equity, and subsequently experienced newly-authorized rates equal only to its cost of equity?

A. *Ceteris paribus*, i.e., holding all other factors constant, one would expect market forces to move the company's stock price lower, closer to a market-to-book ratio of 1.0, to reflect investor expectations of reduced expected future cash flows.

Q. If the average market-to-book ratio of Staff's sample water utilities were to fall to 1.0 due to authorized ROEs equaling their cost of equity, would inclusion of the vs term be necessary to Staff's constant-growth DCF analysis?

A. No. As discussed above, when the market-to-book ratio is equal to 1.0, none of the funds raised from the sale of stock by the entity accrues to the benefit of existing shareholders because the *v* term equals to zero and, consequently, the *vs* term also equals zero. When the market-to-book ratio equals 1.0, dividend growth depends solely on the *br* term. Staff's inclusion of the *vs* term assumes that the market-to-book ratio continues to exceed 1.0 and that the water utilities will continue to issue and sell stock at prices above book value with the effect of benefitting existing shareholders.

Q. What are Staff's historical and projected sustainable growth rates?

A. Staff's estimated historical sustainable growth rate is 4.7 percent based on an analysis of earnings retention for the sample water companies. Staff's projected sustainable growth rate is 5.7 percent based on retention growth projected by *Value Line*. Schedule JAC-6 presents Staff's estimates of the sustainable growth rate.

Q. What is Staff's expected infinite annual growth rate in dividends?

A. Staff's expected dividend growth rate (*g*) is 4.8 percent, which is the average of historical and projected DPS, EPS, and sustainable growth estimates. Staff's calculation of the expected infinite annual growth rate in dividends is shown in Schedule JAC-8.

Q. What is Staff's constant-growth DCF estimate for the sample utilities?

A. Staff's constant-growth DCF estimate is 7.8 percent, as shown in Schedule JAC-3.

The Multi-Stage DCF

Q. Why did Staff implement the multi-stage DCF model to estimate New River's cost of equity?

A. Staff generally uses the multi-stage DCF model to consider the assumption that dividends may not grow at a constant rate. The multi-stage DCF uses two stages of growth, the first stage (near-term) having a four-year duration, followed by the second stage (long-term) of constant growth.

Q. What is the mathematical formula for the multi-stage DCF?

A. The multi-stage DCF formula is shown in the following equation:

Equation 7:

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{(1+K)^t} + \frac{D_n(1+g_n)}{K-g_n}\left[\frac{1}{(1+K)}\right]^n$$

Where:
P_0 = current stock price
D_t = dividends expected during stage 1
K = cost of equity
n = years of non – constant growth
D_n = dividend expected in year n
g_n = constant rate of growth expected after year n

Q. What steps did Staff take to implement its multi-stage DCF cost of equity model?

A. First, Staff projected future dividends for each of the sample water utilities using near-term and long-term growth rates. Second, Staff calculated the rate (cost of equity) which equates the present value of the forecasted dividends to the current stock price for each of

the sample water utilities. Lastly, Staff calculated an overall sample average cost of equity estimate.

Q. How did Staff calculate near-term (stage-1) growth?

A. The stage-1 growth rate is based on *Value Lines*'s projected dividends for the next twelve months, when available, and on the average dividend growth (*g*) rate of 4.8 percent, calculated in Staff's constant DCF analysis for the remainder of the stage.

Q. How did Staff estimate long-term (stage-2) growth?

A. Staff calculated the stage-2 growth rate using the arithmetic mean rate of growth in Gross Domestic Product ("GDP") from 1929 to 2011.[6] Using the GDP growth rate assumes that the water utility industry is expected to grow at the same rate as the overall economy.

Q. What is the historical GDP growth rate that Staff used to estimate stage-2 growth?

A. Staff used 6.5 percent to estimate the stage-2 growth rate.

Q. What is Staff's multi-stage DCF estimate for the sample utilities?

A. Staff's multi-stage DCF estimate is 9.4 percent, as shown in Schedule JAC-3.

Q. What is Staff's overall DCF estimate for the sample utilities?

A. Staff's overall DCF estimate is 8.6 percent. Staff calculated the overall DCF estimate by averaging the constant growth DCF (7.8%) and multi-stage DCF (9.4%) estimates, as shown in Schedule JAC-3.

[6] www.bea.doc.gov.

Capital Asset Pricing Model

Q. Please describe the CAPM.

A. The CAPM is used to determine the prices of securities in a competitive market. The CAPM model describes the relationship between a security's investment risk and its market rate of return. Under the CAPM, an investor requires the expected return of a security to equal the rate on a risk-free security plus a risk premium. If the investor's expected return does not meet or beat the required return, the investment is not economically justified. The model also assumes that investors will sufficiently diversify their investments to eliminate any non-systematic or unique risk.[7] In 1990, Professors Harry Markowitz, William Sharpe, and Merton Miller earned the Nobel Prize in Economic Sciences for their contribution to the development of the CAPM.

Q. Did Staff use the same sample water utilities in its CAPM and DCF cost of equity estimation analyses?

A. Yes. Staff's CAPM cost of equity estimation analysis uses the same sample water companies as its DCF cost of equity estimation analysis.

Q. What is the mathematical formula for the CAPM?

A. The mathematical formula for the CAPM is:

[7] The CAPM makes the following assumptions: 1) single holding period; 2) perfect and competitive securities market; 3) no transaction costs; 4) no restrictions on short selling or borrowing; 5) the existence of a risk-free rate; and 6) homogeneous expectations.

Equation 8:

$$K = R_f + \beta (R_m - R_f)$$

where:

R_f	=	risk free rate
R_m	=	return on market
β	=	beta
$R_m - R_f$	=	market risk premium
K	=	expected return

The equation shows that the expected return (K) on a risky asset is equal to the risk-free interest rate (R_f) plus the product of the market risk premium ($R_m - R_f$) multiplied by beta (β) where beta represents the riskiness of the investment relative to the market.

Q. What is the risk-free rate?

A. The risk-free rate is the rate of return of an investment free of default risk.

Q. What does Staff use as surrogates to represent estimations of the risk-free rates of interest in its historical and current market risk premium CAPM methods?

A. Staff uses separate parameters as surrogates for the estimations of the risk-free rates of interest for the historical market risk premium CAPM cost of equity estimation and the current market risk premium CAPM cost of equity estimation. Staff uses the average of three (5-, 7-, and 10-year) intermediate-term U.S. Treasury securities' spot rates in its historical market risk premium CAPM cost of equity estimation, and the 30-year U.S. Treasury bond spot rate in its current market risk premium CAPM cost of equity estimation. Rates on U.S. Treasuries are largely verifiable and readily available.

Q. What does beta measure?

A. Beta is a measure of a security's price volatility, or systematic risk, relative to the market as a whole. Since systematic risk cannot be diversified away, it is the only risk that is relevant when estimating a security's required return. Using a baseline market beta coefficient of 1.0, a security having a beta value less than 1.0 will be less volatile (i.e., less risky) than the market. A security with a beta value greater than 1.0 will be more volatile (i.e., more risky) than the market.

Q. How did Staff estimate New River's beta?

A. Staff used the average of the *Value Line* betas for the sample water utilities as a proxy for the Company's beta. Schedule JAC-7 shows the *Value Line* betas for each of the sample water utilities. The 0.71 average beta coefficient for the sample water utilities is Staff's estimated beta value for New River. A security with a beta value of 0.71 has less volatility than the market.

Q. What is the market risk premium ($R_m - R_f$)?

A. The market risk premium is the expected return on the market, minus the risk-free rate. Simplified, it is the return an investor expects as compensation for market risk.

Q. What did Staff use for the market risk premium?

A. Staff uses separate calculations for the market risk premium in its historical and current market risk premium CAPM methods.

Q. How did Staff calculate an estimate for the market risk premium in its historical market risk premium CAPM method?

A. Staff uses the intermediate-term government bond income returns published in the Ibbotson Associates' *Stocks, Bonds, Bills, and Inflation 2012 Yearbook* to calculate the historical market risk premium. Ibbotson Associates calculates the historical risk premium by averaging the historical arithmetic differences between the S&P 500 and the intermediate-term government bond income returns for the period 1926-2011. Staff's historical market risk premium estimate is 7.1 percent, as shown in Schedule JAC-3.

Q. How did Staff calculate an estimate for the market risk premium in its current market risk premium CAPM method?

A. Staff solves equation 8 above to arrive at a market risk premium using a DCF-derived expected return (K) of 10.88 (2.1 + 8.78[8]) percent using the expected dividend yield (2.1 percent over the next twelve months) and the annual per share growth rate (8.78 percent) that *Value Line* projects for all dividend-paying stocks under its review[9] along with the current long-term risk-free rate (30-year Treasury note at 3.27 percent) and the market's average beta of 1.0. Staff calculated the current market risk premium as 7.61 percent,[10] as shown in Schedule JAC-3.

Q. What is the result of Staff's historical market risk premium CAPM and current market risk premium CAPM cost of equity estimations for the sample utilities?

A. Staff's cost of equity estimates are 6.6 percent using the historical market risk premium CAPM and 8.7 percent using the current market risk premium CAPM.

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[8] The three to five year price appreciation is 40%. $1.40^{0.25} - 1 = 8.78\%$.
[9] May 31, 2013 issue date.
[10] 10.88% = 3.27% + (1) (7.61%).

Q. What is Staff's overall CAPM estimate for the sample utilities?

A. Staff's overall CAPM cost of equity estimate is 7.7 percent which is the average of the historical market risk premium CAPM (6.6 percent) and the current market risk premium CAPM (8.7 percent) estimates, as shown in Schedule JAC-3.

VII. SUMMARY OF STAFF'S COST OF EQUITY ANALYSIS

Q. What is the result of Staff's constant-growth DCF analysis to estimate the cost of equity for the sample water utilities?

A. Schedule JAC-3 shows the result of Staff's constant-growth DCF analysis. The result of Staff's constant-growth DCF analysis is as follows:

$$k = 3.0\% + 4.8\%$$

$$k = \mathbf{7.8\%}$$

Staff's constant-growth DCF estimate of the cost of equity for the sample water utilities is 7.8 percent.

Q. What is the result of Staff's multi-stage DCF analysis to estimate of the cost of equity for the sample utilities?

A. Schedule JAC-9 shows the result of Staff's multi-stage DCF analysis. The result of Staff's multi-stage DCF analysis is:

Company	Equity Cost Estimate (k)
American States Water	8.8%
California Water	9.7%
Aqua America	8.5%
Connecticut Water	9.8%

Middlesex Water	10.2%
SJW Corp	9.1%
Average	**9.4%**

Staff's multi-stage DCF estimate of the cost of equity for the sample water utilities is 9.4 percent.

Q. What is Staff's overall DCF estimate of the cost of equity for the sample utilities?

A. Staff's overall DCF estimate of the cost of equity for the sample utilities is 8.6 percent. Staff calculated an overall DCF cost of equity estimate by averaging Staff's constant growth DCF (7.8 percent) and Staff's multi-stage DCF (9.4 percent) estimates, as shown in Schedule JAC-3.

Q. What is the result of Staff's historical market risk premium CAPM analysis to estimate of the cost of equity for the sample utilities?

A. Schedule JAC-3 shows the result of Staff's CAPM analysis using the historical risk premium estimate. The result is as follows:

$$k = 1.6\% + 0.71 * 7.1\%$$

$$k = 6.6\%$$

Staff's CAPM estimate (using the historical market risk premium) of the cost of equity to the sample water utilities is 6.6 percent.

Q. What is the result of Staff's current market risk premium CAPM analysis to estimate the cost of equity for the sample utilities?

A. Schedule JAC-3 shows the result of Staff's CAPM analysis using the current market risk premium estimate. The result is:

$$k = 3.3\% + 0.71 * 7.6\%$$

$$k = 8.7\%$$

Staff's CAPM estimate (using the current market risk premium) of the cost of equity to the sample water utilities is 8.7 percent.

Q. What is Staff's overall CAPM estimate of the cost of equity for the sample utilities?

A. Staff's overall CAPM estimate for the sample utilities is 7.7 percent. Staff's overall CAPM estimate is the average of the historical market risk premium CAPM (6.6 percent) and the current market risk premium CAPM (8.7 percent) estimates, as shown in Schedule JAC-3.

Q. Please summarize the results of Staff's cost of equity analysis for the sample utilities.

A. The following table shows the results of Staff's cost of equity analysis:

Table 2

Method	Estimate
Average DCF Estimate	8.6%
Average CAPM Estimate	7.7%
Overall Average	**8.2%**

Staff's average estimate of the cost of equity to the sample water utilities is 8.2 percent.

VIII. FINAL COST OF EQUITY ESTIMATES FOR NEW RIVER

Q. Please compare New River's capital structure to that of the six sample water companies.

A. The average capital structure for the sample water utilities is composed of 48.8 percent common equity and 51.2 percent debt, as shown in Schedule JAC-4. New River's capital structure is composed of 100.0 percent common equity and 0.0 percent debt. In this case, since New River's capital structure is less leveraged than that of the average sample water utility, its stockholders bear less financial risk than do common stock shareholders of the sample water utility companies.

Q. Does New River's decreased financial risk affect its cost of equity?

A. Yes. As previously discussed, financial risk is a component of market risk and investors require compensation for market risk. Since New River's financial risk exposure is less than that of the average sample water companies, its cost of equity is lower than that of the sample water companies.

Q. Is Staff recommending a downward financial risk adjustment to the Company's cost of equity to recognize its lower financial risk?

A. No. Staff normally applies two criteria in assessing whether application of a downward financial risk adjustment is appropriate. The first consideration is whether the utility has a reasonably economical capital structure. Staff considers a capital structure composed of no more than 60 percent equity to meet this condition. If equity exceeds 60 percent, as it does for New River, Staff considers application of a downward financial risk adjustment to be appropriate if the utility meets the second criteria. The second condition is whether the utility has access to equity capital markets. Although New River's equity exceeds 60 percent, it does not have access to the equity capital markets; accordingly, Staff is not

recommending a downward financial risk adjustment to the Company's cost of equity. Staff's methodology for applying a downward financial risk adjustment encourages a utility with access to the equity capital markets to use that access to manage its capital structure with economic efficiency and encourages a utility that lacks access to the equity capital markets to maintain a healthy capital structure.

Q. Did Staff consider factors other than the results of its technical models in its cost of equity analysis?

A. Yes. In consideration of the relatively uncertain status of the economy and the market that currently exists, Staff is proposing an Economic Assessment Adjustment to the cost of equity. In this case, Staff recommends a 60 basis point (0.6 percent) upward Economic Assessment Adjustment, as shown in Schedule JAC-3.

Q. What is Staff's ROE estimate for New River?

A. Staff determined a COE estimate of 8.2 percent for New River based on cost of equity estimates for the sample companies of 8.6 percent from the DCF and 7.7 percent from the CAPM. Staff recommends adoption of a 60 basis point upward Economic Assessment Adjustment resulting in an 8.8 percent Staff-recommended ROE, as shown in Schedule JAC-3.

IX. FINAL WEIGHTED AVERAGE COST OF CAPITAL

Q. What weighted average cost of capital did Staff determine for New River?

A. Staff determined an 8.8 percent WACC for the Company, as shown in Schedule JAC-1 and the following table:

Table 3

	Weight	Cost	Weighted Cost
Long-term Debt	0.0%	0.0%	0.0%
Common Equity	100.0%	8.8%	8.8%
Weighted Average Cost of Capital			**8.8%**

X. FAIR VALUE RATE OF RETURN ("FVROR") RECOMMENDATION

Q. What FVROR does the Company propose in this proceeding?

A. The Company proposes an 8.72 percent FVROR. New River's proposed FVROR represents its proposed 10.00 percent cost of equity, less a 1.28 percent fair value inflation adjustment (10.00% - 1.28% = 8.72%). In making its FVROR calculation, the Company utilized the methodology recommended by Staff in an earlier docket,[11] and adopted by the Commission in Decision No. 71308.[12]

Q. What FVROR does Staff Recommend for New River?

A. Staff recommends a 7.6 percent FVROR for the Company, as shown in Schedule JAC-1.

Q. How did Staff calculate its recommended FVROR?

A. Like the Company, Staff calculated the FVROR utilizing the methodology previously adopted in Decision No. 71308[13] for Chaparral City Water Company, Inc.[14] In short, the FVROR methodology used deducts from the WACC an inflation adjustment/accretion return. The method Staff used in this case differs from the prior method in that Staff used

[11] Chaparral City Water Co., Docket No. W-02113A-07-0551.
[12] Dated October 21, 2009.
[13] *See* Decision No. 71308, p. 43, footnote 258.
[14] Docket No. W-02113A-07-0551.

the yield on 30-year United States Treasury bonds instead of the yield on 20-year U.S. Treasury bonds to calculate the portion of the return required by investor due to inflation (i.e., accretion return). The preferred term for calculating the accretion term is that which most closely matches the weighted average expected life of the plant included in the fair value rate base. Thirty years more closely reflects the weighted average life of the plant included in the fair value rate base than does 20 years.[15] At the time the case resulting in Decision No. 71308 was processed, 20 years was the longest term available for Treasury Inflation Protected Securities ("TIPS") which are used in the calculation of the accretion return. The U.S. Treasury initiated the sale of 30-year TIPS on February 22, 2010.

Q. How did Staff calculate the inflation adjustment/accretion return?

A. Staff first calculated the difference between the nominal yield (i.e., unadjusted for inflation) on the 30-year U.S. Treasury bond and the real yield (i.e., inflation adjusted) on the same 30-year treasury security. The spread between the nominal and real yields on the 30-year treasury security is reflective of the additional return (i.e., the inflation adjustment/accretion return) required by investors for the loss of purchasing power due to inflation over this same 30-year horizon. Since the OCRB, which does not include inflation, represents 50 percent of the FVRB, Staff reduced the accretion return by 50 percent resulting in a modified inflation adjustment/accretion return to deduct from the WACC for purposes of calculating the FVROR. Details of Staff's inflation adjustment/accretion return calculation are presented in Schedule JAC-2.

[15] Thirty years reflects a 3.33 percent depreciation rate and 20 years reflects a 5.0 percent depreciation rate.

Q. Did Staff use spot U.S. Treasury security yields for purposes of making its FVROR estimate?

A. Yes. Staff used the closing spot nominal and real yields on the 30-year U.S. Treasury bond as of May 29, 2013, to correspond with the spot price date selected for Staff's sample companies. Use of the current bond yield is consistent with financial theory (i.e., the Efficient Market Hypothesis).

XI. STAFF RESPONSE TO COMPANY'S COST OF CAPITAL WITNESS MR. RAY L. JONES

Q. Does Mr. Jones provide market based support for his recommended 10.0 percent cost of equity?

A. No. Mr. Jones' testimony was not supported by any market based analysis of the cost of equity. Instead, he based his proposed 10.0 percent cost of equity upon a review of the returns authorized by the Commission in six recent rate cases.[16] The cost of equity varies over time and the cost of equity is dependent upon capital structure that should be adjusted to reflect differences among the sample companies.

XI. CONCLUSION

Q. Please summarize Staff's recommendations.

A. Staff recommends that the Commission adopt an 8.8 percent WACC for New River in this proceeding based on a capital structure composed of 0.0 percent debt and 100.0 percent equity, Staff's 8.2 percent cost of equity estimate and Staff's 60 basis point (0.6 percent) upward economic assessment adjustment.

[16] Direct Testimony of Ray L. Jones, pp. 16-17. Among the six rate filings upon which Mr. Jones based his 10.0 percent cost of equity, five were 2010 dockets and one was a 2009 docket.

Staff further recommends that the Commission adopt a 7.6 percent FVROR for the Company, reflecting a 1.2 percent inflation adjustment/accretion return deduction from the WACC, as shown in Schedule JAC-1.

Q. Does this conclude your Direct Testimony?

A. Yes, it does.

New River Utility Company Cost of Capital Calculation
Capital Structure &
Weighted Average Cost of Capital &
Fair Value Rate of Return
Staff Recommended and Company Proposed

[A]	[B]	[C]	[D]
Description	Weight (%)	Cost	Weighted Cost
Staff Recommended Structure			
Debt	0.0%	0.0%	0.0%
Common Equity	100.0%	8.8%	8.8%
Weighted Average Cost of Capital			8.8%
Less: Accretion Return			1.2%
Fair Value Rate of Return			**7.6%**
Company Proposed Structure			
Debt	0.0%	0.0%	0.0%
Common Equity	100.0%	10.0%	10.0%
Weighted Average Cost of Capital			10.00%
Less: Accretion Return			1.28%
Fair Value Rate of Return			**8.72%**

[D] : [B] x [C]

Supporting Schedules: JAC-3 and JAC-4.

New River Utility Company Cost of Capital Calculation
Inflation Adjustment (Accretion Return)
Included in the Fair Value Rate of Return
Staff Recommended

Description		
Weighted Average Cost of Capital	8.8%	[1]
Less: Modified Inflation Adjustment/Accretion Return	**1.2%**	[2]
Fair Value Rate of Return	7.6%	

[1] Schedule JAC-1

[2] Calculation of Modified Inflation Adjustment/Accretion Return:

30-Year Treasury Yield (as of 5/29/2013) -- Nominal [3]	3.27%
Less: 30-Year Treasury Yield (@ 5/29/2013) -- Real [3]	0.91%
Return Required by Investors due to Inflation (Accretion Return)	2.36%
Times: 50% factor [4]	0.5
Inflation Adjustment (rounded to one decimal point)	**1.2%**

[3] http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/default.aspx

[4] This factor recognizes that the OCRB represents 50% of the FVRB, and the the OCRB includes no inflation.

Note: The above Fair Value Rate of Return calculation is consistent with the methodology adopted in Decision No. 71308 (dated October 21, 2009) with one exception. Specifically, the methodology adopted in Decision No. 71308 utilized a 20-year Treasury yield to determine the return required by investors due to inflation (i.e., accretion yield), as this was the longest term Treasury Inflation Protected Securities ("TIPS") instrument available at the time. However, beginning on February 22, 2010, the Treasury initiated the sale of a new 30-year TIP security, and expanded its analysis to allow for the calculation of an inflation adjustment/accretion return based upon a 30-year Treasury yield. Accordingly, Staff's analysis incorporates the use of a 30-year Treasury yield in order to more accurately reflect the impact of inflation over the life of the Company's plant as reflected in its weighted average depreciation/amortization rate.

New River Utility Company Cost of Capital Calculation
Final Cost of Equity Estimates
Sample Water Utilities

[A]	[B]		[C]		[D]		[E]
DCF Method			D_1/P_0 [1]	+	g [2]	=	k
Constant Growth DCF Estimate			3.0%	+	4.8%	=	7.8%
Multi-Stage DCF Estimate						=	9.4%
Average DCF Estimate							**8.6%**
CAPM Method	Rf	+	β [5]	x	(Rp)	=	k
Historical Market Risk Premium [3]	1.6%	+	0.71	x	7.1% [6]	=	6.6%
Current Market Risk Premium [4]	3.3%	+	0.71	x	7.6% [7]	=	8.7%
Average CAPM Estimate							**7.7%**
					Average of Overall Estimates		**8.2%**
					Economic Assessment Adjustment		**0.6%**
					Sub-Total		**8.8%**
					Financial risk adjustment		0.0%
					Total		**8.8%**

1 MSN Money and Value Line

2 Schedule JAC-8

3 Risk-free rate (Rf) for 5, 7, and 10 year Treasury rates from the U.S. Treasury Department at www.ustreas.gov

4 Risk-free rate (Rf) for 30 Year Treasury bond rate from the U.S. Treasury Department at www.ustreas.gov

5 Value Line

6 Historical Market Risk Premium (Rp) calculated from Ibbotson Associates SBBI 2011 Yearbook data

7 Testimony

New River Utility Company Cost of Capital Calculation
Average Capital Structure of Sample Water Utilities

[A]	[B]	[C]	[D]
Company	Debt	Common Equity	Total
American States Water	43.3%	56.7%	100.0%
California Water	54.2%	45.8%	100.0%
Aqua America	55.2%	44.8%	100.0%
Connecticut Water	55.3%	44.7%	100.0%
Middlesex Water	43.1%	56.9%	100.0%
SJW Corp	56.2%	43.8%	100.0%
Average Sample Water Utilities	**51.2%**	**48.8%**	**100.0%**
New River - Actual Capital Structure	**0.0%**	**100.0%**	**100.0%**

Source:
Sample Water Companies from Value Line

New River Utility Company Cost of Capital Calculation
Growth in Earnings and Dividends
Sample Water Utilities

[A]	[B]	[C]	[D]	[E]
Company	Dividends Per Share 2002 to 2012 DPS[1]	Dividends Per Share Projected DPS[1]	Earnings Per Share 2002 to 2012 EPS[1,2]	Earnings Per Share Projected EPS[1]
American States Water	3.9%	6.0%	7.7%	1.2%
California Water	1.2%	7.4%	5.0%	5.8%
Aqua America	7.7%	8.3%	7.3%	8.0%
Connecticut Water	1.7%	2.8%	3.2%	2.1%
Middlesex Water	1.6%	1.6%	2.1%	5.0%
SJW Corp	4.4%	4.9%	4.2%	6.3%
Average Sample Water Utilities	**3.4%**	**5.2%**	**4.9%**	**4.7%**

1 Value Line

2 Negative values are inconsistent with the DCF, accordingly, they are excluded from the average.

New River Utility Company Cost of Capital Calculation
Sustainable Growth
Sample Water Utilities

[A]	[B]	[C]	[D]	[E]	[F]
Company	Retention Growth 2002 to 2012 br	Retention Growth Projected br	Stock Financing Growth vs	Sustainable Growth 2002 to 2012 br + vs	Sustainable Growth Projected br + vs
American States Water	3.8%	5.6%	1.5%	5.4%	7.1%
California Water	2.4%	3.2%	1.5%	3.9%	4.7%
Aqua America	3.9%	4.4%	1.9%	5.8%	6.4%
Connecticut Water	2.0%	3.0%	3.7%	5.6%	6.7%
Middlesex Water	1.2%	2.8%	2.9%	4.1%	5.7%
SJW Corp	3.5%	3.8%	0.1%	3.6%	3.9%
Average Sample Water Utilities	**2.8%**	**3.8%**	**1.9%**	**4.7%**	**5.7%**

[B]: Value Line
[C]: Value Line
[D]: Value Line and MSN Money
[E]: [B]+[D]
[F]: [C]+[D]

New River Utility Company Cost of Capital Calculation
Selected Financial Data of Sample Water Utilities

[A]	[B]	[C]	[D]	[E]	[F]	[G]
Company	Symbol	Spot Price 5/29/2013	Book Value	Mkt To Book	*Value Line* Beta β	Raw Beta βraw
American States Water	AWR	**53.46**	23.29	2.3	**0.70**	0.52
California Water	CWT	**19.82**	11.51	1.7	**0.65**	0.45
Aqua America	WTR	**31.81**	9.81	3.2	**0.60**	0.37
Connecticut Water	CTWS	**28.78**	13.87	2.1	**0.75**	0.60
Middlesex Water	MSEX	**19.65**	11.88	1.7	**0.70**	0.52
SJW Corp	SJW	**27.30**	15.09	1.8	**0.85**	0.75
Average				**2.1**	**0.71**	**0.53**

[C]: Msn Money
[D]: Value Line
[E]: [C] / [D]
[F]: Value Line
[G]: (-0.35 + [F]) / 0.67

New River Utility Company Cost of Capital Calculation
Calculation of Expected Infinite Annual Growth in Dividends
Sample Water Utilities

[A]	[B]
Description	g
DPS Growth - Historical[1]	3.4%
DPS Growth - Projected[1]	5.2%
EPS Growth - Historical[1]	4.9%
EPS Growth - Projected[1]	4.7%
Sustainable Growth - Historical[2]	4.7%
Sustainable Growth - Projected[2]	5.7%
Average	**4.8%**

1 Schedule JAC-5

2 Schedule JAC-6

New River Utility Company Cost of Capital Calculation
Multi-Stage DCF Estimates
Sample Water Utilities

[A]	[B]	[C]	[D]	[E]	[F]	[H]	[I]
Company	Current Mkt. Price (P_o)[1] 5/29/2013	Projected Dividends[2] (Stage 1 growth) (D_t) d_1	d_2	d_3	d_4	Stage 2 growth[3] (g_n)	Equity Cost Estimate (K)[4]
American States Water	53.5	1.30	1.37	1.43	1.50	6.5%	8.8%
California Water	19.8	0.66	0.69	0.72	0.76	6.5%	9.7%
Aqua America	31.8	0.67	0.70	0.73	0.77	6.5%	8.5%
Connecticut Water	28.8	0.98	1.03	1.08	1.13	6.5%	9.8%
Middlesex Water	19.7	0.75	0.78	0.82	0.86	6.5%	10.2%
SJW Corp	27.3	0.74	0.78	0.82	0.86	6.5%	9.1%
						Average	**9.4%**

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{(1+K)^t} + \frac{D_n(1+g_n)}{K-g_n}\left[\frac{1}{(1+K)}\right]^n$$

Where : P_0 = current stock price
D_t = dividends expected during stage 1
K = cost of equity
n = years of non – constant growth
D_n = dividend expected in year n
g_n = constant rate of growth expected after year n

1 [B] see Schedule JAC-7
2 Derived from Value Line information
3 Average annual growth in GDP 1929 - 2011 in current dollars.
4 Internal Rate of Return of Projected Dividends

EXHIBIT
A-16
ADMITTED

BEFORE THE ARIZONA CORPORATION COMMISSION

BOB STUMP
Chairman
GARY PIERCE
Commissioner
BRENDA BURNS
Commissioner
SUSAN BITTER SMITH
Commissioner
BOB BURNS
Commissioner

IN THE MATTER OF THE APPLICATION OF NEW RIVER UTILITY COMPANY, AN ARIZONA CORPORATION, FOR A DETERMINATION OF THE FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASES IN ITS WATER RATES AND CHARGES FOR UTILITY SERVICE BASED THEREON.	)	DOCKET NO. W-01737A-12-0478

SURREBUTTAL

TESTIMONY

OF

JOHN A. CASSIDY

PUBLIC UTILITIES ANALYST

UTILITIES DIVISION

ARIZONA CORPORATION COMMISSION

AUGUST 12, 2013

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EXECUTIVE SUMMARY
NEW RIVER UTILITY COMPANY
DOCKET NO. W-01737A-12-0478

The Surrebuttal Testimony of Staff witness John A. Cassidy addresses the following issues:

Capital Structure – Staff continues to recommend that the Commission adopt a capital structure for New River Utility Company ("Company") for this proceeding consisting of 0.0 percent debt and 100.0 percent equity.

Cost of Equity – Staff recommends that the Commission adopt an 8.9 percent return on equity ("ROE") for the Company. Staff's estimated ROE for the Company is based on the average of its discounted cash flow ("DCF") method and capital asset pricing model ("CAPM") cost of equity methodology estimates for the sample companies of 8.6 percent for the DCF and 7.9 percent for the CAPM. Staff's recommended ROE includes an upward economic assessment adjustment of 60 basis points (0.6 percent). Staff's Direct Testimony recommended a ROE of 8.8 percent.

Cost of Debt – Staff continues to recommend that the Commission adopt a 0.0 percent cost of debt, as the Company has no debt in its capital structure.

Fair Value Rate of Return – Staff recommends that the Commission adopt a fair value rate of return ("FVROR") of 7.8 percent for the Company. Staff's Direct Testimony recommended a FVROR of 7.6 percent.

Mr. Jones' Testimony – The Commission should reject the 10.0 percent cost of equity proposed by Mr. Jones because it is not supported by any market based cost of equity estimation analysis.

I. INTRODUCTION

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

A. My name is John A. Cassidy. I am a Public Utilities Analyst employed by the Arizona Corporation Commission ("Commission") in the Utilities Division ("Staff"). My business address is 1200 West Washington Street, Phoenix, Arizona 85007.

Q. Are you the same John A. Cassidy who filed Direct Testimony in this case?

A. Yes, I am.

Q. What is the purpose of your Surrebuttal Testimony in this rate proceeding?

A. The purpose of my Surrebuttal Testimony is to report on Staff's updated cost of capital analysis with its recommendations concerning New River Utility Company's ("New River" or "Company") cost of capital and overall fair value rate of return ("FVROR"), and to respond to the cost of capital Rebuttal Testimony of Company witness, Ray L. Jones ("Mr. Jones' Rebuttal").

Q. Please explain how Staff's Surrebuttal Testimony is organized.

A. Staff's Surrebuttal Testimony is presented in four sections. Section I is this introduction. Section II discusses Staff's updated cost of capital analysis. Section III presents Staff's comments on the Rebuttal Testimony of the Company's cost of capital witness, Mr. Jones. Lastly, Section IV presents Staff's recommendations.

II. COST OF EQUITY AND OVERALL FAIR VALUE RATE OF RETURN

Q. Is Staff recommending a different capital structure for New River in its Surrebuttal Testimony than it did in Direct Testimony?

A. No. Staff continues to recommend a capital structure consisting of 0.0 percent debt and 100.0 percent common equity.

Q. Has Staff updated its analysis concerning the Company's cost of equity since filing Direct Testimony in this proceeding?

A. Yes. Staff updated its analysis to include more recent market data.

Q. What is Staff's updated estimate for the cost of equity?

A. Staff's updated estimate for the cost of equity is 8.3 percent. This figure is derived from cost of equity estimates which range from 8.6 percent for the discounted cash flow ("DCF") method to 7.9 percent for the capital asset pricing model ("CAPM") estimation methodologies, as shown in Surrebuttal Schedule JAC-3. In Direct Testimony, Staff's cost of equity estimate was 8.2 percent.[1]

Q. In its Surrebuttal Testimony, does Staff continue to recommend the 60 basis point (0.6 percent) upward economic assessment adjustment to New River's cost of equity that it recommended in its Direct Testimony?

A. Yes.

[1] In Direct Testimony, Staff derived cost of equity estimates of 8.6 percent from the DCF method and 7.7 percent from the CAPM.

Q. What return on equity ("ROE") is Staff recommending for New River?

A. Staff recommends an 8.9 percent ROE. Staff's recommended ROE represents Staff's updated 8.3 percent cost of equity, plus Staff's upward 60 basis point economic assessment adjustment (8.9% = 8.3% + 0.6%).

Q. Did Staff update its analysis concerning the Company's overall fair value rate of return?

A. Yes, the updated analysis is supported by Surrebuttal Schedules JAC-1 to JAC-9.

Q. Does Staff's updated cost of equity analysis result in a change to Staff's weighted average cost of capital?

A. Yes. Based upon its updated cost of equity analysis, Staff's weighted average cost of capital for New River is 8.9 percent, as shown in Surrebuttal Schedule JAC-1. In Direct Testimony, Staff's weighted average cost of capital was 8.8 percent.

Q. What FVROR does Staff recommend for New River?

A. Staff recommends a 7.8 percent FVROR for the Company, as shown in Surrebuttal Schedule JAC-1.[2] Staff's FVROR calculation represents New River's weighted average cost of capital, less an inflation adjustment/accretion return of 1.1 percent (8.9% - 1.1% = 7.8%).

Q. In calculating its updated inflation adjustment/accretion return for the Company, did Staff employ the same methodology used in its Direct Testimony?

A. Yes. Details of Staff's updated inflation adjustment/accretion return calculation are presented in Surrebuttal Schedule JAC-2.

[2] In Direct Testimony, Staff recommended a FVROR of 7.6 percent for New River.

III. STAFF RESPONSE TO COMPANY'S COST OF CAPITAL WITNESS MR. RAY L. JONES

Q. In Direct Testimony, Mr. Jones provided no market based support for his proposed 10.0 percent cost of equity. Does he provide such market based support in Rebuttal Testimony?

A. No. Mr. Jones' Rebuttal Testimony continues to rely upon a review of authorized returns granted by the Commission in recent cases as the basis for his proposed 10.0 percent cost of equity. In Direct Testimony, Mr. Jones based his proposed 10.0 percent cost of equity on a review of the returns authorized in six recent dockets;[3] in Rebuttal Testimony, he expands his review to include authorized returns from ten recent dockets, four of which were among the six dockets reviewed for purposes of his Direct Testimony.[4]

Q. For purposes of establishing the rates to be charged customers by a public utility in a regulatory proceeding, why is it appropriate that the estimated cost of equity be market based?

A. It is appropriate because the cost of equity can only be determined in the marketplace, wherein it manifests itself as the investors' *expected* return. As noted in Staff's Direct Testimony, there is an opportunity cost associated with choosing one investment over another of equivalent risk.[5] Markets are efficient, and with so many investment opportunities to choose from, investors will seek out those stocks offering the highest returns available for a given level of risk; bidding up the share price of stocks deemed to be undervalued, and selling off those shares deemed to be overvalued. Through this

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[3] *See* Jones Direct, p.16.

[4] *See* Jones Rebuttal, p. 29, Table 1- Recent Returns on Equity Granted by the Commission. Among the ten dockets reviewed, four had previously been reviewed by Mr. Jones for purposes of his Direct testimony: Bermuda Water (Docket No. W-01812A-10-0521; Decision No. 72892), Indiada Water/East Slope Water (Docket No. W-02031A-10-0168; Decision No. 73091); Arizona Water – Western Group (Docket No. W-01445A-10-0517; Decision No. 73144); and Arizona-American Water (Docket No. W-01303A-10-0448; Decision No. 73145).

[5] *See* Cassidy Direct, p. 4, lines 5-8.

process, the market determines an entity's cost of equity.[6] Authorized returns on equity are not the equivalent of the cost of equity, and thus should not be relied upon.

Q. Aside from Mr. Jones reliance upon authorized returns to estimate the cost of equity, does Staff have other concerns regarding his proposed 10.0 percent return on equity for New River?

A. Yes. As noted in Staff's Direct Testimony,[7] financial risk is proportional to the level of debt financing employed in a firm's capital structure; the higher the percentage of debt, the greater the exposure to financial risk. Furthermore, equity shareholders require compensation for exposure to financial risk.[8] As noted earlier, New River has a capital structure consisting of 100.0 percent equity and 0.0 percent debt; thus, the Company has no exposure to financial risk. In contrast, as shown in Table 1 of Mr. Jones' Rebuttal (p. 29) Testimony, the average capital structure of the ten sample companies selected by Mr. Jones is more highly leveraged, consisting of 66.49 percent equity and 33.51 percent debt. Nevertheless, despite having no exposure to financial risk, Mr. Jones proposes a *higher* cost of equity (i.e., 10.0 percent) for New River than his sample average ROE (i.e., 9.85 percent). Staff has prepared a restatement of Mr. Jones' Rebuttal Table-1 which corrects for several minor errors contained therein. Staff's restatement appears in Surrebuttal Exhibit JAC-A.[9]

[6] *See* Cassidy Direct, p. 7, lines 15-19.
[7] *See* Cassidy Direct, page 11, lines 11-13.
[8] *See* Cassidy Direct, page 33, lines 12-15.
[9] *See* Cassidy Surrebuttal Exhibit JAC-A. The corrections were made to the authorized ROE for Chino Meadows II Water Co. (corrected, 9.60%), and the authorized ROE for UNS Gas Corp. (corrected, 9.75%). These corrections resulted in a reduction to Mr. Jones' sample average authorized ROE from 9.85 percent to 9.83 percent.

Q. Did Mr. Jones make a downward financial risk adjustment to his estimated cost of equity for New River in recognition of the Company's lack of exposure to financial risk relative to his sample companies?

A. No, he did not.

Q. Did Staff make a downward financial risk adjustment to its estimated cost of equity for New River in recognition of the Company's lack of exposure to financial risk?

A. No. For reasons noted in its Direct Testimony,[10] Staff elected not to make a downward financial risk adjustment to its cost of equity estimate for the Company. However, if New River were a utility with access to the capital markets, making such a downward adjustment would have been warranted. As shown in Surrebuttal Schedule JAC-4, Staff's updated sample average capital structure consists of 50.3 percent debt and 49.7 percent equity. Thus, to properly reflect the absence of financial risk exposure associated with New River's 100.0 percent equity capital structure relative to that of Staff's sample companies, a downward adjustment to Staff's recommended cost of equity for New River could have been appropriate.

Q. How does Staff respond to the concerns raised by Mr. Jones relating to the cost of equity recommended by Staff in Direct Testimony in the pending Global Water ("Global") consolidated rate dockets?

A. Staff would note that the Global rate dockets are on-going so it would not be appropriate for Staff to expand upon, or otherwise attempt to clarify the basis of its arguments in the Global dockets in this New River docket. However, Staff does want to make one point for purpose of clarifying the record in this New River docket. That point is that Staff's cost of equity analysis in the Global dockets was actually completed before its analysis in

[10] *See* Cassidy Direct, pages 33-34.

the New River docket, but testimony was not filed on the original timeline in the Global dockets due to a two month filing date extension approved by the Commission.

IV. STAFF RECOMMENDATIONS

Q. What are Staff's recommendations for the Company's cost of capital?

A. Staff recommends the following for New River's cost of capital:

1. A capital structure of 0.0 percent debt and 100.0 percent equity.
2. A 0.0 percent cost of debt.
3. An 8.9 percent cost of equity (which includes a 60 basis point (0.6 percent) upward economic assessment adjustment).
4. A 7.8 percent FVROR.

Q. Does this conclude your Surrebuttal Testimony?

A. Yes, it does.

New River Utility Company Cost of Capital Calculation
Capital Structure &
Weighted Average Cost of Capital &
Fair Value Rate of Return
Staff Recommended and Company Proposed

[A]	[B]	[C]	[D]
Description	Weight (%)	Cost	Weighted Cost
Staff Recommended Structure			
Debt	0.0%	0.0%	0.0%
Common Equity	100.0%	8.9%	8.9%
Weighted Average Cost of Capital			8.9%
Less: Accretion Return			1.1%
Fair Value Rate of Return			**7.8%**
Company Proposed Structure			
Debt	0.0%	0.0%	0.0%
Common Equity	100.0%	10.0%	10.0%
Weighted Average Cost of Capital			10.00%
Less: Accretion Return			1.28%
Fair Value Rate of Return			**8.72%**

[D] : [B] x [C]

Supporting Schedules: JAC-3 and JAC-4.

New River Utility Company Cost of Capital Calculation
Inflation Adjustment (Accretion Return)
Included in the Fair Value Rate of Return
Staff Recommended

Description		
Weighted Average Cost of Capital	8.9%	[1]
Less: Modified Inflation Adjustment/Accretion Return	**1.1%**	[2]
Fair Value Rate of Return	7.8%	

[1] Schedule JAC-1

[2] Calculation of Modified Inflation Adjustment/Accretion Return:

30-Year Treasury Yield (as of 7/17/2013) -- Nominal [3]	3.57%
Less: 30-Year Treasury Yield (@ 7/17/2013) -- Real [3]	1.29%
Return Required by Investors due to Inflation (Accretion Return)	2.28%
Times: 50% factor [4]	0.5
Inflation Adjustment (rounded to one decimal point)	**1.1%**

[3] http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/default.aspx

[4] This factor recognizes that the OCRB represents 50% of the FVRB, and that the OCRB includes no inflation.

Note: The above Fair Value Rate of Return calculation is consistent with the methodology adopted in Decision No. 71308 (dated October 21, 2009) with one exception. Specifically, the methodology adopted in Decision No. 71308 utilized a 20-year Treasury yield to determine the return required by investors due to inflation (i.e., accretion yield), as this was the longest term Treasury Inflation Protected Securities ("TIPS") instrument available at the time. However, beginning on February 22, 2010, the Treasury initiated the sale of a new 30-year TIP security, and expanded its analysis to allow for the calculation of an inflation adjustment/accretion return based upon a 30-year Treasury yield. Accordingly, Staff's analysis incorporates the use of a 30-year Treasury yield in order to more accurately reflect the impact of inflation over the life of the Company's plant as reflected in its weighted average depreciation/amortization rate.

New River Utility Company Cost of Capital Calculation
Final Cost of Equity Estimates
Sample Water Utilities

[A]	[B]		[C]		[D]		[E]
DCF Method			D_1/P_0 [1]	+	g [2]	=	**k**
Constant Growth DCF Estimate			2.9%	+	5.0%	=	7.9%
Multi-Stage DCF Estimate						=	9.2%
Average DCF Estimate							**8.6%**
CAPM Method	**Rf**	+	β [5]	x	**(Rp)**	=	**k**
Historical Market Risk Premium [3]	1.9%	+	0.71	x	7.2% [6]	=	7.0%
Current Market Risk Premium [4]	3.6%	+	0.71	x	7.3% [7]	=	8.7%
Average CAPM Estimate							**7.9%**
			Average of Overall Estimates				**8.3%**
			Economic Assessment Adjustment				**0.6%**
			Sub-Total				**8.9%**
			Financial risk adjustment				**0.0%**
			Total				**8.9%**

1 MSN Money and Value Line

2 Schedule JAC-8

3 Risk-free rate (Rf) for 5, 7, and 10 year Treasury rates from the U.S. Treasury Department at www.ustreas.gov

4 Risk-free rate (Rf) for 30 Year Treasury bond rate from the U.S. Treasury Department at www.ustreas.gov

5 Value Line

6 Historical Market Risk Premium (Rp) calculated from 2013 Ibbotson SBBI Classic Yearbook data

7 Testimony

New River Utility Company Cost of Capital Calculation
Average Capital Structure of Sample Water Utilities

[A]	[B]	[C]	[D]
Company	Debt	Common Equity	Total
American States Water	43.3%	56.7%	100.0%
California Water	54.2%	45.8%	100.0%
Aqua America	55.2%	44.8%	100.0%
Connecticut Water	55.3%	44.7%	100.0%
Middlesex Water	43.1%	56.9%	100.0%
SJW Corp	56.2%	43.8%	100.0%
York Water	45.0%	55.0%	100.0%
Average Sample Water Utilities	**50.3%**	**49.7%**	**100.0%**
New River - Actual Capital Structure	**0.0%**	**100.0%**	**100.0%**

Source:
Sample Water Companies from Value Line

New River Utility Company Cost of Capital Calculation
Growth in Earnings and Dividends
Sample Water Utilities

[A]	[B]	[C]	[D]	[E]
Company	Dividends Per Share 2002 to 2012 DPS[1]	Dividends Per Share Projected DPS[1]	Earnings Per Share 2002 to 2012 EPS[1,2]	Earnings Per Share Projected EPS[1]
American States Water	3.9%	7.2%	7.7%	1.2%
California Water	1.2%	7.4%	5.0%	5.8%
Aqua America	7.7%	8.3%	7.3%	8.0%
Connecticut Water	1.7%	3.5%	3.2%	2.7%
Middlesex Water	1.6%	1.6%	2.1%	5.0%
SJW Corp	4.4%	4.9%	4.2%	6.3%
York Water	4.4%	3.8%	6.1%	4.6%
Average Sample Water Utilities	**3.6%**	**5.2%**	**5.1%**	**4.8%**

1 Value Line

2 Negative values are inconsistent with the DCF, accordingly, they are excluded from the average.

New River Utility Company Cost of Capital Calculation
Sustainable Growth
Sample Water Utilities

[A]	[B]	[C]	[D]	[E]	[F]
Company	Retention Growth 2002 to 2012 br	Retention Growth Projected br	Stock Financing Growth vs	Sustainable Growth 2002 to 2012 br + vs	Sustainable Growth Projected br + vs
American States Water	3.8%	5.1%	1.6%	5.5%	6.8%
California Water	2.4%	3.2%	1.6%	4.0%	4.8%
Aqua America	3.9%	4.4%	2.0%	5.9%	6.4%
Connecticut Water	2.0%	3.0%	3.7%	5.7%	6.8%
Middlesex Water	1.2%	2.8%	3.3%	4.5%	6.1%
SJW Corp	3.5%	3.8%	0.1%	3.6%	3.9%
York Water	2.2%	2.8%	4.7%	6.9%	7.5%
Average Sample Water Utilities	**2.7%**	**3.6%**	**2.4%**	**5.1%**	**6.0%**

[B]: Value Line
[C]: Value Line
[D]: Value Line and MSN Money
[E]: [B]+[D]
[F]: [C]+[D]

New River Utility Company Cost of Capital Calculation
Selected Financial Data of Sample Water Utilities

[A]	[B]	[C]	[D]	[E]	[F]	[G]
Company	Symbol	Spot Price 7/17/2013	Book Value	Mkt To Book	*Value Line* Beta β	Raw Beta βraw
American States Water	AWR	**58.68**	23.43	2.5	**0.70**	0.52
California Water	CWT	**20.99**	11.57	1.8	**0.65**	0.45
Aqua America	WTR	**32.74**	9.87	3.3	**0.60**	0.37
Connecticut Water	CTWS	**29.64**	13.91	2.1	**0.75**	0.60
Middlesex Water	MSEX	**21.68**	11.94	1.8	**0.70**	0.52
SJW Corp	SJW	**27.44**	15.15	1.8	**0.85**	0.75
York Water	YORW	**21.12**	8.08	2.6	**0.70**	0.52
Average				**2.3**	**0.71**	**0.53**

[C]: Msn Money
[D]: Value Line
[E]: [C] / [D]
[F]: Value Line
[G]: (-0.35 + [F]) / 0.67

New River Utility Company Cost of Capital Calculation
Calculation of Expected Infinite Annual Growth in Dividends
Sample Water Utilities

[A]	[B]
Description	g
DPS Growth - Historical[1]	3.6%
DPS Growth - Projected[1]	5.2%
EPS Growth - Historical[1]	5.1%
EPS Growth - Projected[1]	4.8%
Sustainable Growth - Historical[2]	5.1%
Sustainable Growth - Projected[2]	6.0%
Average	**5.0%**

1 Schedule JAC-5

2 Schedule JAC-6

New River Utility Company Cost of Capital Calculation
Multi-Stage DCF Estimates
Sample Water Utilities

[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
Company	Current Mkt. Price (P_o)[1] 7/17/2013	Projected Dividends[2] (Stage 1 growth) (D_t) d_1	d_2	d_3	d_4	Stage 2 growth[3] (g_n)	Equity Cost Estimate (K)[4]
American States Water	58.7	1.52	1.60	1.68	1.76	6.5%	9.0%
California Water	21.0	0.65	0.68	0.72	0.75	6.5%	9.5%
Aqua America	32.7	0.74	0.78	0.82	0.86	6.5%	8.6%
Connecticut Water	29.6	1.02	1.07	1.12	1.18	6.5%	9.8%
Middlesex Water	21.7	0.76	0.79	0.83	0.88	6.5%	9.8%
SJW Corp	27.4	0.74	0.77	0.81	0.85	6.5%	9.1%
York Water	21.1	0.55	0.58	0.61	0.64	6.5%	9.0%
						Average	**9.2%**

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{(1+K)^t} + \frac{D_n(1+g_n)}{K-g_n}\left[\frac{1}{(1+K)}\right]^n$$

Where : P_0 = current stock price
D_t = dividends expected during stage 1
K = cost of equity
n = years of non – constant growth
D_n = dividend expected in year n
g_n = constant rate of growth expected after year n

1 [B] see Schedule JAC-7
2 Derived from Value Line Information
3 Average annual growth in GDP 1929 - 2011 in current dollars.
4 Internal Rate of Return of Projected Dividends

Staff Restatement of Ray L. Jones Rebuttal Table 1
Recent Returns on Equity Granted by the Commission

Line	Company	Docket No.	Decision No.	Date	Authorized ROE	Capital Structure Debt	Capital Structure Equity
1	Southwest Gas Corp.[1]	G-01551A-10-0458	72723	6-Jan-12	9.50%	47.70%	52.30%
2	Bermuda Water Co.	W-01812A-10-0521	72892	17-Feb-12	8.82%	0.00%	100.00%
3	Chino Meadows II Water Co.[2]	W-02370A-10-0519	72896	21-Feb-12	9.60%	0.00%	100.00%
4	Indiada Water Co.	W-02031A-10-0168, et al.	73091	5-Apr-12	10.00%	0.00%	100.00%
5	Arizona Water Co. - Western Group	W-01445A-10-0517	73144	1-May-12	10.00%	49.03%	50.97%
6	Arizona-American Water Co.	W-01303A-10-0448	73145	1-May-12	10.60%	58.73%	41.27%
7	UNS Gas Corp.[3]	G-04204A-11-0158	73142	1-May-12	9.75%	49.18%	50.82%
8	Arizona Public Service Co.	E-01345A-11-0224	73183	24-May-12	10.00%	46.06%	53.94%
9	Pima Utility Co.	W-02199A-11-0329, et al.	73573	21-Nov-12	9.49%	35.36%	64.64%
10	Arizona Water Co. - Eastern Group	W-01445A-11-0310	73736	20-Feb-13	10.55%	49.03%	50.97%
11							
12	**Average**				9.83%	33.51%	66.49%
13							
14	**New River Utility Co.**					0.00%	100.00%

[1] As per the terms of a Settlement agreement, Decision No. 72723 authorized Southwest Gas an ROE of 9.5%, plus a mechanism for full revenue decoupling.
[2] As per Decision No 72896, Chino Meadows II was authorized an ROE of 9.6%, not 10.0% as represented by Mr. Jones (Jones Rebuttal, Table 1, p. 29).
[3] As per Decision No 73142, UNS Gas was authorized an ROE of 9.75%, not 9.5% as represented by Mr. Jones (Jones Rebuttal, Table 1, p. 29).

EXHIBIT
A-17
ADMITTED

BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

BOB STUMP, Chairman
GARY PIERCE
BRENDA BURNS
SUSAN BITTER SMITH
BOB BURNS

IN THE MATTER OF THE APPLICATION OF CHAPARRAL CITY WATER COMPANY FOR A DETERMINATION OF THE CURRENT FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASE IN ITS RATES AND CHARGES BASED THEREON	DOCKET NO. W-02113A-13-_____

DIRECT TESTIMONY
OF
IAN C. CROOKS, P.E.
ON BEHALF OF
CHAPARRAL CITY WATER COMPANY
APRIL 26, 2013

DIRECT TESTIMONY
OF
IAN C. CROOKS, P.E.
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CHAPARRAL CITY WATER COMPANY
APRIL 26, 2013

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EXECUTIVE SUMMARY

Mr. Crooks testifies as follows:

The Company is requesting that the following post test year projects be included in rate base:

- Well #10 Arsenic Removal Facility
- Reservoir #2 Structural Improvements
- Comprehensive Planning Study
- Telephone System Upgrade
- Distribution System Improvements
- Shea Water Treatment Plant Filter Media
- Tools and Equipment
- Vehicles
- 2013 Recurring Projects - Distribution
- 2013 Recurring Projects – Facilities

The Company is requesting a SIB mechanism to, in part, reduce the harmful impact of regulatory lag between rate cases, to reduce the frequency of future rate cases, to reduce the magnitude of increase in customer bills following rate cases and to maintain and improve the performance of CCWC's water system for customers. The Company is seeking the SIB mechanism to address replacements of valves, service lines, meters and hydrants.

I INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND TELEPHONE NUMBER.

A. My name is Ian C. Crooks. My business address is 2355 W. Pinnacle Peak Road, Phoenix, AZ 85027. My business phone is 623-445-2404.

Q. IN WHAT CAPACITY AND BY WHOM ARE YOU EMPLOYED?

A. I am employed by EPCOR Water USA, Inc. ("EWUS") as the Director of Engineering.

Q. PLEASE DESCRIBE YOUR PRIMARY RESPONSIBILITIES FOR THE COMPANY.

A. I am responsible for the planning, engineering, and project delivery of EWUS's capital program along with the developer services and GIS functional areas. I am responsible for first identifying and prioritizing projects into the budgeting process, then providing oversight of the design and construction contracts to ensure compliance with assigned budget and schedule.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE AND EDUCATION.

A. I joined EWUS through the acquisition of Arizona-American Water in 2012. Prior to that, I was employed by Arizona-American Water beginning in 2006. My role with the Company since November 2011 is as Director of Engineering where I am responsible for the duties described above for the Company's Arizona and New Mexico regulated utility operations. My role from January 2010 to November 2011 was as Director of Operations for Central Division where I was responsible for the operation and business performance of the Company's water and wastewater services in the Sun City, Sun City West, and Agua Fria Districts. Prior to becoming the Director of Operations, I held the position of

Engineering Manager of Developer Services for the Company. I was responsible for the agreements, design, planning, construction, budgeting, and compliance related to development activity for all state operations. Prior to this role, I held the position of Sr. Operations Engineer of Developer Services.

Prior to joining the Arizona-American, I was employed from 2005 to 2006 by NVR, Inc., a national homebuilder, as the Land Development Manager. Before that, from about 1996 to 2005 I was employed by Pennsylvania-American Water Company in Coatesville, Pennsylvania district as Sr. Engineer and for some duration as IT Manager. Prior to that, from 1994 to 1996, I was Engineering Supervisor for Erie City Water Authority. Lastly, my career in the water industry began in 1994 as a water treatment plant operator for the City of Harrisburg Authority.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A. I am currently enrolled at Ottawa University pursuing a Master's Degree in Business Administration. I received a Bachelor of Science degree in Environmental Engineering from Pennsylvania State University in 1994. I have also completed various water-related technical courses that include water production and distribution, wastewater treatment, water distribution, water quality protection, cross-connection control, and water and wastewater management.

Q. ARE YOU A REGISTERED PROFESSIONAL ENGINEER OR CERTIFIED OPERATOR?

A. Yes. I am a registered Professional Engineer in the states of Arizona and Pennsylvania and certified in Arizona as a Grade 2 Water Treatment Plant Operator and Grade 2 Wastewater Collection System Operator.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A. Yes.

II PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS CASE?

A. Please see the executive summary of my direct testimony.

III POST-TEST YEAR CAPITAL PROJECTS

Q. IS THE COMPANY PROPOSING ANY POST-TEST YEAR PLANT ADDITIONS?

A. Yes. Chaparral City Water Company ("CCWC" or "Company") is proposing post-test year plant additions of $3,884,763, see Company witness Ms. Hubbard Exhibit Schedule B-2 ADJ SLH-1. All of the proposed additions are necessary investments for the Company to continue to provide its customers with quality water service. Each of these projects complies with the Commission's current requirements for inclusion of post-test year plant. Below is an explanation of each of the post-test year plant additions.

A Well #10 Arsenic Removal Facility – Project #170974

The Company has two sources of water supply. The primary source is the Central Arizona Project ("CAP") canal by means of a pump station and a five mile pipeline to the Shea Water Treatment Plant. The second source is groundwater from Well #10 and previously from Well #11, which is currently not in-service, see section C below. Renewable surface water from the Colorado River is the primary source of supply, with groundwater used during peak demand conditions. On January 22, 2001, the EPA adopted a new standard for arsenic in drinking water at 10 parts per billion (ppb), replacing the old standard of 50 ppb with system compliance date of January 23, 2006. Well #10 has arsenic concentrations up to 15 ppb.

In 2007, the Company made system modifications and implemented a temporary blending plan to allow water from Well #10 to be blended with treated surface water from the Shea Water Treatment Plant to achieve compliance with the Arsenic Rule. The plan was approved by Maricopa County Environmental Health Services as an interim measure until construction of an arsenic removal facility was completed, which is included as Exhibit ICC-1. The blending plan was approved as "interim" because blending at this facility is problematic. If the surface water supply is disrupted, then Well #10 cannot meet the arsenic requirements. Also, since there is no storage at this plant, the blend requires a looping of system water back to the plant to supply blend water. This looping of system water causes arsenic levels to concentrate over time and use of the blend becomes ineffective. This compromises the Company's ability to provide a safe water supply to its customers.

The risk of disruption to surface water supply could be caused by service disruption at the CAP canal, the Shea Water Treatment Plant, the CAP Pump Station, or the five mile transmission main. Loss of system supply would require that water use, especially in the summer, be curtailed drastically by our customers. If water use were not curtailed sufficiently, the reservoir and portions of the system would run dry within one day. This would require reporting loss of pressure and sanitary conditions to the Arizona Department of Environmental Quality, Maricopa County Department of Environmental Services, and the Arizona Corporation Commission.

The Arsenic Removal Facility at Well #10 provides benefits in both water quality and water reliability to the Company's customers. Before the well was treated for arsenic, there was no firm water supply; in the case that the surface water supply was interrupted, the well could also not operate due to blending requirements. Essentially, this project increased the firm water supply to 1700 GPM by eliminating the need to blend Well #10

water with the Shea Water Treatment Plant treated surface water source. Additionally, water from Well #10 will be used to assist in the reduction of total trihalomethane (TTHM) compounds, which typically are found in higher levels in surface water, therefore reducing future capital expenditures needed for compliance with TTHM regulations in the system.

The arsenic treatment facility improvements were based on the engineering design completed by the Company's consultant in 2011, which is included as Exhibit ICC-2. Arsenic treatment is accomplished using granular ferric hydroxide media in a two media vessel configuration. Construction of the facility began in 2012, and on January 22, 2013, MCESD issued an Approval to Commence Operations. Validation testing commenced on January 28, 2013, and MCESD gave approval to proceed with commissioning testing on February 5, 2013, allowing the well to be placed in-service at that time. The facility passed commission testing, and received final approval of construction from MCSED on April 5, 2013 (see permit included as Exhibit ICC-3). Final accounting for this project is expected to be completed in April 2013 at an estimated total project cost of $793,374.

B <u>Reservoir #2 Structural Improvements – Project #170970, 170975, 379070</u>

Reservoir #2 is the largest potable water storage tank in the CCWC water system at 1.5 million gallons and is the most critical reservoir to the overall system operation. Reservoir #2 feeds Zone 1 customers, as well as the three reservoirs in Zone 2, which then feed Zones 3, 4, and 5. The reservoir was inspected in two stages, first on February 27, 2012, and then on March 21-23, 2012. The inspection found that the reservoir was in need of extensive and immediate repairs. The inspection reports are included as Exhibits ICC-4 and Exhibit ICC-5

The inspection of Reservoir 2 found that the roof structural support needed rebuilding and that internal overflow weir was too small; these conditions could inhibit the flow out of the tank, potentially causing the roof to be pushed up and fail from the water pressure. The overflow piping and weir had rusted loose from the wall and a high probability of failure existed. Failure to rehabilitate and rebuild the tank would result in the tank failing and not being available for service. In addition, a failure of the tank could result in severe damage to Company and other downstream property. The loss of this tank would put all zones in the CCWC system at risk of running out of water. All other zones in the system rely on this tank directly or indirectly. The tank rehabilitation required rebuilding the structural integrity of the tank, repairing and replacing structure, replacing the undersized and failing overflow piping system, extending tank over flow pipe to drainage area, adding safety features to bring it into compliance with current regulations, removing chloride buildup on the interior steel walls and floor, and sand blasting and applying a new coating system to the tank. The majority of the improvements are completed. The external overflow piping from the reservoir to the adjacent wash was completed on April 5, 2013, after which the reservoir was disinfected, filled, and samples pulled for bacteriological and VOC testing. The reservoir was placed back in-service on April 10, 2013. Final accounting for this project is expected to be completed in April 2013 at an estimated total project cost of $595,860.

C <u>Comprehensive Planning Study – Project #170973, 270980, 270983</u>

The purpose of a comprehensive planning study (CPS) is to recommend capital improvement projects that are necessary in order to continue to provide safe, adequate and reliable water service. Recommended improvements will ensure that CCWC can continue to supply domestic, commercial, and industrial customer demand, and meet federal, state, and local regulatory requirements. Recommendations included in a

comprehensive planning study address improvements that contribute toward better quality and service to the Company's customers and provide a tool for the Company's management to assist in the long-term planning process and operation of the company. After EWUS acquired CCWC, it was important for the Company to complete a CPS to assess the system capabilities, vulnerabilities, and improvements. The CPS study examines in detail customer demand projections, sources of supply, water treatment facilities, water distribution, pumping facilities, storage, and water quality regulations.

As part of the Company's overall effort to complete a comprehensive planning study (CPS), an engineering investigation and testing of Well #11 was required to determine its condition, production capability and water quality in order to help determine options to bring back into service. The investigation and testing was conducted from August to September 2012 and the report was completed in March 2013. The investigation and testing found the well could produce about 2,500 gpm if improvements are made to the well casing, the pump and motor are replaced, and new electrical and control sub-systems are built. The arsenic level in this well was 9.5 ppb which is slightly below the arsenic MCL of 10 ppb. The results and report from the Well #11 investigation and testing will be incorporated into the Chaparral CPS effort in order to determine the best alternatives for Well #11 in context of the overall system operation now and in the future.

Final accounting for the CPS is expected to be completed in June 2013 at an estimated total project cost of $132,558.

D <u>Telephone System Upgrade (IPT Telephony) – Project #270981</u>

The Company recently commenced replacement of its existing legacy phone system at the CCWC Office with a new modern IP Telephony system that can better support the Company's business and customer service requirements. The work consists of deploying a Cisco IPT Phone system at the CCWC Office with unique numbers to each phone

station, a basic hunt group feature for the call center staff which will ring one or more phones simultaneously, and integration of the CCWC office with the existing EPCOR Water USA telephony network. The IPT Telephony project is expected to be completed and in-service by April 30, 2013. Final accounting for this project is expected to be completed in May 2013 at an estimated total project cost of $59,000.

E Distribution System Improvements – Project #270975

This a blanket RP work order number for distribution system improvements related to service lines. The amount in CWIP is for service line work completed in November and December of 2012. The project remained in CWIP after 2012 year-end because the Company was integrating CCWC into its business systems and processes and wanted adequate time to properly account for actual costs incurred. The final cost of the work completed was $53,577.

F Shea Water Treatment Plant Filter Media – Project #270976

The filter media was replaced in 2012 for one of the three contact and filter modules at the Shea Water Treatment Plant. The project is post-test year only because the work order for the project was not closed prior to the 2012 year-end, as the Company was integrating CCWC into its business systems and processes and wanted adequate time to properly account for actual costs incurred. The final cost of the project was $59,369.

G Tools and Equipment – Project #270982

This a blanket RP work order number for miscellaneous tools and equipment required for the CCWC operations. The amount in CWIP is for a new air conditioning unit and meter testing bench purchased and installed in November and December of 2012. The project remained in CWIP after 2012 year-end because the Company was integrating CCWC into

its business systems and processes and wanted adequate time to properly account for actual costs incurred. The final cost of the project was $31,777.

H Vehicles – Project #270988

This a blanket RP work order number for vehicle purchases required for the CCWC operations. The amount in CWIP is for a Club Car purchased for the meter reading in November 2012. The project remained in CWIP after 2012 year-end because the Company was integrating CCWC into its business systems and processes and wanted adequate time to properly account for actual costs incurred. The final cost of the project was $9,248.

I Shea Water Treatment Plant Improvements Phase 2 – Project #379071

The contact and filter modules at the Shea Water Treatment Plant use pneumatically operated valves along with numerous other supporting check and pressure relief valves ranging from 6" to 24" in diameter. These valves are critical to the operation of the plant since they all work together to allow for automatic initiation of backwashes, filter to waste, and production modes. The valves have reached the end of their useful lives and no longer operate effectively. Most of the valves are leaking air from the pneumatic operator. In 2012, the Company replaced 35 of the valves and by year-end 2013, the Company plans to replace the last remaining 33 valves in need of replacement as listed in the Exhibit ICC-6. The total project cost is estimated at $350,000.

J 2013 Recurring Projects – Distribution – Project #379101, 379104, 379107, 379670, 379671

Every year, the Company budgets to replace and repair aged infrastructure that is recurring in nature such as meters, services, valves, hydrants, mains, vehicles, tools and equipment. By year-end 2013, the Company plans to spend an estimated $1.14M

replacing services, meters, mains, valves, hydrants, and electrical systems. Many of these are the same type of projects that will be included in the future SIB Mechanism as discussed in my testimony below.

K 2013 Recurring Projects - Facilities – Project #379072

The Company budgets to replace and repair other assets identified by the Company's operations management team. The projects are to replace or improve existing infrastructure, typically the plant related assets. By year-end 2013, the Company plans to spend an estimated $0.65M on the projects identified in the table below.

Project Name	Estimated Cost
Shade Canopy over Blowers and Filter Trains at the Shea Plant	$50,000
Purchase Modular Trailer (admin bldg) Shea Plant	$50,000
Install VFDs on 2 HSP pumps	$40,000
Install Zone 1 Flow Meter	$60,000
Replace Well 10 8"and 10" flow meters	$18,000
Replace backwash flow meter	$6,000
TTHM Spray Aeration and rechlorination at Reservoir 5	$60,000
SCADA Shea Plant	$50,000
SCADA Reservoirs and Booster Stations	$170,000
Well 10 valve modification for series operation	$6,000
Replace Valve and 200' main at Saguaro and Palisades	$60,000
Replace, upsize and re-pipe 10 PRV's	$45,000
PRV vault improvements	$35,000
2013 RP Miscellaneous Projects Total Cost	**$650,000**

IV SYSTEM IMPROVEMENT BENEFITS MECHANISM

Q. IS THE COMPANY REQUESTING A SYSTEM IMPROVEMENT BENEFITS ("SIB") MECHANISM IN THIS CASE?

A. Yes, as described by Mr. Broderick, CCWC is requesting a SIB mechanism to, in part, reduce the harmful impact of regulatory lag between rate cases, to reduce the frequency of future rate cases, to reduce the magnitude of increase in customer bills following rate cases and to maintain and improve the performance of CCWC's water system for customers.

Q. IN WHICH DOCKET DID THE SPECIFICS OF THE SIB MECHANISM ARISE?

A. Currently, the specific details for that mechanism are set forth in a Settlement Agreement docketed on April 1, 2013 in Phase 2 of Arizona Water Company's Docket No. W-01145A-11-0310. EPCOR Water Arizona, Inc. intervened and participated in Phase 2 and was a signatory to the Settlement Agreement. CCWC also supports the Settlement Agreement.

Q. WHAT DOES THE SIB SETTLEMENT AGREEMENT REQUIRE CCWC TO PROVIDE THE COMMISSION IN CCWC'S NEW GENERAL RATE CASE?

A. In addition to making a request for the SIB mechanism, which CCWC is doing here, the Company must also provide a list of SIB eligible projects and an estimation of the capital costs for each project. As detailed in the Settlement Agreement, the Commission approved projects that are included in the surcharge must be completed and placed in service prior the applicable surcharge taking effect. However, a utility may seek approval from the Commission to add a project not on its approved list if circumstances require the Company to undertake such a project.

Q. IS THE COMPANY PROPOSING QUALIFYING PROJECTS FOR A SYSTEM IMPROVEMENT BENEFITS MECHANISM IN THIS CASE?

A. Yes, as further described in the Settlement Agreement SIB Table that is attached as Exhibit ICC-7. The Company is proposing capital projects related to the following categories for inclusion in a SIB Mechanism:

NARUC #	Description
331	T&D Mains and Valves
333	Services
334	Meters
335	Hydrants

As set forth in Section 6.4 of the Settlement Agreement in Docket No. W-01145A-11-0310, each of these types of plant is eligible to be included in a SIB Mechanism.

Q. WHAT WAS THE PREVIOUS 5-YEAR SPEND ON DISTRIBUTION SYSTEM REPLACEMENTS THAT TODAY WOULD QUALIFY FOR THE PROPOSED SIB MECHANISM?

A. Below is a Table IV-I of the prior 5-year capital spending that today would be eligible for the SIB Mechanism.

Table IV-I

	2008		2009		2010		2011		2012		TOTAL		AVERAGE	
	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST
SERVICES	155	$493,870	129	$393,038	134	$462,791	144	$639,078	128	$456,257	690	$2,445,034	138	$3,544
METERS	102	$8,670	79	$6,715	121	$10,285	137	$11,645	80	$6,800	519	$44,115	104	$85
HYDRANTS	18	$28,800	37	$59,200	19	$30,400	52	$83,200	45	$72,000	171	$273,600	34	$1,600
VALVES	0	$0	0	$0	0	$0	3	$25,854	4	$13,065	7	$38,919	4	$5,560
Total		$554,726		$473,765		$548,863		$774,194		$589,285		$2,940,833		

Q. WHAT ARE THE FORECASTED SYSTEM IMPROVEMENTS THE COMPANY IS PROPOSING TO COMPLETE UNDER THE SIB MECHANISM?

A. Table IV-II below summarizes the estimated project quantities and spending per category by year for the next five years. Detail project descriptions are shown on the SIB table 1 included as Exhibit ICC-7. The Company is proposing to invest $8.9M in system improvements over the next 5-years using the SIB Mechanism. The annual costs and counts are expected to fluctuate to some degree based on field conditions and business requirements during each year. The Company will submit updates as required by the Commission using the SIB annual worksheet for review by Commission Staff.

Table IV-2

	2014		2015		2016		2017		2018		TOTAL		AVERAGE	
	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST	UNITS	COST
SERVICES	250	$885,882	250	$885,882	250	$885,882	250	$885,882	250	$885,882	1250	$4,429,409	250	$3,544
METERS	1481	$290,390	1351	$286,035	1316	$248,085	1353	$281,970	1405	$267,485	6906	$1,373,965	1381	$199
HYDRANTS	50	$80,000	50	$80,000	50	$80,000	50	$80,000	50	$80,000	250	$400,000	50	$1,600
T&D VALVES	100	$555,986	100	$555,986	100	$555,986	100	$555,986	100	$555,986	500	$2,779,929	167	$5,560
Total		$1,812,258		$1,807,903		$1,769,953		$1,803,838		$1,789,353		$8,983,303		

Q. THE PROPOSED 5-YEAR INVESTMENT LEVEL IS MORE THAN THE PREVIOUS SPEND. PLEASE EXPLAIN THE REASON FOR THE INCREASE.

A. The prior owner of CCWC did not replace and maintain assets in the CCWC system at levels commensurate with industry standards; the assets were replaced on a reactive basis only after they failed. Water utility infrastructure, or any infrastructure for that matter, requires a continuous infrastructure replacement program as the assets age. Without a proper annual asset replacement program, the water system becomes inefficient, begins to fail, and replacement costs are only pushed down the road at ever increasing costs. EWUS is committed to delivering high quality and reliable water service to its customers. This commitment requires higher levels of infrastructure replacement in the CCWC

system than has occurred in the past. As set forth below, the Company will proactively approach necessary replacements and improvements to the distribution system.

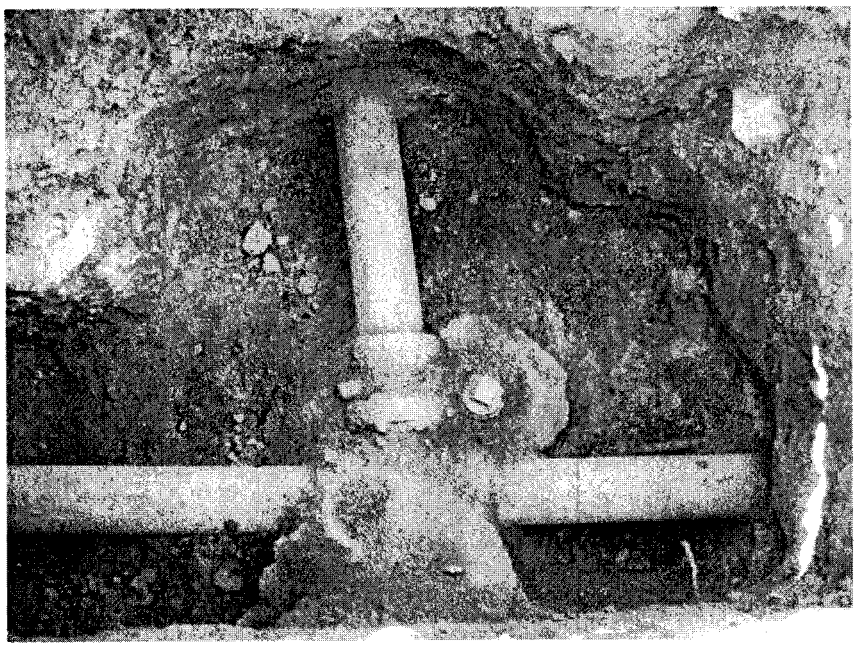
Q. CAN YOU PLEASE PROVIDE SOME BACKGROUND ON THE CATEGORIES OF PROJECTS PROPOSED FOR THE SIB MECHANISM?

A. Certainly. I'll describe the projects by NARUC account.

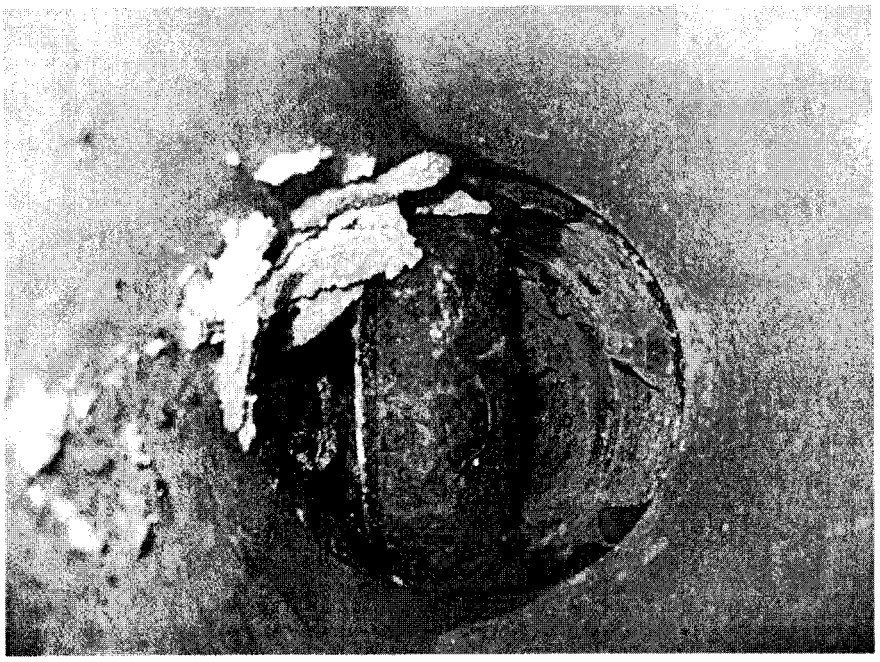
A <u>331 – Transmission & Distribution (T&D) Valves</u>

The CCWC system contains an estimated 4,600 distribution system valves. The majority of the valves in the system are butterfly valves. When the majority of Fountain Hills was developed, the owner of the water system (also the land developer) installed butterfly valves because they cost less than gate valves, which are better suited for installation in distribution systems. The operating gate of a butterfly valve stays in the flow stream at all times, with gears rotating the gate from open, parallel to the flow, to closed, perpendicular to flow. In addition, since CCWC system's butterfly valves are older, the operating gate is cast iron with no rubberized epoxy coating like current valves. Therefore, the combination of the operating gate located in the flow stream and exposed iron creates an ideal environment for the accumulation of tuberculation on the valve components, which seizes the valve in the open or closed position or prevents the valve from operating properly. Below are pictures of butterfly valves replaced in the CCWC system.

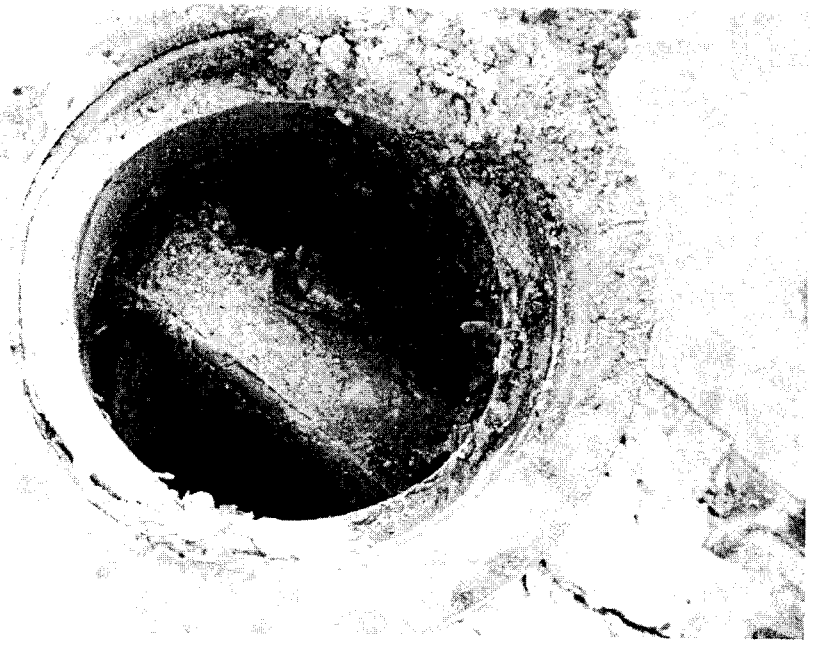
Picture A-1 – Butterfly in CCWC system showing operating nut



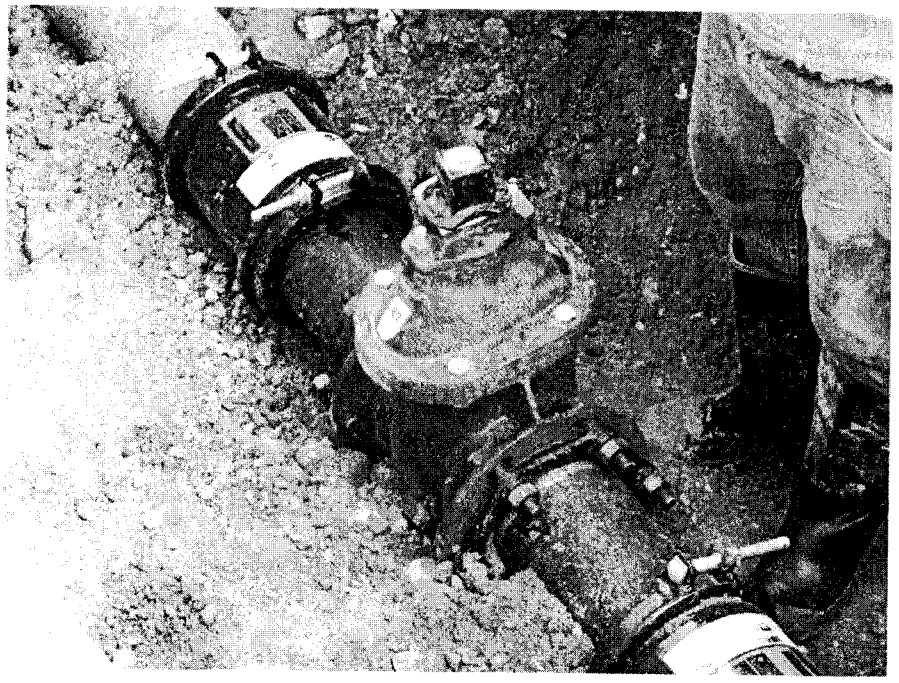
Picture A-2 – Accumulation of tuberculation on the butterfly operating gate



Picture A-3 – Accumulation of tuberculation on the butterfly operating gate



Picture A-4 – New gate valve installed to replace of an old butterfly valve



Historically, the valves were tested and replaced if found broken in coordination with the Town of Fountain Hills street improvement program, during main break repairs, or fire hydrant maintenance. However, the Company has found from its operational experience of the system that more valves need to be replaced and tested on an annual basis to improve system reliability and reduce customer service disruptions. The Company plans to systematically test and replace valves by first targeting the oldest sections of the system and system critical valves. The Company is targeting to replace 100 valves per year under this plan. The investment over five years for valve replacements is estimated at $2.8M.

B 333 – Services

Again, when the developer built the majority of Fountain Hills, it installed single service lines to serve two properties. A single service was installed from the water main to a common property boundary at the curb line where a manifold was installed splitting the service line to feed two residential meters. So, throughout the system, the majority of the branched services are ¾" services supplying two ¾" meters, and in some cases, 1" services supplying two 1" meters. This causes problems with pressure and flow for the customers, and for the Company to terminate or shut-off service to a single customer. In addition, the service line material that was installed at the time was polyethylene service line pipe ("poly pipe"). The use of this material and installation are not appropriate for the CCWC system. The soil conditions and high system pressures cause a higher level of service line failures and leaks which contribute to unnecessary water loss and service disruption. The water from many service line leaks never surface because of the porous soil and can go undetected for a long time. Below is a picture of 2" service line that

recently failed in the CCWC system. Note the indentation on the left where a rock wore away the poly, eventually causing the line to split left to right.

Picture B-1 – Black poly service line material failure

Over the past five years, 690 service lines failed at a cost of $2.5M, see Table IV-1 above, which averages 138 service line failures per year. The Company replaces the single branched service lines with two new ¾" or 1" copper services, *i.e.*, one service line for each metered customer. The CCWC system has approximately 12,600 residential accounts classified as ¾" and 1" meters, and of those, the Company estimates that 3,050 dual-feed poly pipe services remain, which translates to the installation of 6,100 new single-feed copper services. The Company's plan going forward is to increase the rate of replacement and target a replacement rate of 250 services per year at an annual cost of about $0.9 million per year, for a total of $4.4 million over five years.

C <u>334 – Meters</u>

The CCWC system has approximately 13,700 total customer accounts, residential and commercial. The table included as Exhibit ICC-8 shows all the meter reading routes in the system with the number of meters per route, the average meter age, quantity of meters by size, and estimated cost to replace the meters (material and labor). As shown on the table, the weighted average meter age in the system is 10.2 years. The past 5-year average

annual meter replacement rate was 104 meters per year, which at that rate will take over a 130 years to replace the meters in the system. The Arizona Department of Water Resources' (ADWR) Modified Non-Per Capita Conservation Program (MNPCCP) is one of the regulatory programs for large municipal water providers in Active Management Areas. It is a performance-based program (Best Management Practice or "BMP") that participating water providers use to implement water conservation measures that result in water use efficiency in their service areas. ADWR's BMP for meter replacement and testing requires 2" and smaller meters be replaced at a minimum of every 15 years. This meter replacement schedule or better is in-line with industry standards and is authorized by the Commission in EWUS' other districts. Now that EWUS owns the CCWC system, the Company intends to bring the CCWC system into the ADWR meter replacement and testing BMP program compliance. Towards that effort, the Company is proposing to substantially increase the annual meter replacement program. The meter replacement program will target meter routes with the oldest meters first. The replacement program also contributes towards the Company's efforts to reduce CCWC system non-revenue water (NRW) to below ten percent. In addition, nearly all the existing meters in the CCWC system are manual read meters which are grossly inefficient to read compared to today's automatic meter reading (AMR) radio meters. EWUS replaces all meters in its operating companies with the same common AMR meter and software platform, which increases meter reading efficiency, customer service, and employee safety. As shown in the table above, the Company plans to replace 1,381 meters per year on average over the next five-years and expects to continue at this pace until the all meters in the system are replaced. The meter replacement cost over five years is estimated at $1.3M.

D 335 – Hydrants

The CCWC system contains approximately 1,600 fire hydrants. During the past five years, an average of 34 hydrants per year were replaced when they were found not to be operational by the Company or the Town of Fountain Hills Fire Department. The Company is proposing to increase that slightly to 50 hydrants per year in order to catch-up on hydrants needing replacement. In addition, repair parts for most of the fire hydrants in the CCWC system are no longer available because of their age, manufacturer and model--Dresser Model 300 and 500. Further, complicating the replacement of fire hydrants is the fact that the fire hydrant lateral valves are the butterfly type valves that I described above. The butterfly valves either do not work at all or provide limited shut-down of the lateral feeding the hydrant which means the hydrant cannot be replaced until a shut-down is achieved. Therefore, a shut-down of the water mains feeding the area is required, which causes service disruption to many customers. The fire hydrant replacement cost over five years is estimated at $0.4M.

Q. HAVE YOU INCLUDED THE REQUIRED SIB TABLE I IN SPECIFIC SUPPORT OF THE PLANS DESCRIBE ABOVE?

A. Yes, it is included as Exhibit ICC-7. I ask the Commission to approve that table in its decision in this rate case as required by the SIB Settlement Agreement.

Q. HOW DOES CCWC SATISFY THE SIB ELIGIBILITY REQUIREMENTS OF SECTION 6.3 OF THE SIB SETTLEMENT AGREEMENT?

A. The asset replacements as described above and in Exhibit ICC-7, meet the SIB eligibility requirements of Section 6.3.1 and 6.3.3.

The distribution system valves qualify under 6.3.3.1 as a result of "a documented increasing level of repairs to, or failures of, a plant asset justifying its replacement prior

to reaching the end of its useful life (e.g. black poly pipe)" because of the high level of valve failures in the CCWC system. The valve failures also contribute to the Company's non-account water as it takes longer to stop water loss during water main breaks and other repairs, which qualifies the valve replacements under Section 6.3.1 as a result of the Company's non-revenue water exceeding 10 percent.

The service lines qualify under the same 6.3.3.1 provision because the service lines are black poly lines and are failing at a high rate; and also under Section 6.3.1 because the service line failures and undiscovered leaks are contributing to the non-revenue water exceeding 10 percent.

The replacements of manual read meters will contribute towards the Company's efforts to reduce CCWC non-revenue water to below 10 percent and will increase meter reading efficiency, customer service, and employee safety. The meter replacements qualify for the SIB mechanism under Section 6.3.3.2 as "meter replacements for systems that have implemented a meter testing and maintenance program in compliance with AAC R14-2-408.E.". In addition, these replacements also qualify under Section 6.3.1 as a result of the Company's nonrevenue water exceeding 10 percent.

The fire hydrants lines qualify under the same 6.3.3.1 provision because the fire hydrants are failing at a high rate and are not maintainable because parts are no longer available. The fire hydrants also qualify under 6.3.1 because the replacements add to the Company's non-revenue water percent since the hydrants cannot be repaired but must be replaced, which requires the water mains to be shut-down and drained causing water to be wasted.

Q. WHAT FURTHER SUPPORT WILL THE COMPANY PROVIDE FOR INCLUSION OF THESE REPLACEMENTS IN THE SIB MECHANISM?

A. As part of the CPS process described above, the Company will also prepare an Engineering Planning Study supporting the need for replacement of these assets. The Company will also work with Staff during the pendency of this rate case to provide additional data and analysis supporting the need to replace these assets.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY IN THIS CASE?

A. Yes.

EXHIBIT ICC-1

Maricopa County

Environmental Services

Water and Waste Management Division

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hoenix, AZ 85004
hone: (602) 506-6666
ax: (602) 506-6925
DD: 602 506 6704
ww.maricopa.gov/envsvc

Date: October 11, 2007
Owner: Chaparral City Water Co.

MCESD Project #: 2011550
SYSTEM ID #: 04-07-017

CERTIFICATE OF APPROVAL OF BLENDING PLAN WITH STIPULATIONS

PROJECT DESCRIPTION: Chaparral City Water Company, Well 10 Blending Plan. The plan includes blending Well 10 groundwater (Zone 1) with treated surface water from Zone 2. The plan is an interim measure until CCWC installs an arsenic treatment facility at the well site. Well 10 has a maximum historic arsenic concentration of 15 ppb. The well production capacity is 1700 gpm at 70 psi. Zone 2 water is produced at the Shea Surface Water Treatment Plant. It has a maximum historical arsenic concentration of 4 ppb and the pressure in Zone 2 averages 130 psi.

Implementation of the blending plan requires upgrades that will be submitted to the Department for approval as a separate project. The upgrades include: installing an orifice plate into the Well 10 discharge piping to reduce the capacity of the well to 1,090 gpm; adding an 8-inch pressure reducing/sustaining valve, flow meter, and electronic flow control valve to the supply pipeline from Zone 2; and adding a 10-inch static mixer downstream from the blend point. If the blending flow from Zone 2 cannot be maintained at the required set point, a PLC will automatically shut down Well 10.

LOCATION: Fountain Hills, Maricopa County
16402 E: Palisades
ADWR #55-640786
T3N, R6E, SEC 15

OWNER: Attention: Michael Thompson
Chaparral City Water Company
12021 N. Panorama Drive
Fountain Hills, AZ 85268

Pursuant to AAC Title 18, Chapter 4, Article 5, or Chapter 9, Article 8, and Maricopa County Environmental Health Code Chapters II and V, approval to operate the above-described blending system as represented in the approved plan documents on file with the Maricopa County Environmental Services Department (MCESD) is hereby given subject to the following provisions:

1. This certificate is based on submission of an Application for Approval of Blending Plan prepared by the Owner on 10/1/07, a Technical Memorandum Well 10 Blending Plan prepared by Thomas Galeziewski, P.E. (#21284) on 5/3/07, and supporting documents.
2. This approval is void unless the facilities needed for blending receive a Certificate of Approval of Construction from the Department.
3. Laboratory samples shall be taken on a weekly basis during the first month of blending operation to verify that the blending meets the arsenic MCL. The interlock that automatically shuts down Well 10 if the blending flow from Zone 2 cannot be maintained shall be tested. Report the test results to the Department by letter within ten days of receipt of the laboratory results.
4. No other wells or water sources shall be connected to the blending facilities without Department approval. Any change in the approved blending plan that may affect capacity, quality, flow, location or operational performance of the blending system shall be submitted to this Department for review, and Department approval shall be obtained prior to undertaking the work affected by the change.
5. If the capacity (flow rate) of the well changes or if the arsenic concentration in the water increases, the Department shall be immediately notified and a revised blending plan may be needed.
6. Failure to comply with all conditions of this certificate shall result in forfeiture and cancellation of this permit and may require all contaminated wells to be shut down.
7. MCESD reserves the right to modify the Approval of Blending Plan pursuant to future state regulations.

8. A minimum Grade 2 water distribution system operator, certified by the Arizona Department of Environmental Quality, shall oversee the efficient operation and maintenance of the facilities.
9. The Owner shall send the Department monthly reports that include the results of its routine inspections and the description of any abnormal operating conditions experienced during the month. Submit the reports to MCESD on approved forms within 10 days of the end of the month.
10. Representative(s) of MCESD shall be allowed access to the site to conduct inspections of this facility during reasonable hours.
11. The facility shall meet all applicable sampling and reporting requirements under the Safe Drinking Water Act Rule, Title 18, Chapter 4 of the Arizona Administrative Code, and subsequent amendments.
12. All materials or products that come into contact with drinking water or with water treatment chemicals shall conform to ANSI/NSF 60 and 61 in accordance with AAC R18-4-119.
13. Other than for the approved purpose of blending, no connection may exist between potable water and non-potable water.

If this blending plan has not started within one year of the date of approval this approval will be void and a written extension of time shall be required.

WATER AND WASTE MANAGEMENT DIVISION

By Kenneth P. James, P.E. for
Dale Bodiya, PE
Manager, MCESD Treatment Plant Program

Plan Approval Date: **October 11, 2007**

cc: ADEQ Drinking Water Section, 1110 W. Washington Street, Phoenix, AZ 85003
Utilities Division - Engineering Section, Arizona Corporation Commission, 1200 W. Washington Phoenix, AZ 85007-2996
Kevin Chadwick, PE, Manager, MCESD, Water and Waste Management Division
John Kolman, RS, MCESD, Manager, Drinking Water Program
Tom Galeziewski, PE, HDR, 3200 E. Camelback Rd., Suite #350, Phoenix, AZ 85018-2311
MCESD File

EXHIBIT ICC -2

EPCOR USA
CHAPARRAL CITY WATER COMPANY

Stantec

Engineering Report for Well No. 10 Arsenic Treatment

(Submission for Approval)

Prepared For:
EPCOR USA
CHAPARRAL CITY WATER COMPANY

12021 North Panorama Drive
Fountain Hills, AZ 85268

Prepared By:
Stantec Consulting Services Inc

8211 S 48th Street
Phoenix, AZ 85044
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February 2012

Executive Summary

This report reviewed the existing conditions of the Well No. 10 facility, examined the well water quality data, established arsenic treatment system requirements, evaluated three arsenic treatment proposals, made recommendations for the arsenic treatment system design, included engineering design calculations and performed a preliminary cost estimate. The following is a summary of the project:

Design Parameters	Total system design flow:	1,700 gpm
	Arsenic treatment average flow:	850 gpm
	Average bypass flow:	850 gpm
	Design well water As level:	12 µg/l
	Design blended As levels:	Target=8µg/l, max=9 µg/l
	Well pump discharge pressure:	70 psi to 75 psi
	Distribution network static pressure:	60 psi to 65 psi
Treatment System Configuration and Operation Modes	System configuration:	Treatment/bypass/blend
	No of vessels:	Two
	Operation mode:	manual
	Vessel configuration:	Parallel operation
Pretreatment Requirements	pH adjustment:	Not recommended
	Pre-filtration:	Not recommended
	Pre-chlorination:	yes
Recommended Treatment System and reasons for the recommendation	Severn Trent Model EAS-4710 with E33 media • The most generous scope of supply, but the lowest proposed equipment cost ($354,675) among the three treatment systems. • The treatment system is the least affected by pH. It has the highest design BV with or without pH adjustment. • The lowest O&M cost with or without pH adjustment. It has the lowest media replacement cost. • It doesn't require pre-filtration as other two systems do. • It has the lowest headloss through the media. This will allow the existing well pump to meet the pressure needs without a booster pump.	
Other major recommendations	Additional testing for As (III), total As, Iron, pH, silica, manganese, vanadium, phosphate, sulfite and selenium	
	Routine pH and arsenic monitoring	
	SCADA monitoring of flow meters and gauges	
	Replace the existing Cl_2 analyzer with a new reagentless Hach analyzer including pH monitoring capability.	
Estimated Costs	Preliminary opinion of construction cost:	$1.21 million
	Annual media O&M cost:	$128,472
	1,000 gallon water treatment cost:	$0.34
	Media replacement/disposal cost:	$205/cubic feet

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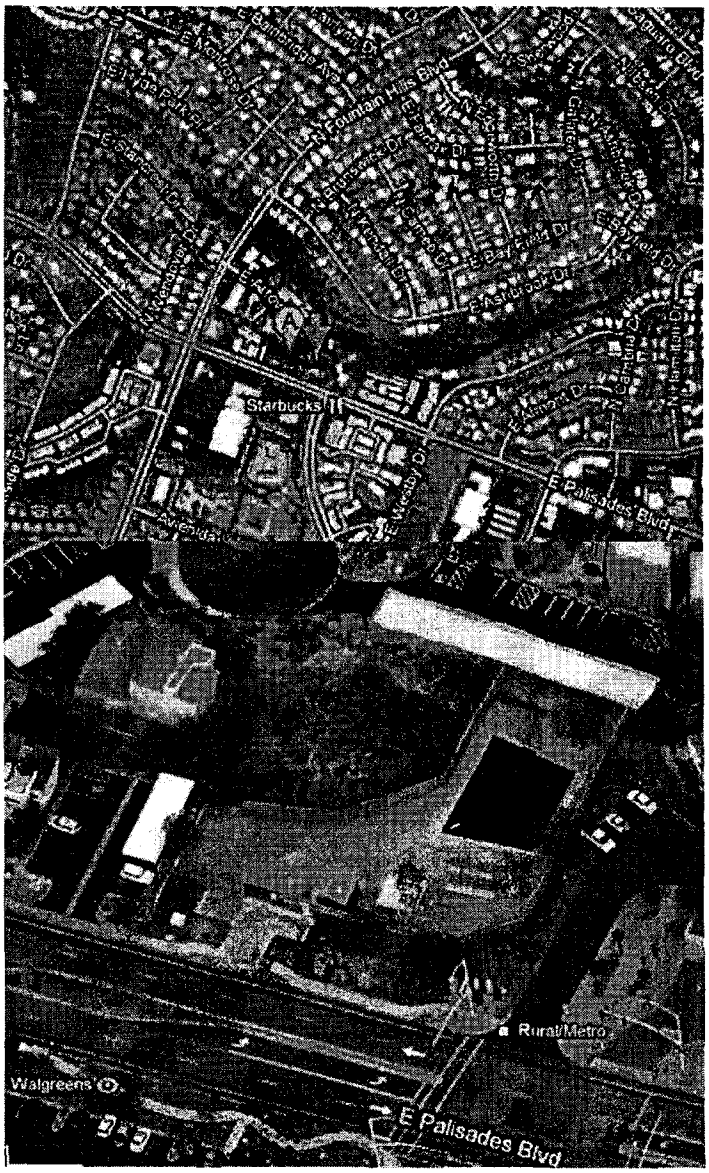
1.0 Project Background

1.1 EXISTING CONDITION

1.1.1 Project location

The Chaparral City Water Company's existing Well No. 10 in the Town of Fountain Hills, Arizona is also known as Palisades Plant or Palisades well. This well is located immediately north of East Palisades Blvd, and approximately 1,000 feet east of Fountain Hills Blvd. The well facility is secured by concrete block walls on all sides.



1.1.2 Existing well and well pump condition

The annual report filed with the Arizona Corporation Commission in 2010 indicated this well was drilled in 1972. The well's ADWR (Arizona Department of Water Resources) ID number is 55-604786. The well is 738 feet deep with 450 feet 20-inch diameter casing and 288 feet 16-inch diameter casing. Existing documents show that the well has a 350 horsepower 7-stage vertical turbine pump. The pump (Model 14M160) was manufactured by Ingersoll Dresser. It was reported that this well has a production rate of 1,885 gpm or 2.71 MGD. The Ingersoll Dresser pump curve indicated a pump capacity of 1,900 gpm at 88 feet bowl head per stage or total 616 feet head (see **Appendix A**).

A 2007 HDR Technical Memorandum for the existing blending system design stated that well pump has a capacity of 1,700 gpm flow at approximately 70 psi discharge pressure.

Recent discussions with the operator indicated that the existing pump"s operating flow without the present blending system is about 1,700 gpm at approximately 70 psi to 75 psi discharge head.

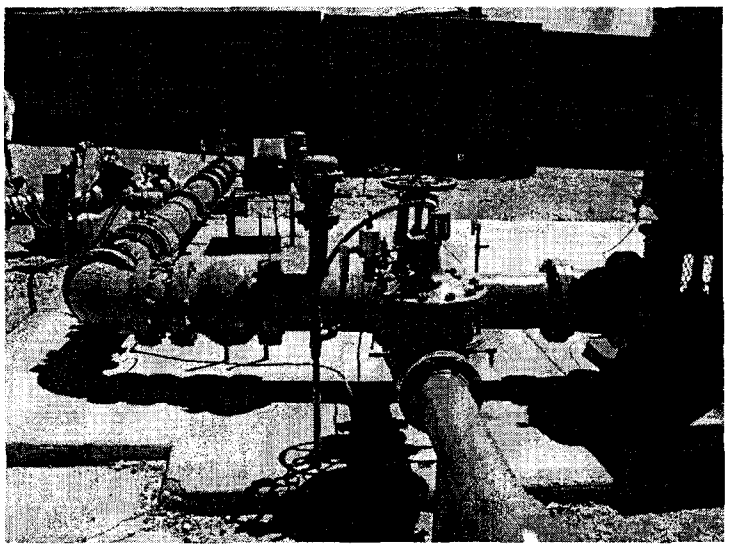
The distribution network"s static pressure at the connection with the pump discharge varies from 60 psi to 65 psi based on pressure gauge readings.

1.1.3 Well water arsenic levels

The existing blending system designed by HDR in 2007 was based on 15 µg/l arsenic in the well water, the maximum testing value from 1999 to 2006. The average value of the 1999 to 2006 arsenic test data was 12.6 µg/l. However, testing data from 2008 to 2011 showed that arsenic level in the water from the well varied from 2.2 µg/l to 11 µg/l, with an average value of 7.7 µg/l. The recent years testing data suggested that arsenic level in the well water is trending down.

1.1.4 The existing blending system

The existing blending system for the Well 10 was installed in 2007 to ensure consistent compliance with arsenic limit. Water from Zone 2 supplied by the 15 MGD Shea Water Treatment Plant (WTP) is used to blend with the well water. The blended water is supplied to Zone 1 distribution network.



The source water of the Shea WTP is central Arizona Project (CAP) water from Lake Pleasant and Colorado River. According to the 2007 HDR Technical Memorandum, arsenic concentrations in the CAP water varied from 2 µg/l to 4 µg/l with an average value of 2.8 µg /l based on testing data from 2001 to 2005. The blending system design was based on 4 µg/l arsenic in the Shea WTP water.

The blending system was designed to use 1,310 gpm flow through a 8" pipe line from Zone 2 for blending with 1,090 gpm flow from the 10" well discharge line into Zone 1. The blending is accomplished by a 10" Komax static mixer located immediately downstream of the two flow streams junction point. The well pump capacity is restricted with a Rosemount Model 1495 orifice plate installed on the discharge pipe. Other devices used for blending operation and control include flow meters, pressure reducing and sustaining valve, electronic control valves, and pressure gauges.

1.1.5 Other existing facilities and operation control

In addition to the well, well pumps and the blending system, currently the well water supply system also includes a liquid sodium hypochlorite feed system, chlorine residual monitoring system, a well water pump to waste system, a lined pond for receiving the pump to waste stream, a radio SCADA system, and a building for housing the disinfection system and the chlorine residual analyzer. The lined pond is drained by gravity via a 4" pipe to a sanitary sewer system operated by Fountain Hills Sanitary District. The pond provides temporary storage for flows exceeding the drain capacity.

Currently Well No. 10 is operated only at high demand times for supplementing water supply to the distribution system. Operation of the well pump and the blending system is controlled by a PLC. When system demand requires water supply from the well, the well pump and the blending system is automatically started based on level signals from Reservoir No.1 in Zone 1 of the distribution system. The system will automatically shut down based on a high system pressure signal from Reservoir No.1. The system can also be remotely started or shut down by operators via the SCADA system.

1.2 PROJECT PURPOSE AND OBJECTIVES

The current blending practice of mitigating arsenic levels runs the risk of either not complying with the MCL or not supplying any water should the CAP water supply be interrupted. Therefore, EPCOR USA Chaparral City Water Company (CCWC) wanted to replace the existing blending system with an arsenic treatment system for ensuring consistent compliance with arsenic limit requirement at all times. This will also allow CCWC to increase water supply from this well to its maximum operating capacity of approximately 1,700 gpm and increase overall system water supply reliability. Additional benefit includes potential reduction of TTHM levels in the water supply system because Shea WTP treats CAP water that has high TOC levels.

CCWC also requested Stantec to investigate the feasibility of using chloramines for disinfection at Shea WTP for reducing TTHM formation. If chloramines disinfection is feasible for implementing at Shea WTP, chloramines disinfection must also be used at Well No. 10 for system consistency. But study and design of the chloramination is out of the scope of this project.

Additionally, the operator has requested to replace the existing ProMinent chlorine residual analyzer with Hach chlorine analyzer because the ProMinent analyzer does not work well and is difficult to calibrate.

2.0 Arsenic Water Chemistry and Regulation

2.1 ARSENIC BACKGROUND AND HEALTH EFFECT

Arsenic is found in the environment in rocks, soil, water, air, and in biota. Natural concentrations of arsenic in soil typically range from 0.1 to 40 mg/kg. Higher concentrations are found in some igneous and sedimentary rocks, particularly in iron and manganese ores. Other natural sources of arsenic include volcanism and forest fires. Through erosion, dissolution, and weathering, arsenic can be released to ground water or surface water.

Arsenic is also released from a variety of human activities. Almost 8 million pounds of arsenic and arsenic containing compounds were released into the environment in 1997. Arsenic is found in the preservative chromated copper arsenate (CCA) used to preserve wood. 90% of all arsenic consumed in the U.S. is used in the production of CCA. Arsenic can be a by-product of mining and smelting, and is of particular concern in old waste disposal sites (e.g., mine tailings). In agriculture, organic arsenic is a constituent of organic herbicides and is a constituent of feed additive for poultry and swine. Other industries and processes which use or release arsenic:

- Manufacturing of metals and alloys;
- Petroleum refining;
- Pharmaceutical, glass, and cement manufacturing;
- Production of lead-acid batteries;
- Production of a particular semiconductor used in computers and other electronic applications;
- Burning of fuels and wastes; and
- Pulp and paper production.

Arsenic can combine with other elements to form inorganic and organic arsenicals. In general, inorganic derivatives are regarded as more toxic than the organic forms. While food contains both inorganic and organic arsenicals, primarily inorganic forms are present in water. Inorganic arsenic, considered to be the more toxic form, is found in ground water, surface water, and many foods. Chronic exposure to high levels of inorganic arsenic in drinking water has been found to result in a variety of adverse health effects, including skin and internal cancers and cardiovascular and neurological effects. Exposures to organic forms of arsenic also occur through ingestion of food and metabolism of ingested inorganic arsenic. Experimental data on the effects of organic forms of arsenic are not as well characterized as those for inorganic arsenic, and thus are the subject for future research. Although people may be exposed to arsenic from industrial sources, as noted above, consumption of food and water is the major source of arsenic exposure for the majority of U.S. citizens.

Arsenic's carcinogenic role was noted over 100 years ago (NCI, 1999) and has been studied ever since. The Agency has classified arsenic as a Class A human carcinogen, "based on sufficient evidence from human data. Increased lung cancer mortality was observed in multiple human populations exposed primarily through inhalation. Also, increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder) and an increased incidence of skin cancer were observed in populations consuming drinking water high in inorganic arsenic."

A 1999 NRC report on arsenic states that "epidemiological studies ... clearly show associations of arsenic with several internal cancers at exposure concentrations of several hundred micrograms per liter of drinking water." Ten epidemiological studies covering eight organ systems have quantitative data for risk assessment (NRC, 1999, Table 4-1). The organ systems where cancers in humans have been identified include skin, bladder, lung, kidney, nasal cavity, liver, and prostate. Table 10-6 of the same NRC report provides risk parameters for three cancers: bladder, lung, and liver cancer. Considering all cancers in aggregate, the NRC states that "considering the data on bladder and lung cancer in both sexes noted in the studies ... a similar approach for all cancers could easily result in a combined cancer risk on the order of 1 in 100" (at the current MCL of 50 µg/L).

In addition to cancer, NRC (1999) reported that arsenic exposures have been linked to other adverse health effects. These include thickening of the skin, effects on the nervous system such as tingling and loss of feeling in limbs, hearing impairment, effects on the heart and circulatory system, diabetes, developmental effects, and effects on the gastrointestinal system and liver.

2.2 GENERAL ARSENIC CHEMISTRY

The valence and species of inorganic arsenic are dependent on the oxidation-reduction conditions and the pH of the water. As a general rule of thumb, the reduced, trivalent form [As(III)] normally is found in groundwater (assuming anaerobic conditions) and the oxidized, pentavalent form [As(V)] is found in surface water (assuming aerobic conditions); this rule does not always hold true for groundwater, where both forms have been found together in the same water source. Arsenate exists in four forms in aqueous solution, depending on pH: H_3AsO^4, $H_2AsO_4^-$, $HAsO_4^{2-}$, and AsO_4^{3-}. Similarly, arsenite exists in five forms: $H_4AsO_3^+$, H_3AsO_3, $H_2AsO_3^-$, $HAsO_3^{2-}$, and AsO_3^{3-}. As shown in Figure 2-1, which contains solubility diagrams for As(III) and As(V), ionic forms of arsenate dominate at pH>3, while arsenite is neutral at pH<9 and ionic at pH>9.

Unlike other toxic trace metals whose solubility tend to decrease as pH increases, most oxyanions, including arsenate (As^{5+}), tend to become more soluble as pH increases. When most other metals become insoluble within the neutral pH range, arsenic is soluble at even near-neutral pH in relatively high concentrations. That is why groundwater is easily contaminated with arsenic and other oxyanions.

As(III) exists in most natural water as $As(OH)_3$ and is more mobile than As(V), $H(As)O_4$,because it is less strongly absorbed on most mineral surfaces than the negatively charged As(V), thus it is commonly more prevalent in water. Unfortunately, studies have shown that most treatment technologies are more effective in removing As(V) as opposed to As(III). Therefore, the majority of the treatment options require a pretreatment process to convert As(III) to As(V).

Treatment technologies with adsorptive media for arsenic removal often function by adsorbing arsenate onto granules. Therefore, the valence and species of soluble arsenic are very important in evaluating arsenic removal.

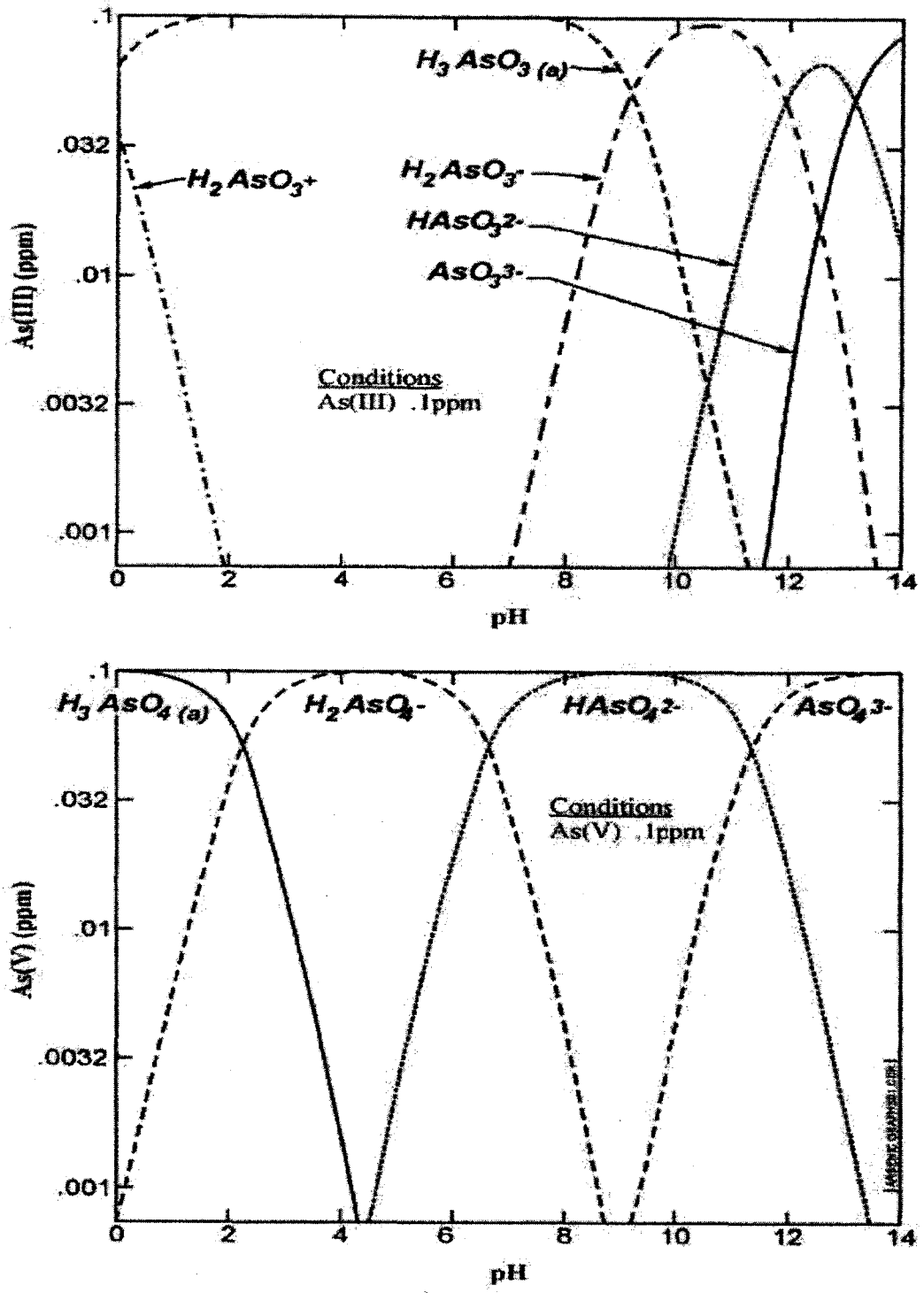


Figure 2.1: Concentrations – pH Diagrams For As(III) and As (V)

2.3 DRINKING WATER ARSENIC REGULATION BACKGROUND

In 1924, The U.S. Public Health Service established an arsenic drinking water standard for interstate water carriers of 0.05 mg/l. The 1974 Safe Drinking Water Act (SDWA) mandates that the U.S. Environmental Protection Agency (EPA) identify and regulate drinking water contaminants that may have adverse human health effects and that are known or anticipated to occur in public water supply systems. On December 24, 1975 under the SDWA authority, EPA established a maximum contaminant level (MCL) for arsenic at 0.05 mg/L. Amended in 1996, the SDWA required that EPA develop an arsenic research strategy and publish a proposal to revise the arsenic MCL by January 2000. On January 18, 2001, EPA finalized the arsenic MCL at 0.01 mg/L (EPA, 2001). In order to clarify the implementation of the original rule, EPA revised the rule text on March 25, 2003, to express the MCL as 0.010 mg/L (10 µg/L or ppb) (EPA, 2003). The final rule requires all community and non-transient, non-community water systems to comply with the new standard by January 23, 2006. To satisfy the arsenic monitoring requirements, all surface water systems must complete monitoring for the revised arsenic MCL by December 31, 2006, and all groundwater systems must complete monitoring for the revised MCL by December 31, 2007 (40CFR 141.23(c)(1)).

3.0 Water Quality Data and Design Requirements

3.1 WELL NO. 10 WATER QUALITY DATA

A grab sample was taken on June 22, 2011 from Well No.10 water for a comprehensive water quality analysis. The analytical parameters were determined based on requests from arsenic treatment system suppliers (Siemens, Severn Trent and Layne Christensen). Table 3.1 is a summary of the test results. Table 3.2 is a summary of available arsenic test data from 2008 to present.

Table 3.1 – Water Quality Testing Results Summary

Testing Parameters	Testing Values	Units
Alkalinity as CaCO3	180	mg/l
Bicarbonate alkalinity as CaCO3	180	mg/l
Total Arsenic	0.011	mg/l
Arsenic (3)	0	µg/l
Arsenic (5)	7.2	µg/l
Barium	0.062	mg/l
Calcium	50	mg/l
Chloride	58	mg/l
Conductivity	560	umhos/cm
Fluoride	1.9	mg/l
Total Hardness	170	mg/l
Iron, Total	0.28	mg/l
Magnesium	11	mg/l
Manganese	0.011	mg/l
Nitrate	1.5	mg/l
pH (field test)	7.8	s.u.
Selenium	0.0059	mg/l
Silica	46	mg/l
Sodium	48	mg/l
Sulfate	28	mg/l
Sulfite	ND	
TDS	370	mg/l
Temperature (field test)	31.6	°C
TOC	ND	
Turbidity	1.5	NTU
Antimony	ND	

Testing Parameters	Testing Values	Units
Copper	0.02	mg/l
Cadmium	ND	
Chromium (VI)	0.0069	mg/l
Chromium (III)	ND	
Color	<1	
DOC	ND	
Iron, Dissolved	ND	
Lead	0.0026	mg/l
Mercury	ND	
Phosphate	ND	
Molybdenum	ND	
Vanadium	0.015	mg/l
Strontium	0.43	mg/l
Zinc	ND	
Nickel	ND	

Table 3.2 – Arsenic Monitoring Data Summary

Sampling Date	Testing Values	Units
7/23/2008	0.0022	mg/l
8/6/2008	0.011	mg/l
1/28/2009	0.0069	mg/l
2/4/2009	0.008	mg/l
3/18/2009	0.0071	mg/l
4/15/2009	0.0077	mg/l
7/1/2009	0.0068	mg/l
10/7/2009	0.0059	mg/l
1/27/2010	0.0097	mg/l
4/20/2010	0.0062	mg/l
2010 annual report	0.0093	mg/l
6/22/2011	0.011	mg/l
Minimum	**0.0022**	**mg/l**
Maximum	**0.011**	**mg/l**
Average	**0.0077**	**mg/l**

The test data in Table 3.1 show that silica in the well water was very high, exceeded typical desired value of 20 mg/l or less for arsenic treatment with iron based media. Turbidity of the well water was also higher than desired maximum value of 0.5 NTU. This means that pre-filtration

may be required for some arsenic treatment systems for reducing headloss through the iron based media. While the pH of the well water is within the typical range of the arsenic treatment system, it is on the high side, and less desirable.

Data in Table 3.2 shows that arsenic level in the well water varied from 0.0022 mg/l to 0.011 mg/l or 2.2 µg/l to 11 µg/l. The maximum arsenic level is slightly above the MCL value of 10 µg/l. A vast majority of these arsenic values were below the MCL value.

However, since test results from grab samples represent only the water quality at the time the sample was taken, actual operating performance of the arsenic treatment system designed in accordance with these water quality test data may differ from the design performance if water quality varies. Additional tests should be performed before operation begins or during initial operation period so that appropriate adjustment can be made for optimal performance and consistent arsenic limit compliance.

3.2 DESIGN PARAMETERS AND REQUIREMENTS

3.2.1 Design Parameters

Arsenic treatment equipment vendors have different concerns regarding the constituents in the well water. Vendors are required to prepare their design proposal based on the data presented in Table 3.1 since that is the only available water quality data for Well No. 10.

The only exception is total arsenic design value. The proposed total arsenic design value is 12 µg/l with consideration of a 1 µg/l safety factor based on the maximum detection level of 11 µg/l.

3.2.2 Design Requirements

3.2.2.1 Design Flow

The total system design flow requirement is 1,700 gpm. This flow is determined based on maximum operating flow of the existing well pump and well capacity. The arsenic treatment average flow is 850 gpm or 50% of the system design flow.

3.2.2.2 Well Pump Discharge Pressure

The arsenic treatment system shall be designed based on 70 psi to 75 psi discharge pressure of the well pump.

3.2.2.3 Treatment Configuration and Targeted Arsenic Level

The arsenic treatment shall be a treatment/bypass/blending system. With this configuration, portion of the flow will be treated and the remaining portion will be bypassed. The treated flow and the bypassed flow will then be blended to achieve a targeted arsenic level of 8 µg/l, and maximum 9 µg/l prior to entry into the water supply distribution network.

The benefits of this treatment configuration include low operating cost, extended media life, small size of the media vessel and low capital cost.

The arsenic treatment system shall consist of minimum two equally sized parallel operating units. The media vessel shall be rated at least 75 psi pressure.

3.2.2.4 Adsorption Media

The proposed media is iron based adsorptive granular media. This type of media is the most widely used product for arsenic removal at present. This media adsorbs arsenic and other heavy metals in the water. Once the media depleted its adsorption capacity, it is removed from the vessels for replacement or regeneration. The exhausted media shall be able to pass a toxicity characteristic leaching procedure (TCLP) test and be classified as non-hazardous waste for landfill disposal.

3.2.2.5 Bypass and Treatment Flows

The arsenic removal capability of the adsorption media gradually decreases throughout its useful life. New virgin media can remove almost all arsenic in the water to non-detect level, while near breakthrough old media removes little arsenic near the end of their life. Therefore, bypass flows and treatment flows can be varied depending on the media condition and still meet the targeted blended arsenic level if so desired.

For this project, in the initial operating stage approximately 66% of the 1,700 gpm total flow, or 1,130 gpm can be bypassed while 34% of the flow or 570 gpm must be treated with arsenic removal system based on a targeted arsenic level of 8 µg/l in the blended water, 0.05 µg/l arsenic in treated water and 12 µg/l arsenic in untreated well water. As operation goes on, the adsorptive capacity of the media will be depleted, hence arsenic level in the treated water will rise. In order to maintain the targeted arsenic level of 8 µg/l in the blended water, bypass flow must decrease and treatment flow must increase. Assuming 6 µg/l is the maximum allowable arsenic level in the treated flow prior to breakthrough, no more 34% of total flow or 570 gpm is allowed to bypass for achieving the 8 µg/l arsenic level in the blended water. Therefore, 66% of the total flow or 1,130 gpm must be treated (see **Appendix B**).

Though the proposed arsenic treatment configuration is capable of treating a wide range flow depending on media condition and actual operating arsenic level in the well water, extensive testing and flow adjustment are required to ensure consistent compliance. In practice, the operator may want to simplify the operation and limit the hydraulic loading to each vessel at design average flow condition. For average flow operation condition, 50% of the system flow or 850 gpm will be bypassed and the remaining 850 gpm will be treated through the arsenic removal system. Under this operation scenario, the blended water will contain approximately 6 µg/l arsenic with fresh new media for treatment, and 9 µg/l arsenic when the media is required for replacement based on the design condition of 12 µg/l arsenic in the well water and the media will be replaced when arsenic in the treated water reaches 6 µg/l (see **Appendix B**).

3.2.2.6 One Unit out of Service Condition

In the event that one of two units is out of service, and if the remaining unit operates at 425 gpm flow, the resulting arsenic level in the blended water will be 9 µg/l with new virgin media in the vessels, and 9.8 µg/l with media that is approaching the end of its useful life based on 12 µg/l in the well water and 6 µg/l in the treated water from the arsenic treatment unit.

It is apparent from the above that if one of the treatment units is not available for operation for some reasons, the remaining unit should either be operated at maximum flow or no water should be supplied from this well for precaution purpose.

The above estimates are based on 12 µg/l arsenic in the untreated well water. Obviously if arsenic level in the well water is lower than 12 µg/l as shown by the testing data, more flow can be bypassed, and less flow will require treatment. **Appendix B** of this report included calculations for 11 µg/l arsenic level condition.

4.0 Arsenic Treatment Technologies

4.1 ARSENIC REMOVAL OPTIONS REVIEW

There are two types of options from which affected water systems may choose in order to comply with the arsenic standard: non-treatment and treatment options. The "non-treatment" options consist of blending treated water, modifying water sources (e.g. changing the well's screen interval), consolidating water sources, or replacing water sources with new sources or consolidating with another water system.

The "treatment" options consist of technologies that can be implemented at a source, point of entry (POE), or even Point of Use (POU) to reduce existing arsenic levels. Treatment technology options include reverse osmosis (RO), activated alumina (AA), ion exchange (IE), lime softening (LS), coagulation/filtration, oxidation/filtration, electrodialysis, adsorptive media system, and subterranean arsenic removal (SAR) or In-situ treatment system. EPA has classified some of these treatment technologies as Best Available Technologies (BAT).

There are advantages and limitations with each of these treatment technologies. But adsorptive media system appears to be the most used technology at present because the adsorptive media system can be supplied as a skid mounted pre-fabricated unit, it is typically a single step process, simple and easy to operate, and generally has the lowest capital cost requirement.

With the adsorption process, the water with high levels of arsenic passes through a bed of adsorption media for treatment. As water flows through the media bed, the arsenic in the water is collected on the active sites within the media and it is sem-permanently held there. The performance of the adsorptive media is monitored by routine arsenic test on the treated water. The rate of change of the arsenic concentration in the treated water is generally slow and predictable. This allows easy forecasting and scheduling media replacement. It also means that laboratory tests for arsenic are not frequently required due to this predictability. However, the media requires periodic backwashing to prevent potential channeling, and remove sediments, precipitates and other suspended solids captured and retained in the media.

The most widely used commercial adsorptive media include activated alumina (AA), ferric based granular products, and granular titanium dioxide. Many other products, such as iron filings, lanthanum compounds, Kimberlite tailings, alumina manganese oxide, and zeolites are also found to have effective arsenic removal capabilities. But the most popular media appears to be the ferric based granular products. Siemens, Severn Trent, and Layne Christensen are leading equipment manufacturers that use ferric based granular products for arsenic removal.

Because of its dominance in the arsenic removal market, we have proposed to use ferric based arsenic treatment system for the Well No. 10 water project. We have requested and received design information and proposals respectively from Siemens, Severn Trent and Layne Christensen. This chapter includes comparisons among the three (3) arsenic treatment systems.

4.2 PILOT STUDIES

Because of complicated water chemistry and their effects on the performance are difficult to quantify, pilot study was often used for determining which product is the most effective for arsenic treatment for water from a particular well. This is especially true during the early years when arsenic removal just began. In the early period of time, vendors, engineers and regulatory agencies didn't have much experience with arsenic removal. Therefore, pilot study was often necessary to demonstrate the proposed treatment system's effectiveness and compile required design criteria for sizing the treatment system.

While pilot study is a still desired valuable tool for designing the arsenic treatment system, it is also an expensive and time-consuming process. With years of experience with arsenic treatment, vendor's engineers today have much better understanding of what effects constituents in the water will have on the performance of the arsenic treatment. Therefore, engineers today are able to successfully and confidently design the arsenic treatment system based on water quality data without necessarily conducting a pilot study.

Of the three vendors we contacted for this project, none of them has requested to conduct a pilot study for providing a proposal. But all of them have requested water chemistry data for preparing their proposals.

We also discussed with the regulatory agency engineer regarding this project and the proposed vendors. The regulatory agency engineer has indicated that pilot study is not required for regulatory approval of this project. Therefore, we do not recommend any pilot study for this project based on the above discussions.

4.3 FERRIC ADSORBENT ARSENIC TREATMENT SYSTEM EVALUATIONS

Even though the media used by Siemens, Severn Trent and Layne Christensen are all ferric based adsorptive products, they are proprietary products with different characteristics and requirements. Siemens' media is called granular ferric hydroxide (GFH®). Severn Trent's media is granular ferric oxide, known as Bayoxide® E33, developed by Bayer A.G. Layne Christensen's media is hydrous iron oxide, a hybrid resin bead, known as LayneRT™.

4.3.1 Water Chemistry Test Requirements

In addition to arsenic, the ferric based media also adsorb other metals, phosphate and other constituents in the well water. Therefore, the adsorption of arsenic on to media is affected by well water chemistry. But the effects of the constituents on the media's adsorption are different for each media because each media's unique properties. Some constituents that affect the performance are common and the effects are quantifiable. These constituents must be taken into account with the system designs. Therefore, all three manufacturers have requested detailed water analysis. However, due to each media's unique properties and system design features, the three manufacturers have different water quality analysis requirements. The following table presents constituent test requirements from the manufacturers:

Table 4.1: Water Quality Test Requirements

Constituents	Siemens Requirements	Severn Trent Requirements	Layne Christensen Requirements	Notes
Arsenic (III)	Yes	Yes	Yes	
Arsenic (V)	Yes	Yes	Yes	
Arsenite	Yes	Yes	Yes	
Arsenate	Yes	Yes	Yes	
Arsenic (total)	Yes	Yes	Yes	
Alkalinity	Yes			
Antimony	Yes	Yes		
Barium	Yes			
Calcium	Yes			
Cadmium	Yes			
Chloride	Yes			
Conductivity	Yes			
Chromium (III/VI)	Yes			
Copper	Yes			
Color	Yes			
DOC	Yes			
DOM	Yes			
Fluoride	Yes			
Hardness (total)	Yes	Yes	Yes	
Iron, dissolved	Yes	Yes	Yes	Siemens requires <0.2 ppm
Iron, total	Yes	Yes	Yes	Siemens requires <0.2 ppm
Lead	Yes			
Manganese	Yes	Yes	Yes	Siemens requires <0.05 ppm
Magnesium	Yes			
Mercury	Yes			
Molybdenum	Yes			
Nitrate	Yes			
Nickel	Yes	Yes		
Oxygen	Yes			Siemens requires >0.5 ppm.
Phosphate	Yes	Yes	Yes	Layne Christensen required 100 ppb detection limit. Severn Trent desires <0.5ppm. Siemens requires<0.05 ppm.
pH	Yes	Yes	Yes	Severn Trent wanted pH to be 6.0 to 8.0. Siemens" operating range is 5.5 to 9.0

Selenium	Yes	Yes		
Silica	Yes	Yes	Yes	Siemens requires <20 ppm
Sodium	Yes			
sulfate	Yes			
Sulfite	Yes	Yes		
Strontium	Yes			
Temperature	Yes			
TDS	Yes			
TOC	Yes			
Turbidity	Yes			
Vanadium	Yes	Yes	Yes	
Zinc	Yes			

The above table shows that arsenic, hardness, iron, manganese, phosphate, pH, silica and vanadium are the most critical water quality data for all three arsenic treatment systems. Siemens have the most extensive water quality testing requirements, which may indicate that Siemens" media are more sensitive and its performance is more likely to be affected by water chemistry variations.

4.3.2 Physical and Chemical Properties of the Media

The media from the three manufacturers have different physical and chemical properties. Table 4.2 is a comparison of physical and chemical properties of the three arsenic sorbents.

Table 4.2: Physical and Chemical Properties of the Adsorptive Media

Properties	Manufacturers		
	Siemens	**Severn Trent**	**Layne Christensen**
Matrix/active ingredient	$Fe(OH)_3$ and β-FeOOH	Iron oxide	Hydrous iron oxide
Physical form	Granular, micro porous	granular	Hybrid resin bead
Color	Dark brown to black	yellow	brown
Bulk density (lbs/cf)	71.8 lbs/cf	29 lbs/cf	50 lbs/cf
Moisture content (%)	45%	20% max	55 to 62%
Grain size (mm)	0.3 to 2 mm	<0.5mm, 20% max >2 mm, 5% max. 1.0 to 1.4 mm	0.3 to 1.2 mm
Adsorption density (g/kg)	Up to 60, wet weight	3.6	
Backwash requirement	Yes	Yes	No
Arsenic residuals (fines)	Yes	Yes	No
Regenerable	No	No	Yes
Disposal requirement	landfill	landfill	Landfill

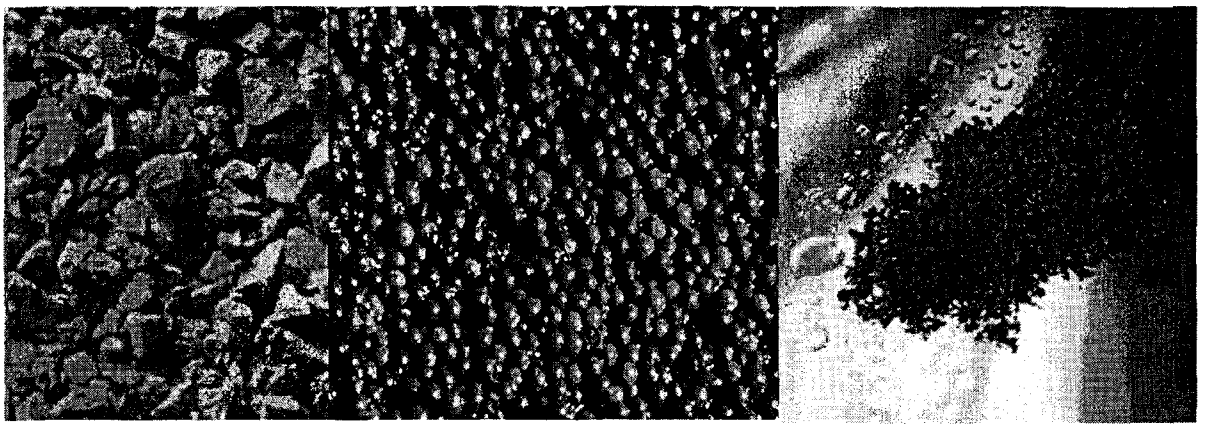


Figure 4.1: Left to Right: Severn Trent Media, Layne Christensen Media & Siemens Media

4.3.3 The Treatment System Design Comparisons

All three arsenic treatment systems are a fixed bed adsorption system that uses the iron-based media to adsorb dissolved arsenic in water. When the media reaches its adsorption capacity, it will be removed from the vessels and replaced with new media if the media is not regenerable. The spent non-regenerable media will be hauled away to a landfill for disposal after passing the TCLP test. For regenerable spent media, it will be hauled to a central facility for regeneration, then hauled back for refilling the vessel. But eventually the regenerable media also must be disposed of in landfill after approximately 5 regeneration cycles.

Since arsenic levels in the Well No. 10 water is relatively low (<25 µg/l), it is proposed that arsenic treatment system consists of a treatment/bypass/blending configuration. The bypass will be accomplished with flow control valves and flow meters for flow monitoring and control.

Generally, a standard arsenic treatment system consists of two or more pressure vessels with factory- installed internals for distribution and collection of effluent and backwash flows. The media vessels configuration is typically placed in series operation if 90% arsenic reduction across the system is consistently required. If the required percentage reduction is less than 90%, then parallel design is often used. Since Well No. 10 water contains relatively low arsenic, and arsenic reduction requirement is low. Therefore, a parallel 2-vessel configuration is proposed for the Well No. 10 arsenic treatment system.

Table 4.3 is a comparison of the three (3) arsenic treatment system designs.

Table 4.3: Arsenic System Design Comparisons

Properties	Manufacturers		
	Siemens	Severn Trent	Layne Christensen
Equipment model	GFH 114P GA	EAS-4710	PES120
Treatment configuration	Full flow treatment or Treatment/bypass/blend	Treatment/bypass/blend	Treatment/bypass/blend Run one vessel at a

			time
Number of vessels	3 vessels for FFT 2 vessels for TBB	2	2
Vessel configuration (series or parallel)	Parallel	Parallel	Parallel
Vessel pressure rating (psi)	100	75	75
Vessel dimensions (height, diameter)	144" dia	120" dia x 60" straight shell height	120" dia x 64" straight shell height
Vessel materials	Carbon steel	Carbon steel	Carbon steel
Media volume (cubic ft)	377cf/vessel	267 cf/vessel	250 cf/vessel
Media depth (ft)	3.33	3.4	3.18
EBCT at design flow (minutes)	5.0/5.16	4.7	2.2
Hydraulic loading rate (gpm/sq ft)	5.0/4.83	5.4	10.83
Design peak flow to each vessel (gpm)	567/365	425	1244
Design average flow to each vessel (gpm)	567/365	425	850
Backwash flow rate (gpm)	904	750	N/A
Backwash loading rate (gpm/sq ft)	8	9.5	N/A
Backwash duration (minutes)	10	12	N/A
Optimal operating pH	7.0	7 to 7.5	6.5 to 7.2
Backwash frequency	Every 4- 6 weeks	Once every 1 to 4 months	N/A
Design BV Capacity	55,000 w/o pH adjustment/vessel, and 110,000 with pH adjustment,	94,000/vessel w/o pH adjustment 128,000/vessel w/pH adjustment	68,000/vessel w/o pH adjustment 100,000/vessel w pH adjustment
Treated water/cf media at design BV (gal)	411,400 w/o pH adjustment 822,800 w/pH adjustment	703,120 w/o pH adjustment 957440 w/pH adjustment	508,640 w/o pH adjustment 748,000 w/pH adjustment
Design BV effluent arsenic basis	8 µg/l	8 µg/l	8 µg/l
Headloss with clean media (psi)	3	2	5.10

Headloss when backwash is required (psi)	7.5	4	N/A
Media replacement method	Fill the media thru a manway into the vessel by a crane or forklift and removed by vacuum truck	Fill the media thru a manway into the vessel by a crane or forklift and removed by vacuum truck	Slurry pumping
Media regeneration recovery rate (%)	N/A	N/A	95%, add 5% virgin media
Operation Mode (auto/manual)	manual	manual	manual
Testing and Monitoring Parameters and Frequency Requirements	More frequent monitoring near the end life cycle of the media	Testing Arsenic once per month until effluent As is 5 ppb, then test As every 2 weeks to breakthrough	Quarterly. Arsenic, iron, manganese, phosphate, silica and pH.
Pre-treatment requirement	Pre-filtration with bag filter, chlorination, optional pH adjustment	Chlorination	Pre-filtration with bag filter, optional pH adjustment
Post-treatment requirement	none	None	None
Capital Cost	$783,000 for 3 vessels $495,000 for 2 vessels	$354,675 w/o pH adjustment $380,000 w/ H_2SO_4 pH adjustment $537,150 w/ CO_2 pH adjustment	$445,750 w/o pH adjustment $470,050 with pH adjustment
5-year guaranteed media replacement/disposal or regeneration cost ($/cf)	$216	$205	$160 ($280 for virgin media)
Annual media /chemical cost based on design flow	3-vessel w/o pH adjustment:$462,704 3-vessel with pH adjustment:$241,324 2-vessel w/o pH adjustment:$198,418 2-vessel with pH adjustment:$109,181	$128,472 w/o pH adjustment $94,347 w/pH adjustment	$162,866 w/o pH adjustment $132,818 with pH adjustment
Treated Water Cost per 1000 gal	3-vessel w/o pH adjustment:$1.0 3-vessel with pH adjustment:$0.30	$0.34 w/o pH adjustment $0.18 w/pH adjustment	$0.64 w/o pH adjustment $0.36 w/ pH adjustment

	2-vessel w/o pH adjustment:$0.64 2-vessel with pH adjustment:$0.20		
Per GPM Design Flow Capital Cost	3-vessel w/o pH adjustment:$461 3-vessel with pH adjustment:$475 2-vessel w/o pH adjustment:$582 2-vessel with pH adjustment:$611	$417 w/o pH adjustment $446 w/pH adjustment	$524 w/o pH adjustment $553 w/ pH adjustment

4.3.3.1 Treatment Configurations

We have requested the arsenic treatment system configuration to consist of treatment, bypass and blend with parallel operating vessels since the arsenic levels in the well water are barely above MCL. All three vendors have agreed with this approach by proposing a 2 parallel vessels system. But Siemens also proposed a full flow treatment option with 3 parallel vessels. We do not agree with the full flow treatment approach because it is not cost effective based on arsenic levels in the well water. The full flow treatment option has high capital and operating costs.

Though the Layne Christensen"s system is also a parallel system, their engineer stated that their system does not need to run both vessels at the same time for meeting the design requirements. Instead, they wanted to run one vessel a time because of their high design loading. This operating approach offers the advantage of having a standby vessel all time except when one vessel is taken out of service for media regeneration.

4.3.3.2 Operation Mode

All three manufacturers have proposed manual operation for the arsenic treatment system. However, if pH adjustment is included, the chemical feed system will be automated operation. We have discussed with the vendors specifically regarding automated operation. None of them think that automated operation is needed for this arsenic treatment system. On contrary, they all believe that automation will make the system more complicated in addition to high capital cost requirement. They all stated that almost no other systems that are similar to this project have automatic operation.

4.3.3.3 Pre-treatment and Post-treatment Requirements

Pre-treatment requirements typically include chlorination, sediment filtration and pH adjustment depending on well water quality and media characteristics. Although all of the three vendors claimed that their media is able to remove both As (III) and As (V), the As (III) removal efficiency is always low. For this reason, chlorination is often used to oxidize As (III) to As (V). Additionally, pre-chlorination also controls iron bacteria growth in the vessel media.

However, water quality test data showed that there is no As(III) in the well 10 water. Therefore, pre-chlorination for oxidation purpose was not required by any of the three vendors.

The Layne Christensen arsenic treatment system requires a pre-filtration system to remove sediments in the well water because their system does not have a backwashing system. Without this pre-filtration system, there will be high headloss through their media. Siemens also desired to have a pre-filtration system because of less desired high turbidity concern. Severn Trent is the only vendor that does not require a pre-filtration system.

The well water"s pH of 7.8 is within the acceptable range of the three vendors. But the pH is on the high side. Therefore, the capacities of the treatment systems are lower without pH adjustment. Siemens has estimated that their treatment system"s bed volume (BV) is 50,000 to 55,000 without pH adjustment. But the BV can be increased to 110,000 if pH is adjusted to around 7.0. Layne Christensen wanted to reduce pH to 7.2 and increase their design BV from 68,000 to 100,000. Severn Trent claimed that their treatment system will perform well enough without pH adjustment, and pH adjustment is not needed. If pH is adjusted, Severn Trent"s design BV will be 128,000, a modest increase from 94,000 without pH adjustment.

The proposed pH adjustment chemicals include sulfuric acid and carbon dioxide. The chemical feed system will be interlocked with the well pump and modulated based on flow rate and well water pH. Therefore, the pH adjustment system operation will be automated if pH adjustment is included.

Though the pH adjustment system will be an automatic operation, there will be needs for chemical storage, handling and system maintenance. While sulfuric acid pH adjustment system has a low capital cost requirement (approximately $30,000), the sulfuric acid chemical is a very dangerous material and requires extreme care for handling. The carbon dioxide is a safer chemical, but the feed system requires approximately $200,000 capital cost to install. The safety concern, maintenance requirement and high capital cost are other reasons that Severn Trent didn"t recommend pH adjustment system for their arsenic treatment system.

4.3.3.4 Vessel Designs and Accessory Supplies

Both Seven Trent and Layne Christensen"s vessels are designed for 75 psi rated pressure. This pressure rating is the same as the expected maximum discharge pressure of the well pump. Siemens" vessels are designed for 100 psi rated pressure.

Siemens" vessels are 11 feet in diameter, the largest among the 3 vendors. Therefore, the Siemens system requires the largest footprint. Both Severn Trent and Layne Christensen have proposed 10 feet diameter vessels. Their footprints are also very similar in size.

Siemens" scope of supply is very limited. In addition to the vessels, media and accessories within the vessel, other supplies include valves for inlet, backwash, drain, and media fill and removal only. Pre-filtration bag filter and pH adjustment system are optional items.

Layne Christensen offered moderate scope of supplies. In addition to vessels, media and accessories within the vessels, their supplies also include a bag filter, a propeller flow meter, 3

pressure gauges and one pressure differential indicator, inlet/outlet valves, drain valve, media fill/removal valves, inlet water distribution, backwash water collection header and lateral system, interconnection piping between vendor supplied units, and a piping support rack. pH adjustment system is an optional supply item.

Severn Trent has the most generous scope of supply, including vessels, media, an influent flow meter for each vessel, a pressure gauge for each vessel, differential pressure switches, bypass flow meter, valves for inlet, backwash, bypass, drain, media fill/removal, inlet header, outlet piping, backwash header and collection, and a piping rack.

See **Appendix C, D**, and **E** for detailed proposal scope of supplies.

4.3.3.5 Design Media Volume and EBCT

Siemens" design requires the largest media volume, which generally means high media replacement cost, and less capacity on unit volume basis. Layne Christensen"s design has the smallest media volume. Severn Trent"s media volume is slightly larger than Layne Christensen.

Siemens and Severn Trent have the similar EBCT, approximately 5 minutes. This offers the advantage that if one of them is installed, any of the three vendor"s media can be used in the vessels. This has in fact occurred for some existing arsenic treatment systems because the original design media didn"t perform well as expected for some reasons.

Layne Christensen"s design EBCT is 2 minutes. The disadvantage of this EBCT design is that only Layne Christensen"s media can be used in their vessels assuming design flow stays the same.

4.3.3.6 Hydraulic Loading Rates

The Layne Christensen"s treatment system has the highest hydraulic loading rate. This is because Layne Christensen"s media is a hybrid resin bead that can withstand high loading rate without breaking up. On the other hand, both Siemens and Seven Trent"s media are relatively fragile granular materials, and subject to breaking up into small pieces at high loading rates.

The high hydraulic loading rate of the Layne Christensen system enables it to operate only one vessel at a time.

4.3.3.7 Backwashing and rinsing

Both Siemens" and Severn Trent"s arsenic treatment system require backwashing. The backwashing operation serves two purposes. The primary purpose is to "fluff" or stratify the media since as water passes through the media, the media can compact and cause channeling. The fluffing will allow even flow across the media section. The secondary purpose is to wash out any fines and sediments that may be intercepted by the media. The accumulated fines and sediments will block passage ways and increase headloss through the vessel if they not

removed. The backwashing cycle is typically decided by maximum allowable headloss through the vessel or based on duration of operation. Additionally if the vessels are idle for a while, the vessels must also be backwashed prior to starting treatment operation for removing stagnant water in the vessels. New media must also be backwashed before treatment operation begins for cleaning media and removing fines.

Backwash operation is typically performed manually. However, pressure differential gauges and timers can be used to alert the operator when the operation is needed. After backwash, the media must be rinsed for further cleaning purpose.

Generally raw well water is used for backwash and rinse operations. For this project, backwash water and rinse water will be discharged to the existing lined pond, then drain to the sanitary sewer system.

Layne Christensen states that their treatment system does not need backwashing because their media is spherical hybrid resin beads of uniform size that do not break up or cause channelization. Layne Christensen system requires a pre-filtration system that will remove all potential sediments in the well water. So backwash is not needed.

4.3.3.8 Headloss Through the Vessels

Among the three vendors, Severn Trent"s treatment system has the lowest headloss across their system (2 psi for clean media and 4 psi at backwash). Based on the well pump"s operating discharge pressure of 70 psi to 75 psi at design flow and the distribution network"s static pressure of 60 psi to 65 psi, a booster pump may not be needed if Severn Trent"s treatment system is used for this project.

Siemens" and Layne Christensen"s treatment systems have higher headloss requirement (3 psi for Siemens and 5.1 psi for Layne Christensen). Additionally, both their systems also need a pre-filtration system, which requires up to 10 psi headloss prior to filter bay changes. Therefore, both of the two systems will require a booster pump to supply blended well water to the distribution network.

4.3.3.9 Design BV and Water Treatment Capacity

Severn Trent has the highest design BV values with or without pH adjustment for the well water. Severn Trent"s design BV is 71% higher than Siemens and 38% higher than Layne Christensen without pH adjustment, and is 16% higher than Siemens and 28% higher than Layne Christensen with pH adjustment.

On per cubic feet of media treatment capacity basis, Severn Trent"s media can treat approximately 700,000 gallons of water before the capacity is exhausted without pH adjustment while Siemens" media can treat approximately 410,000 gallons and Layne Christensen"s media treats about 510,000 gallons.

With pH adjustment, the capacity of 1 cubic feet of media increases to 822,000 gallons for Siemens, 750,000 gallons for Layne Christensen and 960,000 gallons for Severn Trent. By far Severn Trent"s arsenic treatment media has the largest capacity.

4.3.3.10 Media Replacement and Regeneration

After the media is depleted, it must be either be replaced with new media or removed for regeneration, then refill. Media replacement or regeneration is typically performed by the equipment manufacturer. All three vendors have proposed and included media replacement or regeneration and disposal costs in their proposals.

Layne Christensen"s media are regenerable. Layne Christensen has a media regeneration facility in the Phoenix metro area. The recovery rate of the media regeneration is approximately 95%, and the Layne Christensen will add 5% of virgin media after each regeneration cycle. The 5% virgin media cost is already included in the proposed regeneration cost. The adsorption capacity of the regenerated media is essentially the same as the new media. Currently, the NSF-61 certification on the regenerated media is 5 regeneration cycles or about 3 years operating time without pH adjustment, and 4 years with pH adjustment. However, Layne Christensen claimed that this can be extended to 10 cycles, an equivalent of 6 years operating time without pH adjustment and 8.5 years with pH adjustment, through the additional testing. Layne Christensen has stated that the media has been regenerated in the lab over twenty (20) times with no lost capacity. The cost for complete media with 100% virgin media is approximately $280 per cubic feet.

Environmentally, the regenerable media reduces waste disposal needs. But the media regeneration requires five (5) days turnaround time for media removal, regeneration and filling back into the vessel. The Layne Christensen media is removed and re-filled by slurry pumping.

Neither of Siemens"s and Severn Trent"s media is regenerable. Therefore, once the adsorption capacity of the media is depleted, it must be removed and replaced with new media for both Siemens"s and Severn Trent"s media. The exhausted media must be disposed of, typically by landfill after passing the TCLP test. Both vendor"s media are removed by vacuum truck from the vessels. New media are filled into the vessels by forklift or other similar equipment. The media replacement process takes approximately 2 days before it is ready for operation. The new media must be backwashed prior to treatment service begins.

4.3.3.11 Capital Costs

Siemens" proposed cost of $495,000 for the 2-vessel configuration treatment system is the highest among the three (3) vendors. The proposed cost didn't include pH adjustment system or pre-filtration system cost. As discussed previously in this report, Siemens also has the least supplies of accessory piping, valves, pressure gauges and flow meters.

Layne Christensen"s proposed cost of $445,750 without pH adjustment system is modestly lower than the Siemens" cost. But Layne Christensen"s scope of supply is much more generous than Siemens.

Severn Trent"s proposed cost of $354,675 without pH adjustment is the lowest of the three vendors. Severn Trent"s scope of supply is also the most generous.

If pH adjustment is included, and sulfuric acid chemical is used for pH adjustment, Severn Trent still has the lowest cost of the three vendors ($380,000), significantly lower than Siemens" $525,000 and Layne Christensen"s $470,050.

4.3.3.12 Estimated Annual O&M Costs

We have estimated the annual operation and maintenance (O&M) costs for comparison purpose for all three treatment system with and without pH adjustments. The estimated costs included media replacement and disposal or regeneration, and pH adjustment chemical, but didn't include labor, electricity, backwashing or pre-filtration or pre-chlorination because these cost factors are either equal for all treatment systems or insignificant. It is assumed that media will be replaced by the equipment supplier. It is also assumed that spent media will be disposed of or regenerated by the equipment supplier.

The estimated O&M costs show that Siemens" proposed full flow treatment with 3-vessel has significantly higher cost ($462,704 without pH adjustment, and $275,491 with pH adjustment) than the treatment/bypass/blend system with 2-vessel ($198,418 without pH adjustment, and $121,279 with pH adjustment).

The estimated O&M costs also show that Severn Trent"s proposed treatment system has the lowest cost either with pH adjustment ($94,347) or without pH adjustment ($128,472), while Layne Christensen"s O&M costs are modestly higher ($162,866 without pH adjustment, and $132,818 with pH adjustment) media regeneration and replacement cost on 10 regeneration cycle basis.

The above O&M cost information also shows that pH is a significant factor that affects the media"s treatment capacity and operating costs.

4.3.3.13 Estimated Per 1000 Gallons Treatment Cost

We also estimated costs for treating of 1000 gallons with all three treatment systems with or without pH adjustment. Siemens" treatment system costs vary from $1.0 with full flow treatment without pH adjustment to $0.2 including pH adjustment and with treatment/bypass/blend configuration.

Layne Christensen"s treatment system costs based on 10 regeneration cycles are $0.64 without pH adjustment and $0.36 with pH adjustment.

Severn Trent"s treatment system costs are the lowest, varying from $0.34 without pH adjustment to $0.18 with pH adjustment.

The above treatment cost information again shows that pH has significant influence on the operating cost.

5.0 Recommendations

Based on the existing site condition, well water quality data, complied arsenic data, review and evaluation of the three (3) arsenic treatment systems in previous chapters in this report, the arsenic treatment system was designed based on the following recommendations for the project:

5.1 DESIGN PARAMETERS

- Design flows: 1700 gpm well pump flow and 850 gpm arsenic treatment flow on average.
- Design well water arsenic level: 12 µg/l
- Blended water arsenic levels: target level is 8 µg/l, maximum level is 9 µg/l.
- Maximum headloss through the arsenic treatment vessel is 5 psi.

5.2 TREATMENT SYSTEM CONFIGURATION AND OPERATION MODES

- Treatment system configuration: Treatment/bypass/blend, two (2) treatment vessels, parallel operation.
- Operation Modes: manual backwash and rinse operations. For normal operation, valves on the inlets and outlets of vessels are in open position, well pump is automatically on/off based on the Reservoir No. 1 water levels and Zone 1 pressures or manually start/stop by the operator.

5.3 PRETREATMENT SYSTEMS

- No pH adjustment due to safety concerns for handling dangerous chemical and minimal cost saving.
- No pre-filtration due to high headloss requirement.
- Include pre-chlorination to prevent bacteria growth in the media and oxidize any As (III) that may exist in the well water.

5.4 ARSENIC TREATMENT SYSTEM

We recommend the Severn Trent arsenic treatment system for the project. The reasons for recommending this system include:

- It has the most generous scope of supply, but the lowest proposed equipment cost among the three treatment systems.
- Its treatment system is the least affected by pH.
- It has the highest design BV with or without pH adjustment. Even without pH adjustment, its design BV is decently high. Therefore, pH adjustment is not necessary because its benefit is limited. This eliminates requirements for a chemical feed system and handling dangerous chemicals.

- It has the lowest O&M cost with or without pH adjustment. It has the lowest media replacement cost.
- It doesn't require pre-filtration as other two systems do.
- It has the lowest headloss through the media. This will allow the existing well pump to meet the pressure needs without a booster pump.
- Its vessel design will allow other vendor's media to be used should their media do not provide the most cost effective performance.
- The Severn Trent arsenic treatment system is widely used in Arizona. In fact, Arizona American Water, which EPCOR USA has agreed to acquire, has several facilities using the Severn Treatment arsenic treatment system. Therefore, use of the Severn Trent system for this project provides consistency with other facilities, and potential media buying and servicing advantages with the vendor.

5.5 OTHER RECOMMENDATIONS

5.5.1 Additional Testing and Monitoring

The design water quality data were produced based on a single grab sample, which has limitations in terms of representativeness. To ensure consistent compliance with arsenic limits additional tests for critical water quality parameters, such as As (III), total As, Iron, pH, silica, manganese, vanadium, phosphate, sulfite and selenium, must be conducted for verifying the design water quality data before treatment begins or during initial operation period so that necessary adjustments can be made if needed. Additionally, arsenic and pH should be routinely monitored for operation and compliance purposes.

5.5.2 Facility Visits

Since this project will be the first arsenic treatment facility for the CCWC operators and maintenance personnel, it would be beneficial for CCWC staff to see how the treatment system works and operated at other similar facilities. Therefore, we recommend visiting other arsenic treatment facilities in Phoenix metro area in addition to training that will be provided by the equipment vendor as required for this project.

5.5.3 SCADA Monitoring

Though we do not recommend the arsenic treatment system be automated for operation, we recommend all flow meters, pressure gauges and other electronic instruments be monitored via the existing SCADA system on site. Therefore, all instruments are designed to provide 4-20 mA signals for integrating with the existing SCADA system. When any of the controlling parameters reaches to a pre-determined value or fails, an alarm must be activated to alert the operator for necessary operation or corrective actions.

5.5.4 Chlorine Residual Monitoring, Demolition and Chlorination

As requested by the operator, a new Hach chlorine residual analyzer will replace the existing analyzer. The recommended new analyzer is Hach CLF10 reagentless analyzer with pH monitoring capability. See **Appendix F** for cut sheets.

The existing liquid sodium hypochlorite chlorination system will remain until the Owner's chlorination system at Shea WTP is changed to chloramine disinfection.

We would recommend the injection of liquid ammonium sulfate (LAS) to approximately three (3) pipe diameters downstream of the chlorine injection point for converting the existing disinfection to a chloramine disinfection system in the future. We further recommended that the empty room in the north side of the existing building be used for LAS storage and feeding system. Free ammonia, monochloramine, total chlorine and free chlorine should be monitored with the chloramine disinfection system. Design of the chloramination system is outside of the scope of this project.

The existing Zone 2 water supply for the blending system will be removed to allow the arsenic treatment system to connect to the existing blending system. The existing well pump discharge piping, valves and accessories will be modified for connection to the new arsenic treatment system.

5.6 PRELIMINARY OPINION OF PROBABLE COST ESTIMATE

We have performed a preliminary opinion of probable construction cost estimate for constructing an arsenic treatment system for the Well 10 site. Our estimate was $1.21 million including 25% contingency. This cost estimate was performed based on present available information, and should only be used for budget forecasting purpose.

APPENDIX A

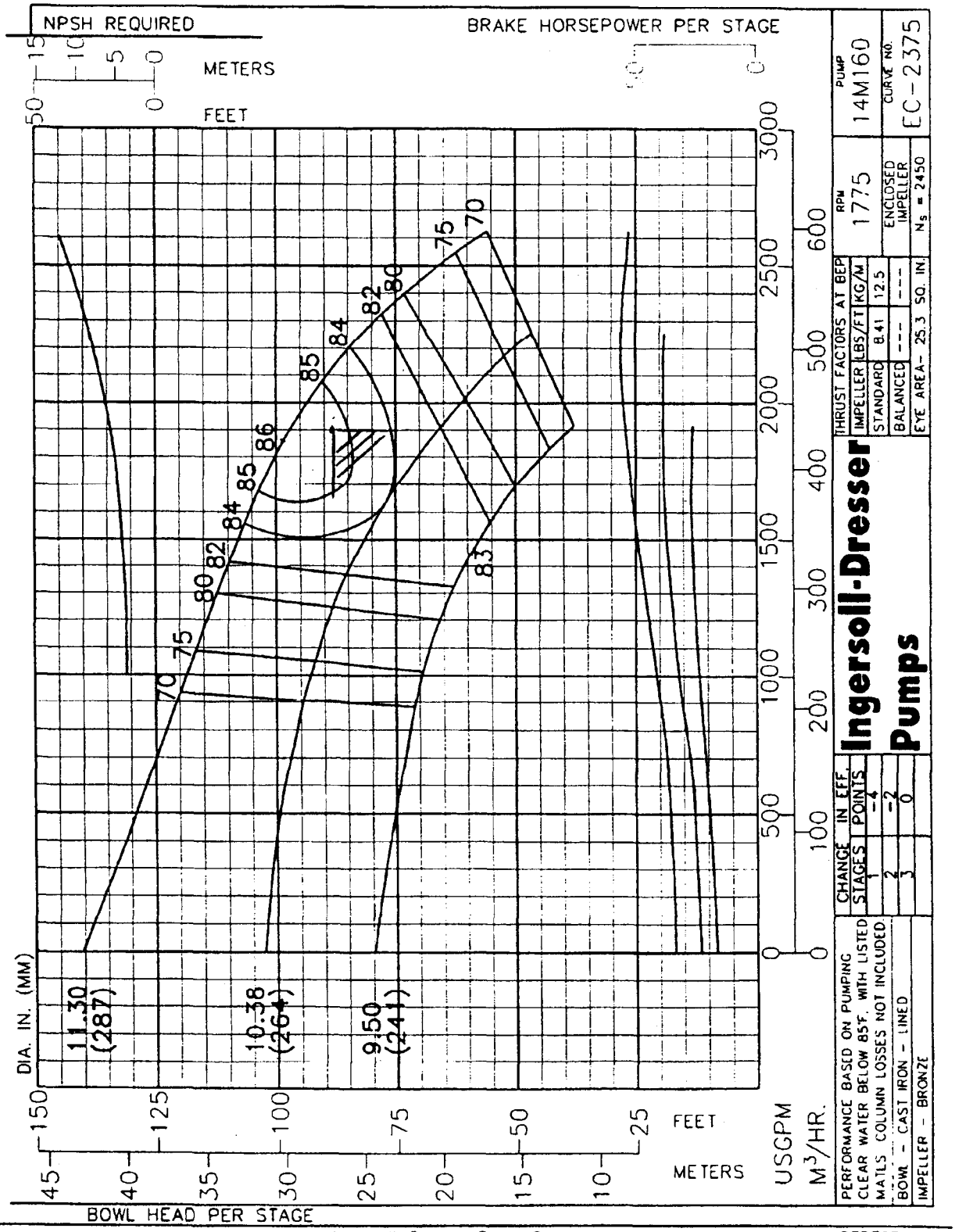
Existing Well Information

Ingersoll-Dresser Pumps

Well 10 Curve as of 1996

VTP VERTICAL PUMPS

Sheet 520.63
December 1, 1993
New Sheet



©1993 Ingersoll-Dresser Pump Company
Printed in U.S.A.

COMPANY NAME: Chaparral City Water Company
Name of System: ADEQ Public Water System Number:

WATER COMPANY PLANT DESCRIPTION

WELLS

ADWR ID Number*	Pump Horsepower	Pump Yield (gpm)	Casing Depth (Feet)	Casing Diameter (Inches)	Meter Size (inches)	Year Drilled
55-604784(not in service)	N/A	1500	725	10 3/4	8	1970
55-604785(not in service)	N/A	1180	765	350-20/415-16	10	1970
55-604786	350	1100	738	450-20/288-16	10	1972
55-604787	250	1100	768	300-20/468-16	10	1972

* Arizona Department of Water Resources Identification Number

OTHER WATER SOURCES

Name or Description	Capacity (gpm)	Gallons Purchased or Obtained (in thousands)
CAP Water Treatment Plant I	0	0
CAP Water Treatment Plant II	10,417	1,946,342
Well #10 and #11	2,200	57,085

BOOSTER PUMPS		FIRE HYDRANTS	
Horsepower	Quantity	Quantity Standard	Quantity Other
40	5	1659	N/A
60	2		
75	7		
100 & 125	4		

STORAGE TANKS		PRESSURE TANKS	
Capacity	Quantity	Capacity	Quantity
3.5	1	10,000	2
1.5	1	5,000	2
1.25	4	3,000	1
0.5 or less	3		

Weber Group L.C.
CONTRACTORS
16825 S. Weber Drive
Chandler, AZ 85226-4112
(480) 961-1141 Voice
(480) 961-0290 Fax

Well Video Log

Date: 3/17/04

AFTER BRUSHING WELL

Customer: Chaparral City Water Job #: 04-4909

Location: Hwy. 87 to Shea Blvd. west to Saguaro Blvd. north to Palisades Blvd. west past Ave. Of The Fountains about 100', well site on right Well #: Palisades Plant #10

City: Fountain Hills County: Maricopa State: Arizona

Case Size: 20" OD Liner Size: 16"---446'

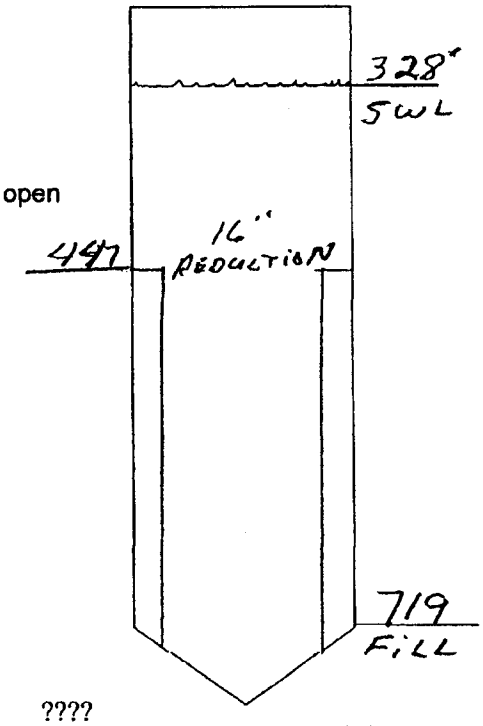
Drilling Method ???? Orig. Depth ???? Current Depth 719' S.W.L. 328'

Reference by: Gabe T. P. O. #:

Type of Perforation: Horizontal Saw Cuts Type Drive Elec. Turbine

447' to 719'

Results: Two vent holes down 18" from top of casing.
All joints in 20" and 16" are between 8 ft. and 12 ft..
Appears to be pin hole leaks at 164', 170' 6", 174' 8", & 175' 11".
Slight scum on top of water.
Water was dirty from 328' to 719'.
Open bar holes at 447' 6", and 474' 7".
Perforations appear to be 70% to 80% open from 447' to 700', & and 10% open from 700' to 719'.



Recommendations: Install Test Pump.

Signed: Jim Murdock Bottom ????

C:\Documents and Settings\Marianne\My Documents\well reports\chaparral#10-2.doc

GILBERT PUMP & EQUIPMENT COMPANY

PUMP TEST

TESTED BY: Haukeli

DATE TESTED: 7-11-94

OWNER: Chaparral City Water WELL #: 10 POWER METER #: 309833

LOCATION: Fountain Hills, Arizona

ASSEMBLED INFORMATION

McCrometer 1300

FLOW METER 5.5 PIPE I.D. 10.125 GPM 1380

METER KH 3.6 C.T. MULT. 80 10 REV. IN 40.26 SEC.

PUMPING LEVEL 400 FT. STATIC LEVEL 335 FT.

EXT. HD. OF 157.1 FT. DRAW DOWN 65 FT.

*TOTAL PUMP HD. 557.1 FT. GAL/FT. D.D. 21.2 GAL.

FRICT. LOSS OF FT. AMPS 348 358 360

TOTAL BOWL HEAD FT. VOLTS 460 460 460

PUMP SETTING 490 FT. COL. SIZES 10-3172-23/16

BOWLS BJ 14 CGH 7stg. ? COL. SIZES

PUMP RPM 1780 MOTOR HP 350 Yaskawa #0071302901

CALCULATIONS

KH 3.6 x MULT. 80 x 36 ÷ SEC. 40.26 10 REVS = KWI 257.5

KWI 257.5 x 1.34 = IHP 345.1 x .92 = BHP 317.5

GPM 1380 ÷ 226 = 6.1 ACRE FT./24 HRS.

GPM 1380 x TPH* 557.1 ÷ 3960 ÷ IHP 345.1 = O.A.EFF. 56.3 %

OVERALL EFF. (O.A.EFF.) 56.3 ÷ .92 = PUMP EFF. 61.1 %

POWER COST

KWI 257.5 x RATE/HR. $? x 24 = COST/24 HR. $

24 HR. COST $ ÷ AC/FT/24 HR. 6.1 = COST/ACRE FT. $

REMARKS: Changed oil dripper solenoid coil.

Pump operation appears fine.

KEEP IN FILE

PUMP INSTALLATION REPORT
(As Installed)

KEEP IN FILE

CUSTOMER: CHAPARRAL WATER JOB # PP6 0549

LOCATION:

WELL NO: # 10 POWER CO. N/A METER #

INSTALLER: Milton DATE 10-10-96

CASING DIA. 20 IN. WELL DEPTH 717 FT. STATIC WATER 316 FT.

DRIVER: MFG. HP 350 SN 007/822001 GEAR RATIO —

HEAD: MFG. B.J. SIZE REG IN (M) (FM) B.C. IN.

TOP COLUMN NIPPLE: LENGTH 2 DIA. 10 IN. (T) (B)

COL. DATA	NO. JOINTS	LENGTH	DIA.	TYPE	THREAD/INCH
PIPE:	1 EA	5 FT.	10 IN	(T) (B)	8
TUBE:	1 EA	5 FT.	3 IN	B.J.	8 (LH) (RH)
SHAFT:	1 EA	5 FT	2 3/16 IN	B.J.	8
PIPE:	24 EA	20 FT	10 IN	(T) (B)	8
TUBE:	24 EA	20 FT	3 IN	B.J.	8 (LH) (RH)
SHAFT:	24 EA	20 FT	2 3/16 IN	B.J.	8
PIPE:	EA	FT	IN	(T) (B)	
TUBE:	EA	FT	IN		(LH) (RH)
SHAFT:	EA	FT	IN		

TOTAL COLUMN LENGTH: 487 FEET (INCLUDING HEAD JOINT)

SPIDERS: LOCATED AT 40 FEET INTERVALS (DOUBLE AT)

AIRLINE: 487 FEET 3/4 DIA. (BANDED) (FREE HANGING)

SUCTION PIPE: 10 FEET 10 DIA. W.S. TYPE (W) (WO) (STRAINER)

DISCHARGE PIPE: 2 FEET 10 DIA.

BOWL ASSEMBLY: MFG. N/A SIZE 14 m-160 STAGES 7

IMPELLERS SET AT 5 TURNS

START UP: VOLTS/IDLE / / / VOLTS/RUN 476/476/771/ AMPS / / /

REMARKS: (ADAPTERS, SPACERS,) (PUMPING CONDITIONS ON START UP, ETC.)

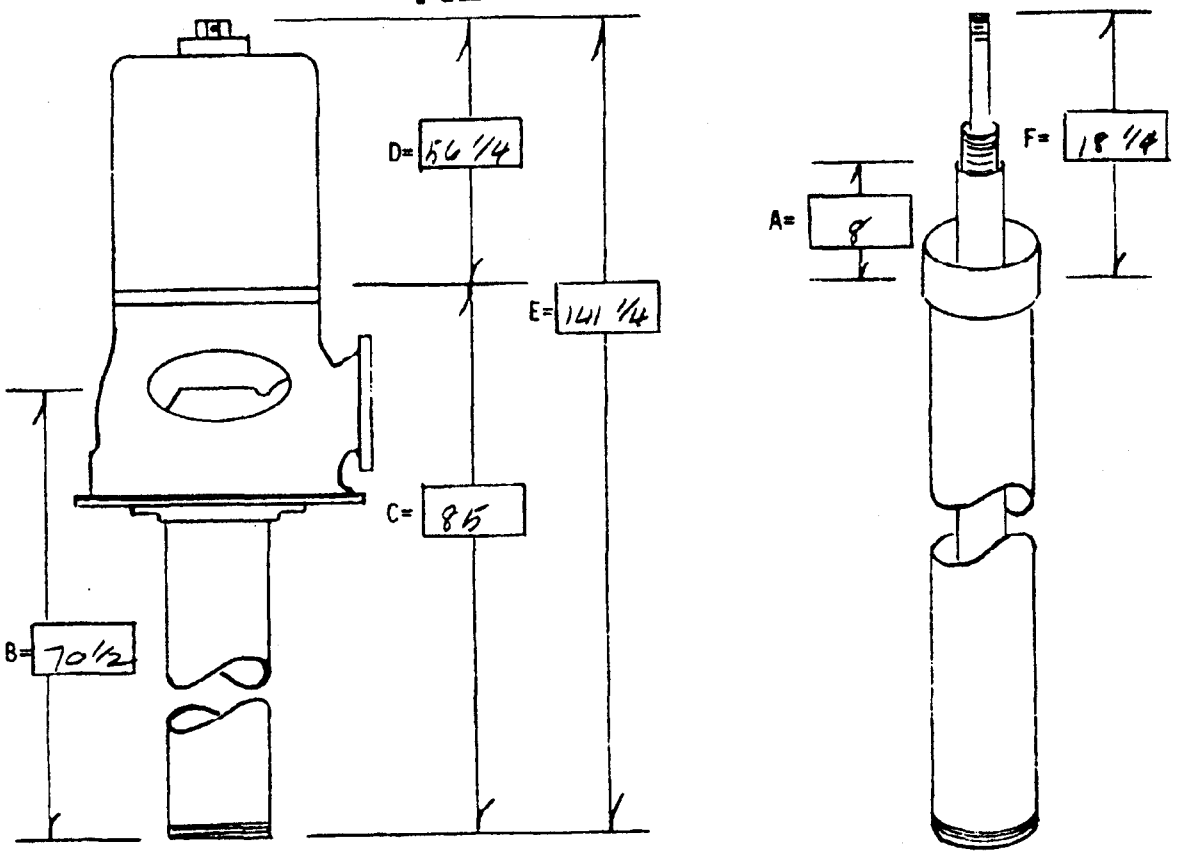
ONE 5/8 SPACER under Head Shaft

(CONTINUED ON REVERSE SIDE)

GILBERT PUMP & EQUIPMENT COMPANY
HEAD SHAFT AND STRETCH TUBE CALCULATION SHEET

CUSTOMER CHAPARRAL WATER WO NUMBER PPG 0549

KEEP IN FILE



COLUMN DATA AT POINT OF MAKE-UP

SHAFT SIZE 2 3/16 THREAD 8
BEARING SIZE 3 TYPE BRL THREAD 8 (LH) OR RH L.H.
PIPE COUPLING SIZE 10 THREAD 8 TAPER OR (BUTT) BUTT
TENSION NUT SIZE 3 TYPE BRL THREAD 8 (LH) OR RH
STRETCH TUBE SIZE 3 LENGTH 55 1/2 TYPE BRL
HEADSHAFT DIA. 2 3/16 LENGTH 125 TOP THREAD 8 (LH) OR RH KW 1/2

A = TUBE PROJECTION ABOVE COLUMN SEAT
B = LENGTH FROM BOTTOM OF HEAD NIPPLE TO STRETCH POINT PRIOR TO STRETCHING
C = LENGTH FROM BOTTOM OF HEAD NIPPLE TO TOP OF HEAD OR ADAPTER PLATE
D = LENGTH THROUGH DRIVER - PLUS HEAD NUT (INCLUDE HEAD NUT)
E = SUM OF C AND D
F = SHAFT PROJECTION ABOVE COLUMN SEAT

CALCULATIONS

B 70 1/2 INCH
LESS A 8 INCH
= 62 1/2 INCH STRETCH TUBE ASSEMBLY
7"
55 1/2

E 141 1/4 INCH
LESS F 18 1/4 INCH
= 123 INCH HEAD SHAFT ASSEMBLY
+ 2"
125

Ship To: GILBERT PMP

Req'd Ship Date
Date Shipped
SERIAL No. 9609C60754
Ship Via

Tag No. P.O. 72079
Marks:

Qty. | Description | BOM #

Discharge Head Model
Headshaft ☐ Yes ☐ No
" x " x " Long
☐ Carbon Steel, ☐ St. Steel

COLUMN ASSEMBLY
☐ Oil Lube ☐ Water Lube
☐ Flanged ☐ Threaded
" Dia. Column x Length
" Dia. Column x Length
" x " x Length Inner Column
" x " x " x Bell Tube Assy
" x " Spiders

KEEP IN FILE

BOWL ASSEMBLY
7 Stage 14 M Bowl with 160-11.06" Imp.
for 10" Col. x 3" oil Tube 2 3/16" lineshaft
Bowl Shaft - 2 1/4" x 2 3/16" x 12 5/8" Long
Shaft Stickup - 20"
Suction Case - 10", Flgd. or X Thd. Bell

SPECIAL INSTRUCTIONS:

SERIAL PLATE DATA
Serial No. 9609C60754
Bowl 14 M
Impeller 160-11.06
No. of Stages 7
Speed RPM 1770
GPM
TDH

NOTE: Trimmed impellers must be backfiled and rebalanced to .2-ounce inches.

Form #HP1067-583

BOWL ASSEMBLY DESIGN SHEET

DESIGNED BY: R Roy[illegible] APPROVED BY: _____ DATE: 9/26/96

CUSTOMER: CHAPARRAL CITY WATER JOB NO.: PP6-0549

WELL: INSIDE DIAMETER AT BOWL SETTING: 20 ? INCH

BOWL ASSEMBLY: 7 STAGE 14M160 MOD. IDP MFG. TRIM 11.04 IMP. DIA. 85.5 % EFF

BOWL DESIGN: 1900 GPM 616 (1) FT. BOWL HEAD 345.67 BOWL H.P.

PUMPING LEVEL	316	FT.	COLUMN SIZES		
EXTERNAL HEAD	277.2	FT.	487	FT.	10 X 3 X 2 3/16
COLUMN LOSS	22.8	FT.		FT.	
VELOCITY HEAD		FT.		FT.	
(1) TOTAL BOWL HEAD	616	FT.		FT.	

THRUST DATA: IMP. KT. 8.41 X 616 FT. BOWL HD. = 5,180 #

SHAFT WT./FT. 13.5 X 487 FT. SETTING = 6,574 #

TOTAL PUMP THRUST = 11,754 #

(DRIVER THRUST CAPACITY = UNK #)

HP DATA: BOWL H.P. 345.67 (BOWL SHAFT DIA. 2 1/4 RATED H.P. 700)

LINESHAFT LOSS 11.2

TOTAL SHAFT H.P. 356.87 (LINESHAFT DIA. 2 3/16 RATED H.P. 657)

THRUST LOSS 1.57 $\frac{(\text{TOTAL PUMP THRUST} \times \text{R.P.M.} \times .0075)}{(1,00,000)}$

GEAR LOSS — (GEAR RATIO —)

TOTAL PUMP H.P. 358.44 (DRIVER RATED 350 H.P. @ 1780 R.P.M.)

RELATIVE SHAFT STRETCH: (H) 616 x (S) 487 x (KT) [redacted] 8.41

2,500,000 x (AS) 3,758 = .268 [redacted] SHAFT STRETCH

(H) x (S) x (KC)

2,500,000 X (AC = T) _____ = (_____ COL. STRETCH)

= _____ REL. STRETCH

D PLAY DATA: .75 STD. _____ REG. CUT NO EXTRA

MARKS:

SET IMPELLERS @ 2 1/2 - 3 TURNS FROM FREE BOTTOM 10 TPI

RTH 6TH

APPENDIX B

Engineering Design Calculations

EPCOR USA Chaparral City Water System

Well No. 10 Arsenic Treatment Design Calculations

ons were performed based on the recommended Serven Trent arsenic treatment system.

February 10, 2012

nic Level of 12.0 PPB Condition

rated flow:	1885 gpm,=	2.71 MGD		From "Chaparral City Water System Improvement Plan", May 2007
operating flow:	1700 gpm,=	2.45 MGD		Based on phone call conversation wi Moore on 6-29-2011
sign flow:	**1700 gpm,=**	**2.45 MGD**		
atment vessels design flow:	**850 gpm,=**	**1.22 MGD**		
harge pressure:	70 psi	minimum		
enic level in untreated well water:	12.0 ppb			
enic level in blended water:	8.0 ppb			
	9.0 ppb, maximum			
arsenic treatment units:	2			
sel diameter:	10 ft, based on Severn Trent proposal.			
ss section area:	78.5 sf			
esign hydraulic loading rate for the vessel:	5.4 gpm/sf, based on Severn Trent proposal.			
design loading rate:	8.0 gpm/sf, based on Severn Trent data.			
lowable hydraulic flow to each vessel = 78.5 x 5.4=	425 gpm			
allowable hydraulic flow to each vessel =78.5 x 8 =	628 gpm			
lowable bypass flow with new virgin media:				
rsenic level in treated water:	0.05 ppb	assumed. Non-detect according to vendor.		
e arsenic treatment system	570 gpm,=	0.82 MGD	34% of total flow	
bypassed = 1700 - 570=	1130 gpm,=	1.63 MGD	66% of total flow	
rsenic level in blended water=[(12*1130+0.05*570)/1700]=	8.0 ppb			
ch arsenic treatment unit =(570/2) =	285 gpm,=	0.41 MGD		
el in blended water with one unit out of service=[(628*0.05 + (1700-628)*12)/1700]=	7.6 ppb	assuming the remaining unit will operate at 628 gpm f		
el in blended water with one unit out of service=[(425*0.05 + (1700-425)*12)/1700]=	9.0 ppb	assuming the remaining unit will operate at 425 gpm f		
nt/50% bypass average design conditions:				
rsenic level in treated water :	0.05 ppb	assumed. Non-detect according to vendor.		
enic treatment system	850 gpm,=	1.22 MGD	50% of total flow	
bypassed = 1700 - 850=	850 gpm,=	1.22 MGD	50% of total flow	
rsenic level in blended water=[(12*850+0.05*850)/1700]=	6.0 ppb			
ch arsenic treatment unit:	425 gpm,=	0.61 MGD		

'el in blended water with one unit out of service=[(628*0.05 + (1700-628)*12)/1700]=	7.6	ppb		assuming the remaining unit will operate at 628 gpm f
owable bypass flow with depleted old media:				
nax arsenic level in treated water prior to breakthrough:	6.0	ppb		
;enic treatment system	1130	gpm,=	1.63 MGD	66% of total flow
bypassed = 1700 - 1130=	570	gpm,=	0.82 MGD	34% of total flow
ırsenic level in blended water=[(12*570+6*1130)/1700]=	8.0	ppb	targeted arsenic level	
ch arsenic treatment unit:	565	gpm,=	0.81 MGD	peak unit design flow
'el in blended water with one unit out of service:	9.8	**ppb**	In compliance, assuming the remaining unit will opera: 628 gpm peak hydraulic flow.	
el of 11.0 PPB, the maximum detected level condition				
ı rated flow:	1885	gpm,=	2.71 MGD	From "Chaparral City Water System
· operating flow:	1700	gpm,=	2.45 MGD	Based on phone call conversation wi
sign flow:	**1700**	**gpm,=**	**2.45 MGD**	
harge pressure:	70	psi	minimum	
detected arsenic level in untreated well water:	11.0	ppb		
enic level in blended water:	8.0	ppb		
	9.0	ppb, maximum		
; arsenic treatment units:	2			
sel diameter:	10	ft, based on Severn Trent proposal.		
;s section area:	78.5	sf		
esign hydraulic loading rate for the vessel:	5.4	gpm/sf, based on Severn Trent proposal.		
design loading rate:	8.0	gpm/sf, based on Severn Trent data.		
lowable hydraulic flow to each vessel = 78.5 x 5.4=	425	gpm		
allowable hydraulic flow to each vessel =78.5 x 8 =	628	gpm		
lowable bypass flow with new virgin media:				
ninimum arsenic level in treated water:	0.05	ppb	assumed. Non-detect according to vendor.	
;enic treatment system	470	gpm,=	0.68 MGD	28% of total flow
bypassed = 1700 -470 =	1230	gpm,=	1.77 MGD	72% of total flow
ırsenic level in blended water =[(1230*11+470*0.05)/1700] =	8.0	ppb		
ch arsenic treatment unit =470/2 =	235	gpm,=	0.34 MGD	
'el in blended water with one unit out of service= (628*0.05+(1700-628)*11)/1700 =	7.0	ppb	assuming the remaining unit will operate at maximum hydraulic flow.	
nt/50% bypass average design conditions:				
ırsenic level in treated water :	0.05	ppb	assumed. Non-detect according to vendor.	
;enic treatment system	850	gpm,=	1.22 MGD	50% of total flow
bypassed = 1700 - 850=	850	gpm,=	1.22 MGD	50% of total flow

rsenic level in blended water=[(11*850+0.05*850)/1700]=	5.5	ppb		
ch arsenic treatment unit:	425	gpm,=	0.61 MGD	
el in blended water with one unit out of service=[(628*3 + (1700-628)*11)/1700]=	7.4	ppb	assuming the remaining unit will operate at 628 gpm f	
owable bypass flow with depleted old media:				
nax arsenic level in treated water prior to breakthrough:	6.0	ppb	design level	
senic treatment system =	1020	gpm,=	1.47 MGD	60% of total flow
bypassed = 1700 - 1020=	680	gpm,=	0.98 MGD	40% of total flow
rsenic level in blended water =[(680*11+1020*6)/1700] =	8.0	ppb	targeted arsenic level	
ch arsenic treatment unit =1020/2 =	510	gpm,=	0.73 MGD	
el in blended water with one unit out of service= (628*6+(1700-628)*11)/1700 =	9.2	**ppb**	In compliance, assuming the remaining unit will opera max hydraulic flow.	

ded Design Conditions

al design flow =	1700	gpm	
flow=	850	gpm	
N=	850	gpm	
parallel treatment vessels=	2		
flow to each vessel=	425	gpm	average
	628	gpm	maximum
ll water arsenic level=	12	ug/l	
lended water arsenic levels=	8	ug/l, targeted	
	9	ug/l, maximum	
ic level in treated wate prior to media replacement=	6	ug/l	
el in treated water with fresh virgin media=	0.05	ug/l	assumed
vel in blended water with fresh virgin media=(850*0.05+ 850*12)/1700=	6.0	ug/l	
vel in blended water with old media prior to replacement=(850*6+850*12)/1700 =	9.0	ug/l	
vel in blended water with one vessel out of service with new virgin media= (425*0.05+(1700-00 =	9.0	ug/l	
vel in blended water with one vessel out of service with old media= (628*6+(1700-628)*12)/1700	**9.8**	**ug/l, in compliance.**	

pe Design Flowing Velocities

/ell pump discharge pipe - common line before flow split and after blending:	10	inches	
ipe cross section area:	0.55	sf	
esign flow:	1700	gpm,=	3.79 cfs
elocity in the pipe:	6.95	ft/s, <10 ft/s, ok	
rsenic vessel common influent pipe size:	10	inches	
ipe cross section area:	0.55	sf	

esign flow:	850 gpm,= 1.89 cfs
elocity in the pipe:	3.47 ft/s, <10 ft/s, ok
ıdividual vessel influent and effluent pipe size:	8 inches
ipe cross section area:	0.35 sf
esign flow:	425 gpm,= 0.95 cfs
elocity in the pipe:	2.71 ft/s, <10 ft/s, ok
ıdividual vessel backwashing pipe size:	8 inches
ipe cross section area:	0.35 sf
esign flow:	750 gpm,= 1.67 cfs
elocity in the pipe:	4.79 ft/s, <10 ft/s, ok
ommon vessel effluent pipe size:	8 inches
ipe cross section area:	0.35 sf
esign flow:	850 gpm,= 1.89 cfs
elocity in the pipe:	5.43 ft/s, <10 ft/s, ok

APPENDIX C

Severn Trent Equipment Price Quote and Cut Sheets

SORB 33® As Removal System Sizing & Estimate

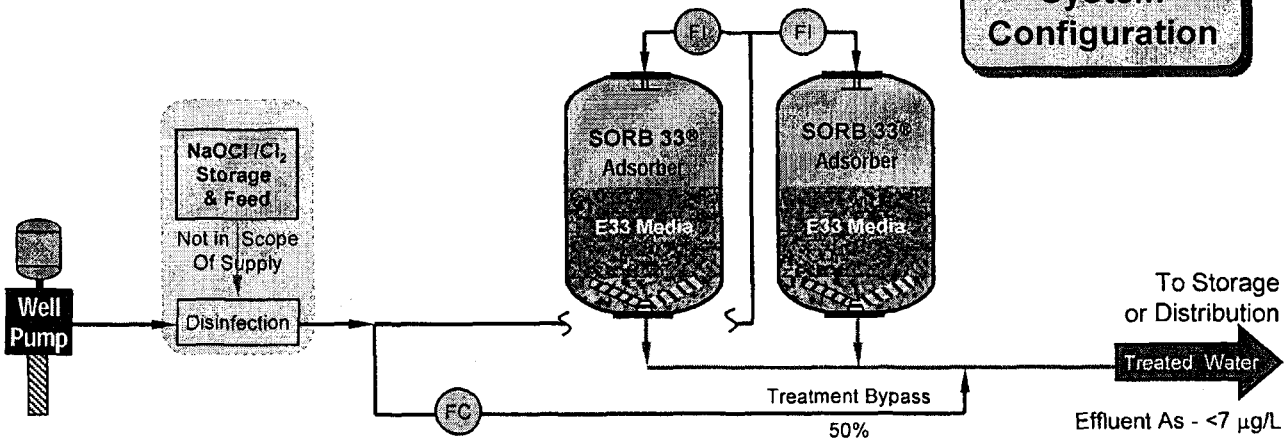
Project Name & General Information

Client:	**EPCOR Arizona**	Average Flow:	**2.45**	MGD Avg
Name of Site:	Well No. 10	Well Capacity:	**1,700**	gpm
Primary Contact:	William Li	Treatment Flow:	**850**	gpm
Engineer:	Stantec	Op Factor: 24.0 Hrs/Day or **100%**	50.0%	Bypass

System Design

SORB 33® Model No:	EAS-4710	Contact Time (EBCT) & Bed Depth:	5.0 Min / 3.4 ft
Adsorber No & Size:	Two 10.0 ft Diameter	Average Treatment Rate:	2,448,000 gals/Day
System Footprint:	28'L x14'W x 14'H	Design Flow Rate per Adsorber:	425 gpm
Flow Configuration:	Parallel ^{w}/Bypass		
Adsorptive Media:	Bayoxide E33 Granules	Loading Rate (Specific Velocity):	5.4 gpm/ft^2
Media Quantity:	16,524 lbs (7.49 MT)	Estimated Working Capacity:	94,000 BV's
	563 cubic ft	Media Cycle Life:	10.6 Months
Backwash Volume:	9,750 gals/vessel	Volume Treated per Cycle:	394.6 million gals
SORB Backwash Rate:	750 gpm	Arsenic Analysis:	**12.0** µg/L As
pH Adjustment:			
Special Features:		Pres:	70 psig

System Configuration



Budgetary Capital & Operating Costs

Annual O&M Costs: **$140,200** per Yr or **$51 / Acre Ft**

Total Capital Costs: **$354,675**

Unit Capital Costs: **$0. 145** per Gal/Day of Capacity

Total Water Volume Treated: **395** Million Gallons

Special Notes

Issued: 05-Aug-11 A10 Proposal No. 35602 S07

SEVERN TRENT SERVICES

TETRA® Filtration Products

SEVERN TRENT SERVICES

EPCOR
Well #10 Site
Fountain Hills, AZ

PROPOSAL FOR

SORB 33® Adsorber Systems
For Arsenic Removal

TWO (2) 10'-0" DIA. ADSORBER WITH BAYOXIDE® E33 MEDIA

This proposal contains proprietary or confidential information of Severn Trent Water Purification, Inc. (STWP) regarding patent protected proprietary technologies and their implementation in the field, recommended uses and costs. Any such proprietary or confidential information disclosed herein is provided at buyer's request and solely for the purpose of enabling buyer to evaluate this proposal.

In receiving and reading this proposal, buyer agrees that it will not reveal or otherwise distribute its contents to any third party without STWP's prior written consent. The foregoing limitation shall not preclude buyer from disclosing the contents of this proposal to its employees, on a need to know basis, who have the responsibility to evaluate and/or implement the program set forth in this proposal. This proposal shall at all times remain the exclusive property of STWP until accepted by the party to which it was tendered.

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STWP Proposal 35750 Rev 1
04 August 2011

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Bayoxide Brochure

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D1051 Piping and Instrumentation Diagrams (P & IDs) for two (2) 10'-0" diameter adsorbers

G1051 General Arrangement – Plan & Sections for two (2) 10'-0" diameter adsorbers

1.0 INTRODUCTION

Severn Trent Water Purification, Inc. (STWP) is pleased to offer this proposal for the supply of equipment, Bayoxide® E33 media and services for two (2) 10'-0" diameter SORB 33® Engineered Arsenic System (EAS) adsorbers for EPCOR at its Well No. 10 site. This proposal is in accordance with the specifications and drawings of STWP and the information provided by the client in the Site Qualification form.

This proposal is the complete description of the technical offer. Below is a summary of the design criteria:

Well flow rate:	1700 gpm (max)
Treatment flow rate:	850 gpm (max)
Pump discharge pressure:	50 psig (assumed)
Pump operation:	100% utilization
Site elevation:	1900 ft approximately
Adsorber location:	outdoors – no weatherproofing required
Backwash discharge:	To evaporation pond
Site height limitations:	None
Media loading method:	Bag hoisted overhead
Piping material:	Cement-lined ductile iron
Controls Communications:	None requested. None provided.
Power available at site:	480V/3ph and 120V/1ph

2.0 EQUIPMENT DESCRIPTION

2.1 Adsorber Internals

2 lots Support Gravel
To support the media and cover the effluent collectors, shipped in 50 lb. bags

2 lots Bayoxide® E33 Media
Shipped in 1,650 lb (57 ft^3) super sacks

2.2 Process Vessels

2 Adsorber Vessels
75 psig vertical pressure vessels, each 10'-0" diameter with min. 5'-0" straight side wall. Design features as follows:

- SA516-70 carbon steel plate.
- Designed and stamped to ASME Section VIII, Division 1 Code in effect at time of contract award.
- Legs for support of the vessels from the floor.
- Interior blast cleaned, SP-10, and coated with ANSI / NSF Std. 61 certified epoxy.

- Exterior blast cleaned, SP-6, and coated with two coats of self-priming epoxy.
- Two access ports, one 24" diameter on the side wall with hinge and one 14" x 18" on the top head
- 304 stainless steel inlet distributor/backwash collection pipe.
- 304 stainless steel effluent header with 304 stainless steel screened laterals.

2 lots Adsorber Piping

The attached general arrangement drawing is indicative of how a pair of vessels will be piped together.

- Cement-lined ductile iron process piping, painted same as vessel.
- Galvanized carbon steel rupture disc and vent piping

2.3 Valves & Accessories

The enclosed P & IDs indicate the type, quantity and size of valves and accessories for the vessels. Manual butterfly valves will have lugged cast iron bodies, stainless steel discs and handwheel operators. Accessories will include rupture discs, expansion joints, and air release/vacuum valves. Adsorbers are to be backwashed manually.

2.4 Instrumentation

2 Influent Flow Meters

Magnetic flow meters with stainless steel grounding rings and integral transmitters, sizes are indicated on the P & IDs.

2 Differential Pressure Switches

2.5 Auxiliary Equipment – Process Bypass Control

The following equipment will be installed in piping supplied by the field contractor. This is for a partial bypass of the system flow to extend the media life of the adsorber.

1 Bypass Flow Meter

Magmeter, size per the P & ID, with the same features as those for the Adsorber Influent Flow Meters.

1 Bypass Manual Flow Control Valve

Manual butterfly valve, size per the P & ID, with the same features as those for the Adsorber Valves.

3.0 ASSEMBLY REQUIREMENTS

The following are the items that will be shipped individually that must be assembled in the field.

- Gravel
- Bayoxide® E33 media
- Adsorbers: All the internal collectors and distributors will be installed at the shop. The carbon steel piping will be attached at the shop but may need to be removed for shipping.
- Process Piping: The pair of adsorbers will have a central piping "tree" with valves attached. This "tree" will be shipped as a unit. Individual piping spools that connect the "tree" with the adsorbers will be shipped loose for connection in the field. These loose pipe spools will include the expansion joints.
- Influent flow meters for adsorbers
- DP switches for adsorbers
- All auxiliary equipment

The Bayoxide® E33 media is to be loaded through the top access hatch of the adsorber by raising the bags up by crane, forklift or other means. Therefore, sufficient overhead clearance of at least 13' must be available (assuming use of a forklift). If there is a building roof without sufficient inside clearance, then an access hatch or removable panel must be available for media loading.

In the future media will have to be replaced after it reaches a point at which it cannot remove arsenic to required levels. At that time removal of the media will be by a vacuum hose accessed through the top or side manway.

4.0 FIELD SERVICES

STWP will furnish the services of a qualified field representative to instruct operation personnel and advise on equipment and media installation for 3 days in 1 trip and start-up for 4 days in 2 trips.

Additional services can be purchased, if desired, at the rate of $1,250 per day (8 hr/day max.), including travel days, plus travel and living expenses to be billed at cost.

When the STWP field representative arrives on-site at the time requested by the contractor/purchaser all equipment must be ready for work to begin. If equipment is not ready then our standard per diem rate, plus travel and living expenses, will apply.

5.0 QUALIFICATIONS

The following items are not included in the STWP package:

- ARRA certification of equipment
- Receiving, unloading, storing and installation of STWP supplied equipment
- Concrete foundations for vessels, building/architectural work and engineering thereof
- Anchor bolts for adsorber vessel or mechanical equipment
- Access ladders & platforms for adsorbers.
- Interconnecting piping or piping supports including flanges, bolts, nuts and gaskets, and engineering thereof, outside the boundary of the piping on the adsorber vessels. Note, piping for bypass is part of the piping not supplied by STWP.

- Impulse tubing for DP switches for adsorbers
- Electrical starters, transformers, circuit breakers, motor control center, and engineering thereof.
- Conduit and wire to all devices.
- Mounting brackets for control panel
- Heat trace and insulation for freeze protection of pipe and instruments
- Water supply/disposal for flushing of adsorber internals
- Performance testing; collection of samples and lab analysis
- Spare parts
- Chemicals

STWP will provide 3 operation and maintenance manuals in final form.

6.0 PRICE AND PAYMENT SCHEDULE

STWP will deliver the equipment, materials and service described herein for a lump sum of $354,675 including freight, but no taxes.

The media replacement cost (includes replacement and disposal of spent media) is $205/ft^3.

Pricing is valid for thirty (30) days **and is conditioned upon acceptance of the STWP Standard Terms and Conditions of Sale (Revision 31 January 2009).**

Payment is net 30 days after invoice. All invoices to be submitted by the 25th day of the month or sooner. Interest to be billed at 1-½% per month on invoices unpaid after 30 days or the maximum allowable by law, whichever is less.

Payment shall be made as follows:

10%	Invoiced upon initial submittal of drawings for approval;
30%	Invoiced upon delivery of raw materials to fabricator and media to distribution site;
50%	Invoiced upon delivery of equipment to the site;
10%	Invoiced upon completion of start-up.

7.0 PRODUCTION SCHEDULE

- Submittal of EIC & mechanical drawings for approval within 6 to 8 weeks after receipt of purchase order.
- Delivery of equipment 14 to 18 weeks after submittal approval.

8.0 ACCEPTANCE OF PROPOSAL

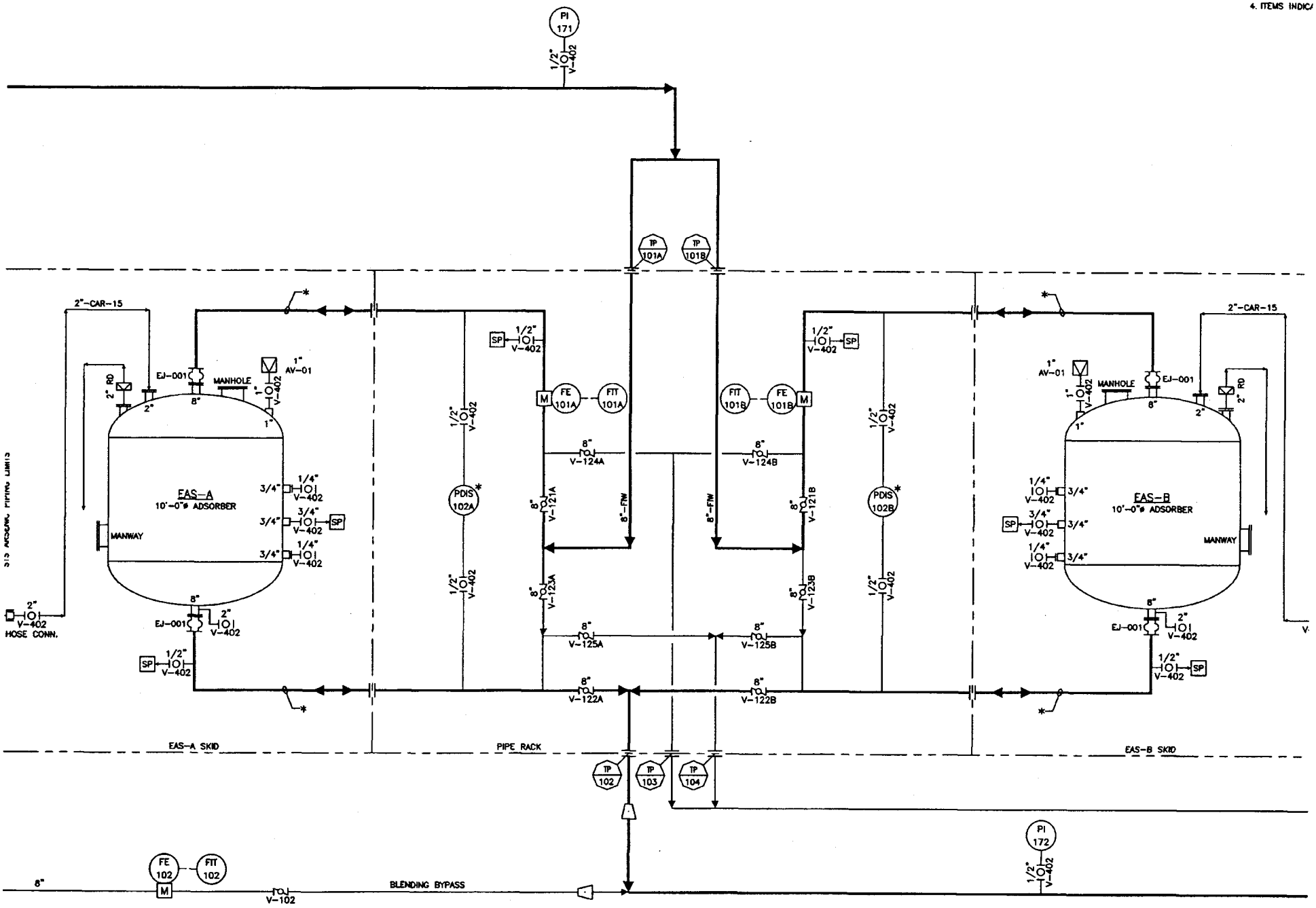
The referenced documents and attached Standard Terms and Conditions of Sale are incorporated herein and are agreed to be a material part of this Agreement.

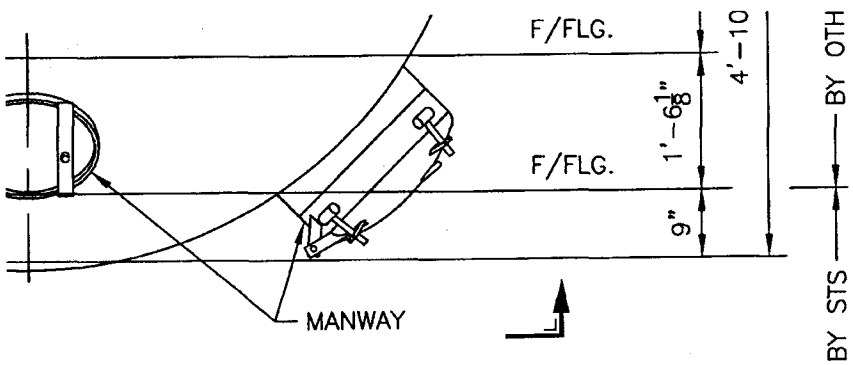
AGREED BY: AGREED BY:

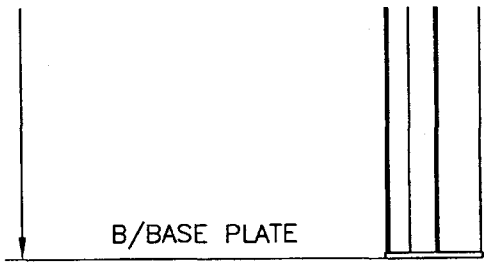
Severn Trent Water Purification, Inc.	_____
	(Company)
_____	_____
(Name)	(Name)
_____	_____
(Title)	(Title)
_____	_____
(Date)	(Date)
	_____
	(Client's Purchase Order Number)

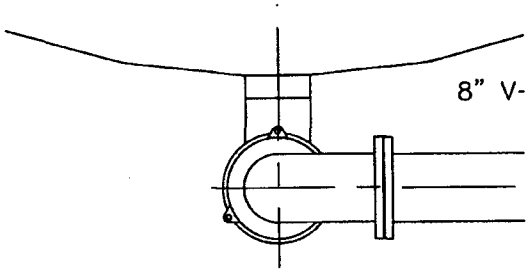
OTHERS) WI

4. ITEMS INDIC

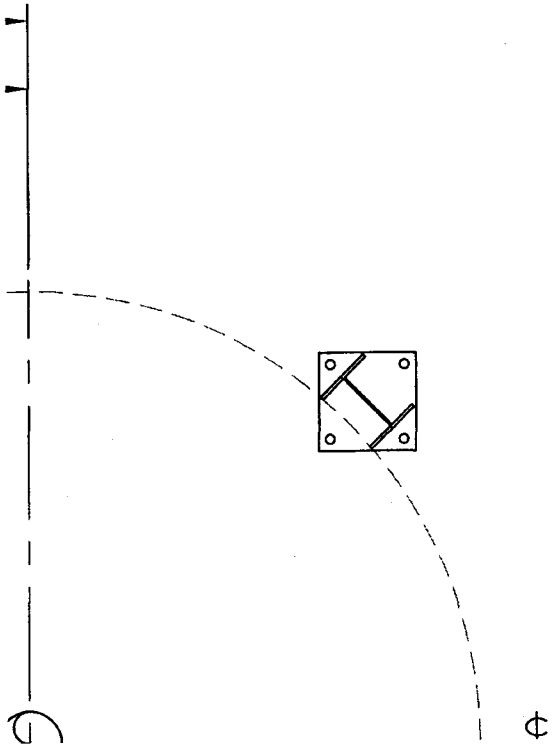


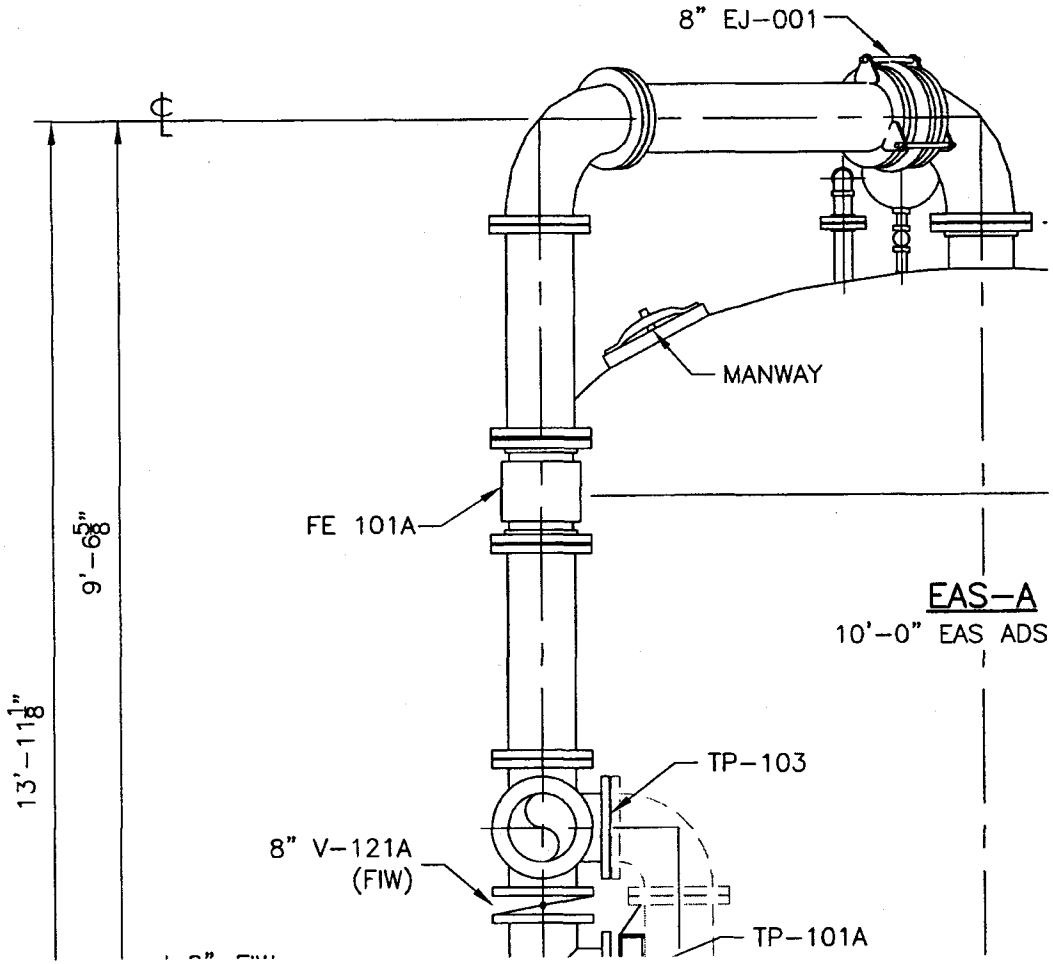






S-B
S ADSORBER





EAS-A
10'-0" EAS ADS

SEVERN TRENT SERVICES

Filtration Products

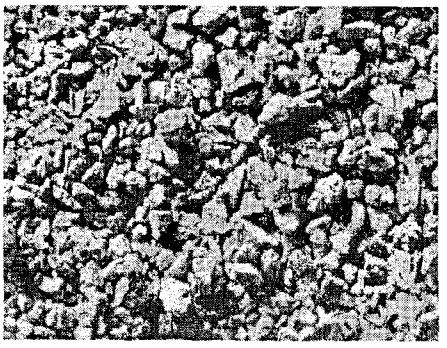
Bayoxide® Arsenic Removal Media - Ferric Oxide Adsorptive Media

The simple and economical SORB 33® arsenic removal technology uses Bayoxide® E33 granular or Bayoxide® E33P pelletized, ferric oxide media, developed by LANXESS and produced for Severn Trent specifically for groundwater source drinking water adsorption. The Bayoxide® media is long-lasting and once exhausted can be sent to a non-hazardous landfill for disposal.

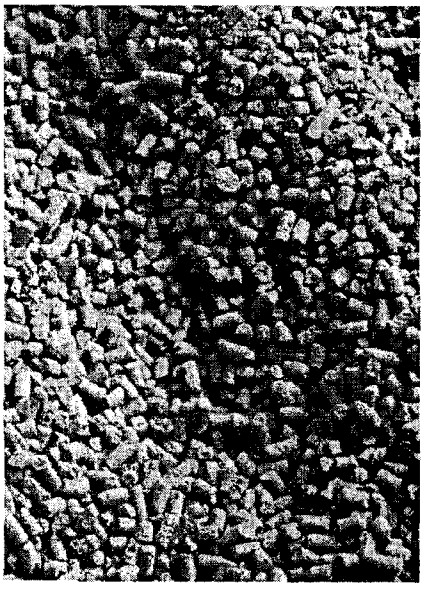
Bayoxide® media has been successfully removing arsenic from drinking water treatment systems since 1999. The media is NSF Standard 61 approved, and has received regulatory approval from agencies in the United Kingdom, France, Hungary and more.

The Bayoxide® media is dry and designed to remove both arsenic (III) and (V) well below 10 µg/L from drinking water sources. Bayoxide® media has a high capacity for arsenic, providing long operating cycles and low operating costs. The media's life expectancy is dependent on site-specific water quality and operating levels. Bayoxide® media will adsorb arsenic in preference to these other ions. Under high pH conditions, high levels of vanadium, phosphate (>1.0 ppm) and silica (>40 ppm) can present interference and reduce the media's adsorption capacity for arsenic. Therefore, Severn Trent Services offers pre-treatment solutions to minimize the effect of interference from these ions.

As the global provider of Bayoxide®, Severn Trent Services inventories large volumes of the media and can readily meet first install and refill needs of our clients.



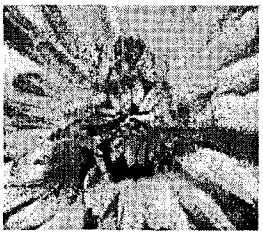
Bayoxide® E33 Media

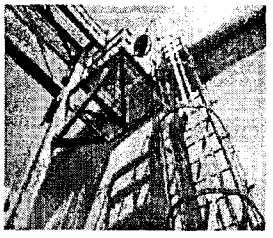


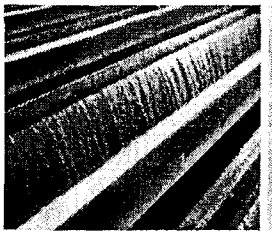
Bayoxide® E33P Media

Features & Benefits

- Removes As (III) and As (V) to < 4 µg/L
- Robust Bayoxide media has high capacity for arsenic
- Long media life under continuous operation
- Very low residual (backwash) effluents: <0.1% of water treated
- No re-pumping required
- No chemicals for regeneration
- Small footprint
- Dry media







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FS-1.02b01

Bayoxide® media is filled into the adsorption vessels from sacks by gravity or by hydraulic eduction. The exhausted media is non-hazardous and can be sent to a landfill, passing TCLP or landfill leaching requirements. Spent media can be removed hydraulically or by vacuum.

Bayoxide® E33 Media Specification

The dry, crystalline granular Bayoxide® E33 media was designed with a high capacity for arsenic, providing long operating cycles and low operating costs.

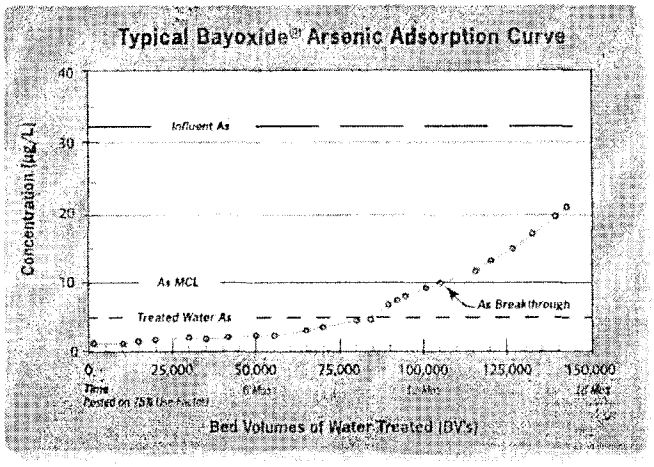
- Chemical Designation: Synthetic Iron Oxide
- Fe_2O_3 Content: >70%
- Specific Surface Area: 120 – 200 m^2/g
- Sieve Analysis:
  - <0.5 mm, 20 % max
  - >2.0 mm, 5% max
- Density: Approx. 29 lb/ft^3 (0.46 g/cm^3)
- NSF Standard 61 and Drinking Water Inspectorate (DWI) Approved

Adsorption tests on Bayoxide® E33 have shown that it will adsorb antimony, cadmium, chromate, lead, molybdenum, selenium and vanadium.

Bayoxide® E33P Media Specification

Bayoxide® E33P is a pelletized version of the granular Bayoxide® E33 arsenic removal media, and offers advantages over the original granular formulation. The pelletized Bayoxide® E33P media has the same high capacity for arsenic removal as the original media. The pellet composition has a more uniform and sharper pore configuration, which improves product handling. As a result pressure drop is reduced across the media bed requiring less frequent backwashes. Bayoxide® E33P can also be loaded into the vessel in the dry state and creates minimal dust.

- Chemical Designation: Synthetic Iron Oxide
- Fe_2O_3 Content: >70%
- Specific Surface Area: 120 – 200 m^2/g
- Sieve Analysis:
  - <1.0 mm, 20 % max
  - >1.4 mm, 5% max
- Density: Approx. 35 lb/ft^3 (0.56 g/cm^3)
- NSF Standard 61 and Drinking Water Inspectorate (DWI) Approved



In this illustration, water containing 32 µg/L arsenic can be treated to about 105,000 bed volumes before the treated water's arsenic level exceeds the 10 µg/L MCL. Bayoxide® E33 has a gradual breakthrough curve that allows operators to efficiently manage the system without the need for emergency media exchange due to sharp break through seen from other media.

Bayoxide® E33 is a registered trademark of Bayer, AG

565.0200.1 09/07

SORB 33® Arsenic Removal System Treatment Bypass and Blending Frequently Asked Questions

SEVERN TRENT SERVICES

Filtration Products

Q: What advantages does treatment bypass and blending of untreated water have for SORB 33® arsenic removal systems?

A: Throughout most of the Bayoxide® E33 media life, it will remove arsenic to levels much lower than the 10 µg/L MCL set by the USEPA. When treating waters with relatively low arsenic levels (<25 µg/L), systems are usually designed to treat a portion of the flow, and bypass the remainder, blending it with treated water to produce a quality of 8-9 µg/L arsenic, slightly below the MCL. As much as 60% of the water can bypass treatment while meeting the regulatory limit. SORB 33® systems are provided with bypass lines, valves and flow meters to monitor the amount bypassed versus the flow being treated. The benefits of this treatment configuration are to reduce operating costs by extending the media life and to reduce the size of the adsorbers.

An example of a simple treatment bypass configuration is illustrated in the middle line of the table below. Well water containing 12 µg/L arsenic is treated to a blend target value of 8 µg/L. Using an average 4 µg/L arsenic treatment level, 50% of the 1,500 gallons per minute (gpm) water flow is treated, and 50% is bypassed. This configuration extends the media life by nearly 100% and allows for smaller adsorber designs.

Treatment/Bypass Percentage vs Treated Arsenic Level					
Total Flow: 1,500 gpm			Influent [As]: 12 µg/L As		
Adsorbers: 2			Blend [As]: 8 µg/L As		
Media Vol: 443 ft^3 total					
Treated Water	**Treatment Percent of Total**	**Treatment Rate**	**Flow per Adsorber**	**EBCT**	**Bypass Flow**
µg/L As	%	gpm	gpm	min	gpm
1.5	38%	571	286	5.8	929
3	44%	667	333	5	833
4	50%	750	375	4.4	750
5.5	62%	923	462	3.6	577
7	80%	1,200	600	2.8	300

Q: Can the treatment bypass be optimized over the media life to extend media life while maintaining a target blend arsenic level?

A: SORB 33® systems are conservatively designed within the media's Empty Bed Contact Time (EBCT) and loading rate limits. As illustrated in the table, more water can be bypassed early in the media cycle when the treated water has 1.5-3 µg/L arsenic. Later in the cycle, less water is bypassed as the treated water increases above 5.5-7 µg/L. This is accomplished without exceeding the design loading rate of 8 gpm/ft^2 and going below the minimum EBCT of 2.5 minutes. In this case, the maximum treatment is 80% of the well water flow rate.

The treated water arsenic level increase is very gradual, so bypass flow rate changes can be made incrementally following routine arsenic analyses of the treated water.

Q: Is Bypass/Blending a treatment design approved by state regulators?

A: Treatment Bypass and blending to a level below the MCL is an accepted design by water quality regulatory agencies in most, but not all, states where arsenic treatment is being used.

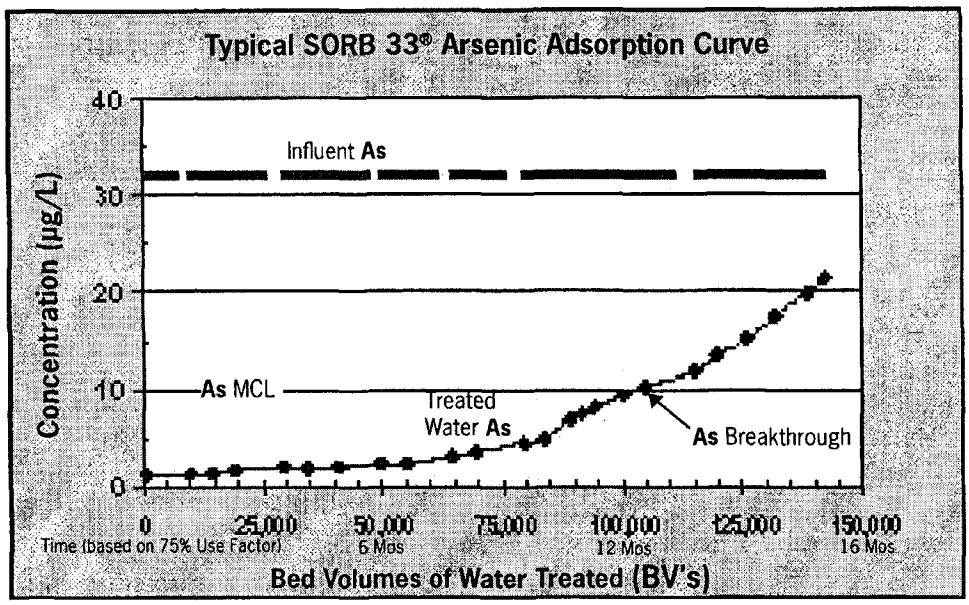
SORB 33® Arsenic Removal Systems Bayoxide® E33 Media Performance Arsenic Breakthrough Curves - Frequently Asked Questions

SEVERN TRENT SERVICES

Filtration Products

Q: What is the method used to evaluate Bayoxide® E33 Arsenic Removal Performance?

A: Arsenic removal performance via adsorption is illustrated graphically using a "Breakthrough Curve" such as the one shown below. Performance of an adsorbent is measured by the number of bed volumes of water that can be treated with one bed volume (BV) of media before it exhausts, i.e., can no longer adsorb arsenic efficiently. A BV is the volume of media in the adsorber. An adsorber with a 100 ft^3 media bed is equivalent in volume to 748 gallons, and if the media can treat 100,000 BV's of water, that equates to 74,800,000 gallons that can be treated through that adsorber. The adsorption curve below is typical for Bayoxide® E33 media used in the SORB 33® Process. In this illustration, water containing 32 µg/L arsenic can be treated to about 105,000 BV's before the treated water's arsenic level exceeds the MCL of 10 µg/L. This is called the breakthrough point.



Monitoring of SORB 33® performance is done by routine analysis of the treated water. Early in the cycle, this can be done on a bi-monthly basis. When the treated water's arsenic level increases above 4-5 µg/L, this frequency is increased to semi-monthly so as to be able to schedule media replacement as close to the breakthrough point as possible without exceeding the MCL. In this case, more frequent analysis starts at about 80,000 BV's. Using the timeline, this would be at about 9½ months, and the analysis is closely monitored until the media is changed out at about 98,000 BV's, or after 12 months of operation, when the treated water arsenic reaches 9 µg/L.

Unlike breakthrough curves for water softening resins or some other adsorbents, arsenic will continue to be adsorbed by Bayoxide® E33 even after it exceeds the MCL. Softening resin hardness breakthroughs rapidly to the influent levels (within <1,000 BV's on the above curve) leaving little time to schedule media change-out, etc. However, in the illustration above, arsenic continues to be adsorbed from partially "spent" Bayoxide® E33 media for over 20,000 BV's beyond 10 µg/L MCL breakthrough. The advantage of an "extended adsorption" media like Bayoxide® E33 is that its capacity can be increased in a lead/lag (series), or "sequencing" flow configuration.

APPENDIX D

Siemens Equipment Price Quote and Cut Sheets

William,
I have broken out the scenarios with recommendations. Note for all options, a pre-filter will be required as the turbidity is above the design criteria of 0.5 NTU. Below I have outlined the design criteria for iron based media (GFH). It is recommended that over a longer period of time, the full flow treatment will be the best option.

Design Criteria

- Ground Water Systems Characteristics
- Oxygen >0.5 mg/L
- Ferrous iron <0.2 mg/L
- Manganese <0.05 mg/L
- Aluminum <0.2 mg/L
- Silica <20 mg/L
- Phosphate <0.05 mg/L (as phosphate)
- Sulfate < 25 mg/L
- TDS < 500 mg/L
- pH adjustment not required in most cases (range 5.5 to 9.0)
- Pre-oxidation is not required

Design basis based on the water quality of Well 10 noted below.

- Alkalinity as CaCO3 180 mg/l
- Bicarbonate alkalinity as CaCO3 180 mg/l
- Total Arsenic 0.011 mg/l
- Arsenic (3) 0 ug/l
- Arsenic (5) 7.2 ug/l
- Barium 0.062 mg/l
- Calcium 50 mg/l
- Chloride 58 mg/l
- Conductivity 560 umhos/cm
- Fluoride 1.9 mg/l
- Total Hardness 170 mg/l
- Iron, Total 0.28 mg/l
- Magnesium 11 mg/l
- Manganese 0.011 mg/l
- Nitrate 1.5 mg/l
- pH (field test) 7.8
- Selenium 0.0059 mg/l
- Silica 46 mg/l
- Sodium 48 mg/l
- Sulfate 28 mg/l
- Sulfite ND
- TDS 370 mg/l
- Temperature (field test) 31.6oF
- TOC ND
- Turbidity 1.5 NTU
- Antimony ND
- Copper 0.02 mg/l
- Cadmium ND
- Chromium (VI) 0.0069 mg/l
- Chromium (III) ND
- Color <1
- DOC ND
- Iron, Dissolved ND
- Lead 0.0026 mg/l

- Mercury ND
- Phosphate ND
- Oxygen (field test)
- Molybdenum ND
- Vanadium 0.015 mg/l
- Strontium 0.43 mg/l
- Zinc ND
- Nickel ND

Since there are a number of none detects (ND), the projections are very rough estimates and if this project is realized, it is recommended that a RSSCT and/or pilot test be conducted.

Here are the general comments on the water quality provided.

- pH is on the high side at 7.8.
- There is some questions about the Arsenic numbers; the Total Arsenic is listed at 11 ppb, Arsenic (3) at 0 ppb, and Arsenic (5) at 7.2 ppb. Numbers don't add up, 3.8 ppb off as either Arsenic (5) or (3). Not a big deal; Total Arsenic of 12 ppb is to be used for the BV estimation.
- Silica is high at 46 mg/L.
- Turbidity is high at 1.5 NTU; typically would like levels at <0.5 NTU. Over time this will result in solids build-up in the GFH. Note my comment on a pre-filter.

Design assumptions.

- Two tanks in parallel each treating 425 gpm.
- HLR of 5 gpm/sf.
- EBCT of 5 min.
- 40" of GFH.
- 24/7 operation.
- Used 12 ppb Arsenic.
- Phosphate was listed as ND; used 0.05 mg/L.

Given that the 50% will be treated and blended, theoretically the GFH system cannot put out more than 8 ppb to still achieve a 10 ppb in the finished (blended) water. As a safety factor, I looked at a level of 8 ppb for the BV estimation.

Therefore, based on the above assumptions and accounting for Silica and Vanadium, it is estimated at 50K - 55K to 8 ppb. The main issues are the high pH and silica.

<u>Option A. Full flow Treatment (No pH Adjustment) Parallel Configuration</u>

Budge Price: $783K (3 tanks)

Influent flow: 1,700 gpm
Vessel Size: 12 ft diameter
Vessel Quantity: 3 (each treating 567 gpm)
Tank type: ASME Code
Design HLR: 5 gpm/ft2
EBCT: 5 minutes
Material: Carbon Steel
Estimated media cost: $216/cu.ft.
Media Volume: 1,130 ft3

Cost $/1,000 gallons: $0.52 (media only)

Based on the above assumptions and accounting for Silica and Vanadium, the estimated bed volume is 50K - 55K to 7 ppb. It is recommended that a pre-screen be installed prior to the treatment system.

Option B. Full flow Treatment (pH Adjustment to 7.0) Parallel Configuration

Budge Price: $783K (3 tanks)

Influent flow: 1,700 gpm
Vessel Size: 12 ft diameter
Vessel Quantity: 3 (each treating 567 gpm)
Tank type: ASME Code
Design HLR: 5 gpm/ft2
EBCT: 5 minutes
Material: Carbon Steel
Estimated media cost: $216/cu.ft.
Media Volume: 1,130 ft3
Cost $/1,000 gallons: $0.26 (media only)

Based on the previous assumptions and a pH of 7.0, the estimated BV is around 110K, hence the lower cost per 1,000 gpm. It is recommended that a pre-screen be installed prior to the treatment system.

Option C. Bypass Option Parallel

Budge Price: $495K (2 tanks)

Blend Parameters

- Target arsenic: 8 ppb
- Arsenic treated: 4 ppb
- Influent arsenic: 11 ppb
- Treated influent: 42.86%
- Treated influent: 728.57 (total)
- Treated arsenic level: 1.71 ppb
- Bypass: 57.14%
- Bypass: 971.43 gpm
- Blend arsenic: 4 ppb

Influent flow: 729 gpm
Vessel Size: 11 ft diameter
Vessel Quantity: 2 (each treating 365 gpm)
Tank type: ASME Code
Design HLR: 4.83 gpm/ft2
EBCT: 5.16 minutes
Material: Carbon Steel
Media Volume: 754 ft3

It is recommended that a pre-screen be installed prior to the treatment system. Note that as the media become loaded, more treated water will be necessary. Confirmation testing with either RSSCT and/or pilot is recommended.

Under the condition of only one tank in service, the theoretical arsenic level limit for the system would be 4 ppb to still achieve 10 ppb in the finished. Note that if the treatment system is interrupted for any reason, the complete water system would be shut down. Also with smaller treat versus bypass, this does lead to lower capital cost, but more frequent media replace, which should be noted that the cost of the treatment systems is in the media cost.

Price Additions:
None

Equipment Furnished:
Scope includes 100 psi working pressure filter tank with supporting legs. Top side inlet connection with overdrain pipe and bottom head effluent connection. Shop installed steel plate underdrain with Model 650 MSW underdrain nozzles with ABS screws. Screwed air release connection. One 14" x 18" manhole in top head. One coat of interior and exterior primer, and two coats of interior finish paint above the underdrain. Sch. 40 steel filter face piping with exterior primer coat. Manually operated butterfly valves for inlet, backwash waste and effluent. Automatic operated air release valve and piping. 12" of support gravel and 40" of GFH media. GFC #4879 loss of head gauge and #1639 backwash rate of flow indicator. Tanks include separate nozzles for media removal and fill.

Equipment Not Furnished:
Installation, concrete slab work including waste sump, interconnecting piping, chemical feeds (if required), and overall plant operation and controls.

Notes:
Prices include technical direction, commission and freight to the west coast.
Filter tank size is outside diameter. Straight side shell height is 6'-0".
Unit capacity based on 5 gpm/sq.ft. of tank area and 5.0 minute Empty Bed Contact Time.

As a minimum, your proposal shall include the following information:

1. Media data

Matrix/active ingredient Active Substance: [Galvan, Anthony G (WT)] Fe(OH)3 and ß-FeOOH: 55-60%
Physical form[Galvan, Anthony G (WT)] Granular - micro porous
Color[Galvan, Anthony G (WT)] Brow
Bulk density (lbs/cf)[Galvan, Anthony G (WT)] 72 lbs/cf
Moisture content (%)[Galvan, Anthony G (WT)] 45%
Grain size (mm)[Galvan, Anthony G (WT)] 0.3 to 2.0 mm
Adsorption density (g/kg)[Galvan, Anthony G (WT)] up to 60 g/kg phosphate/arsenic
Backwash requirement[Galvan, Anthony G (WT)] 8 to 12 gpm/ft2
Arsenic residuals (fines) [Galvan, Anthony G (WT)] if excessive backwashing....fines can be generated
Regenerable [Galvan, Anthony G (WT)] Yes, but would create a larger

waste....Siemens only promotes a once through and then the media is disposed. Media can be disposed via landfill after passing the TCLP.
Disposal requirement[Galvan, Anthony G (WT)] TCLP pass....disposal to landfill. Siemens has a media service where we remove and replace the media. Please see attached media service brochure.
Optimal pH operating range[Galvan, Anthony G (WT)] 7 pH
Minimum contact time (minutes)[Galvan, Anthony G (WT)] 5 minute EBCT

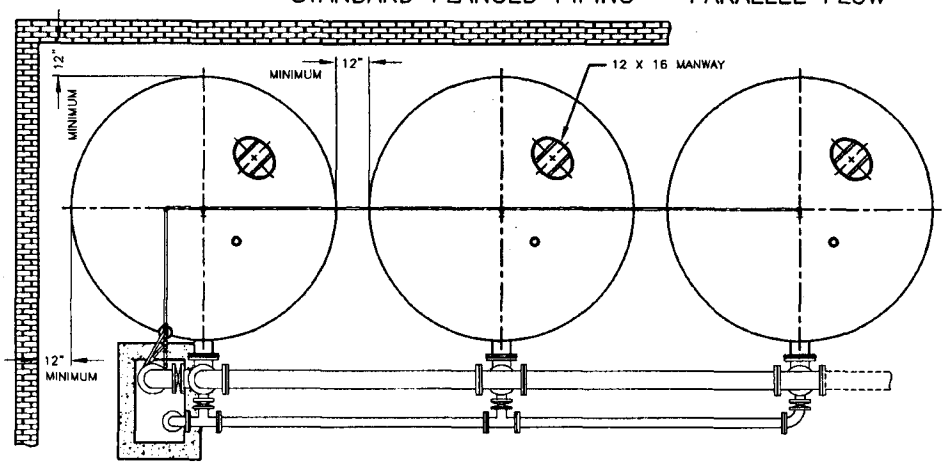
2. Design data

Number of vessels [Galvan, Anthony G (WT)] see size option above.
Equipment Model[Galvan, Anthony G (WT)] GFH arsenic treatment system by tank size.
Configuration (series or parallel)[Galvan, Anthony G (WT)] if >90% removal then series if <90% removal then parallel system. All parallel.
Vessel pressure rating (psi) [Galvan, Anthony G (WT)] As noted above....100 psi working pressure....the pressure through the media is 0.9 psi/ft of media.
Vessel dimensions (height, diameter) [Galvan, Anthony G (WT)] as noted above.
Vessel materials[Galvan, Anthony G (WT)] Carbon steel
Media volume (cubic ft) [Galvan, Anthony G (WT)]As noted above.
Media depth (ft) [Galvan, Anthony G (WT)] 3.33 ft
EBCT at design flow (minutes) [Galvan, Anthony G (WT)] as noted above.
Hydraulic loading rate (gpm/sq ft) [Galvan, Anthony G (WT)] As noted above
Design peak flow to each vessel (gpm) [Galvan, Anthony G (WT)] as noted above.
Design average flow to each vessel (gpm) [Galvan, Anthony G (WT)] as noted above
Backwash flow rate (gpm) [Galvan, Anthony G (WT)] based on tank diameter, we can calculate the flow. So: a 12 ft diameter tank will have a cross sectional area of 113 ft2 at a backwash loading rate of 8 gpm/ft2 = 904 gpm.
Backwash loading rate (gpm/sq ft) [Galvan, Anthony G (WT)] 8 gpm/ft2
Backwash duration (minutes) [Galvan, Anthony G (WT)] ~10 minutes
Backwash frequency (times/month) [Galvan, Anthony G (WT)] 4 to 6 weeks backwash frequency

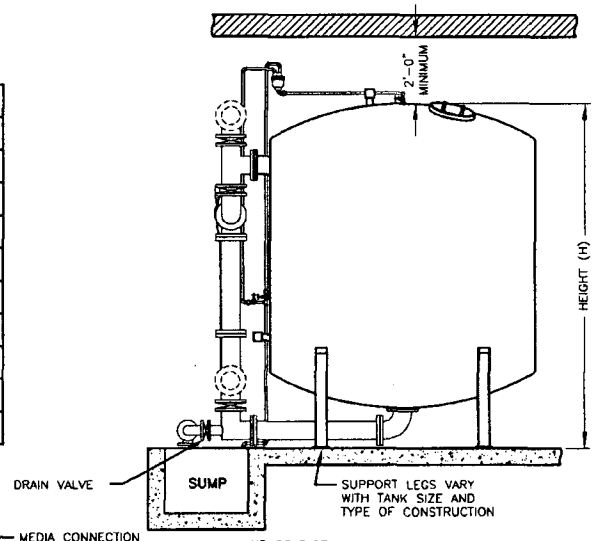
Working capacity (BV) [Galvan, Anthony G (WT)] see note above on the ND values....estimated BV projection at 50-55K bed volumes at pH 7.8 at noted water quality values. At pH 7.0 the bed volumes are increased to approximately 110K.
Breakthrough BV (at 10 ug/l As) [Galvan, Anthony G (WT)] as note above.
Headloss with clean media (psi) [Galvan, Anthony G (WT)] 0.9 psi/ft of media....so if there are 3.33 ft of media, the headloss of the clean media is about 3 psi or <5 psi.
Headloss when backwash is required (psi) [Galvan, Anthony G (WT)] <7.5 psi, but should never meet this pressure as the water should be clean <0.5 NTU. Note that the system is design based on time to backwash which is typically 4 to 6 weeks....The GFH treatment systems have an operating differential pressure of no more than 7.5 psi measured from inlet to effluent header. Backwash water is supplied from in-service vessels so no supply storage or pump is required for backwashing the units. The primary purpose of the "backwash cycle" in a GFH system is to "fluff" or stratify the media. As the water passes through the media the media can compact and close of flow trends causing channeling. The "fluffing" of the media allows even flow and exchange around the media particles. While the Adsorbers are not to run as filters, contaminates can collect on the surface of the GFH media. This material must be removed by periodically flushing out, or backwashing following the instructions given in this booklet. Rigorous backwashing as seen in filter systems should not occur in this system, light backwashing to remove contaminates is occasionally required. When the GFH media is washed at the proper rate, the media bed is lifted and the particulate is washed from the vessel. If the rate is too great, media will be lost from the system. If the rate is too low, the bed will not be completely cleansed. The backwash rate should not exceed 12 gpm. Eight, (8) gallons per minute is the starting recommended flux rate.
Media replacement method [Galvan, Anthony G (WT)] Siemens media replacement contract recommended. Otherwise, a vacuum truck or eductor type system.
Media regeneration recovery rate (%) [Galvan, Anthony G (WT)] we don't promote media regeneration, but have seen somewhere in the range of 50 to 70%.
Operation Mode (auto/manual)[Galvan, Anthony G (WT)] manual....but can provide automatic....but

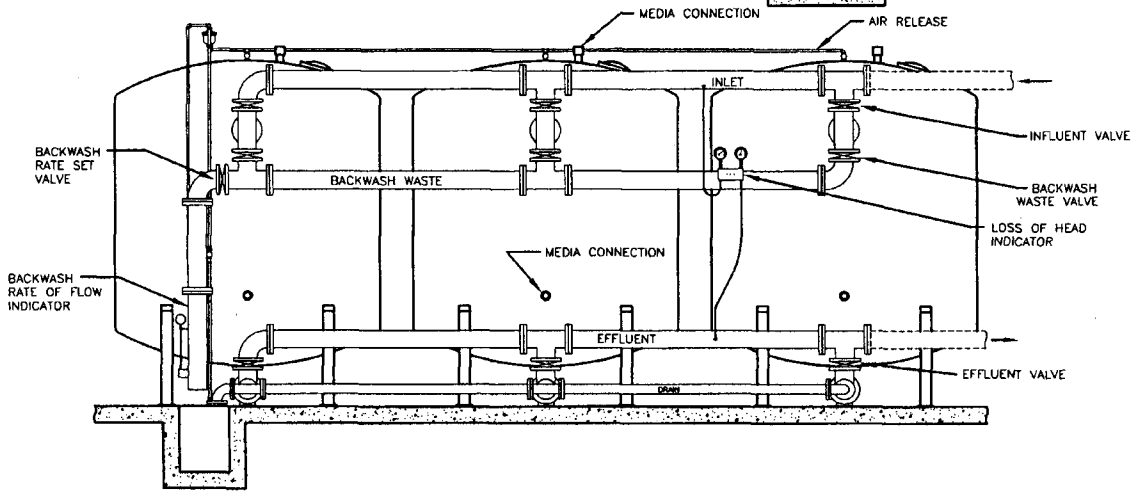
since the system backwash duration is 4 to 6 weeks, then manual is sufficient
Testing and Monitoring Parameters and Frequency Requirements [Galvan, Anthony G (WT)] on the initial startup, less monitoring....as the media becomes loaded (used), then it requires more frequent testing. RSSCT and/or pilot will give you a gauge also on media loading (i.e., bed volumes)
Pre-treatment requirement [Galvan, Anthony G (WT)] Yes....it is recommended to have a 20 micron filter....note that if there is a substantial turbidity load, this will depend on the what pre-treatment option is employed....I have seen some plants install back filters on the front end.
Post-treatment requirement[Galvan, Anthony G (WT)] no....but if excessive iron or backwashing, then a post treatment filter. Also, we have seen other end-users employ a decant tank and reuse the water.
Vessel effluent As levels (ug/l)[Galvan, Anthony G (WT)] variable depending on well utilization, pH, constituent levels
5-year guaranteed media replacement/disposal or regeneration cost ($/cf) [Galvan, Anthony G (WT)] I should have the information on the 5 year media replacement by tomorrow.

GENERAL FILTER
THREE UNIT ARSENIC REMOVAL SYSTEM
STANDARD FLANGED PIPING – PARALLEL FLOW



TANK DIAMETER (in.)	
TANK HEIGHT, H (in.)	
TANK AREA (sq.ft.)	
TOTAL AREA (sq.ft.)	
FLOW (gpm)	
BW FLOW (gpm)	
BW VOLUME (gal)	
VALVES & HEADERS (in.)	
BED VOLUME/TANK (cu.ft.)	
BED VOLUME/TOTAL (cu.ft.)	
MEDIA CONNECTION (in.)	





NOTE: PIPING SHOWN DASHED IS NOT PROVIDED BY SIEMENS WATER TECHNOLOGIES UNLESS SPECIFICALLY QUOTED.

NOTE: CONFIGURATION SHOWN IS STANDARD

A–28450–0
NEW 04/01

SIEMENS *Water Technologies*
Ames, IA
515–268–8400

William,
Please see my comment below. Thanks!

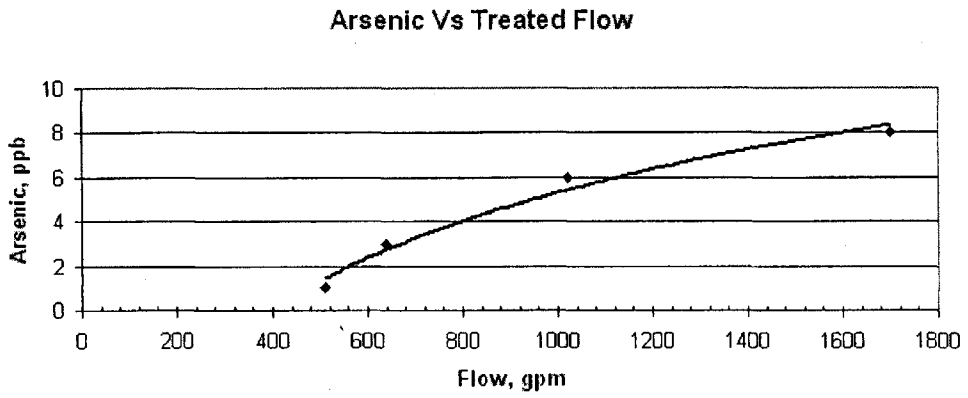
1. You noted that all options require a pre-filter since turbidity is above your design criteria. But I didn't see the pre-filter was included in the scope of supply.

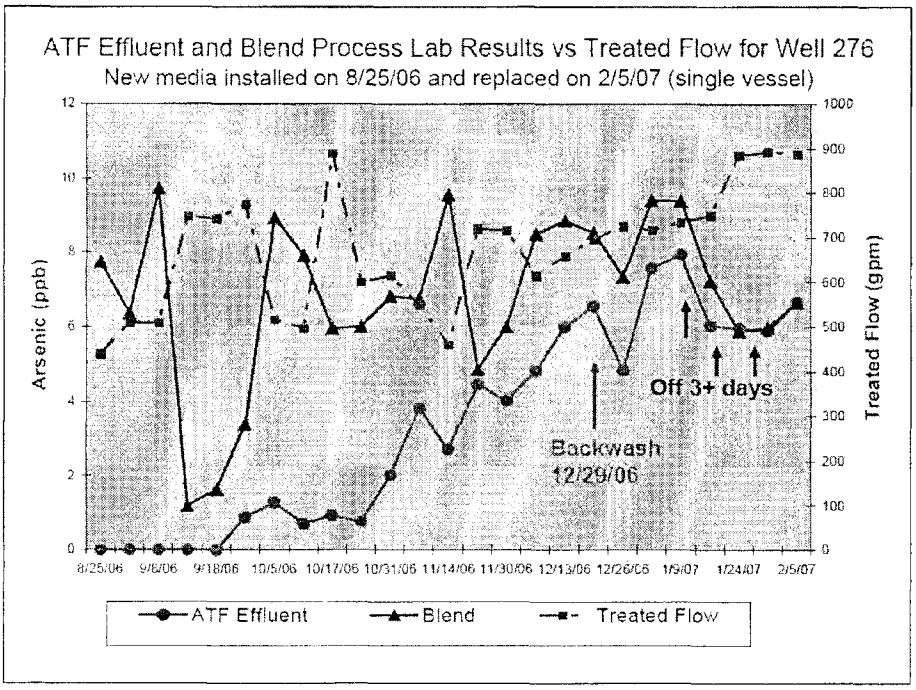
   Siemens does not provide the pre-filter....this is usually specified by the consultant....

2. You said over longer period of time, the full flow treatment will be the best option. Can you explain in detail. Since our arsenic level is only slightly above the MCL level for some of the tested values, I have thought treatment/bypass/blend should be a better option in the longer run.

   This would be true if only arsenic was the only constituent in the water....The capital cost will be less expensive, but over time as the media becomes loaded, more water that has to be treated. I have provide an example of the arsenic occurrence a the media becomes loaded....as you can see is does require more water to be treated versus bypass as the media becomes loaded (no it is not linear)....this is only an example, there is no way to really know how the media will exhaust out....we can test via RSSCT/Pilot.... I have provided what was seen on one of our earlier installations based on media resting....as noted in my earlier email, there several variables that can affect the media performance (i.e., constituent level, pH, media resting, etc.).

   As noted, we can look at blending....just keep in mind that there are several variables that need to be considered before designing the blend system...





3. Because this treatment configuration will process only a portion of total flow, it takes a longer time to exhaust the adsorption capacity of the media assuming the total media volume is the same for both options.

   As the media becomes exhausted, it will require more water to be treated.

4. I believe the treatment/bypass/blend configuration is less expensive for both capital investment and O&M.

   Capital cost is less, but over time may be more costly....O&M will need to be evaluated....I still do not have the information from our media service group....also, we would need a complete water quality analysis.

5. How much it will cost to run a RSSCT?

   $12K....How long the RSSCT will run? 10 weeks....Have your proposal included RSSCT? No....

6. I agree the arsenic test numbers present some questions.

7. Please cost the pH adjustment system based on sulfuric acid. Please also provide O&M cost estimates for the pH adjustment system....

   We would need to know preferred pH adjustment system as noted in my earlier email....(i.e., acid or carbon dioxide). Acid has been the preference....

8. The option C's vessel size is 11 ft diameter. Please confirm.

   Siemens standard vessel size is 11 ft. We really only needed an 10.5 ft diameter unit....850 gpm / 2 (two tanks parallel) = 425 gpm / 5 gpm ft2 = 85 ft2 = 10.41 ft diameter so pick the next even size 10.5 ft diameter.

9. Please provide a PID or flow diagram drawings for your treatment options.

I sent a GA of the parallel tanks in my earlier email....

I don't have a PID as we only provide the tanks and the media....some valving....I have attached the equipment list in my earlier email.

10. We would like to use the existing SCADA system on site to monitor the flow meters and pressure gauges. We will need 4-20mA signals from these devices.

    Not a problem.... I will need more time to price up the flow meters and pressure gauges having a signal of 4-20 mA. Also, any other monitoring devices....i.e., chlorine residual, etc.

11. Will your piping be supported by a rack provided by you?

    Rack? Not sure what you are asking....

Please give feel free to give me a call so we can hone in on what you would like to control and what treatment design would be best suited. Thanks!

APPENDIX E

Layne Christensen Equipment Price Quote and Cut Sheets

Stantec
8211 South 48th Street
Phoenix, AZ 85044-5355
Phone: 602.438.2200
Fax: 602.431.9562

Project Estimate: LayneRT Arsenic Treatment System

Friday, August 05, 2011

Prepared For: William Li
Professional Engineer

Prepared By: Michael Boyd
Account Manager

DESCRIPTION:

Thank you for choosing Layne Christensen Company, a leader in groundwater development. Layne Christensen continually works to tailor unique and practical solutions using Layne products and services to meet individual client needs within the water community. Layne Christensen has been maintaining life's most vital resource since 1882. Our full range of water-related services encompasses site selection, well field design and development, pump installation and repair, water treatment, aquifer maintenance and remediation, and well rehabilitation.

The scope of work for this project is to furnish a LayneRT arsenic treatment system for Stantec. The attached scope of work includes the details of the system. With the current pH value of 7.8, Layne will warrant the bed life to achieve 68,000 Bed Volumes (BV's). If we adjust the pH down to 7.2, the warranted bed life will exceed 100,000 BV's. This performance guarantee can be supplied as an executed operating agreement upon the request of the client.

Thank you again for choosing Layne Christensen Company. As a representative of the company's Phoenix, Arizona based office, I realize that Layne possesses the experience and technical expertise to solve your complex water supply issues. We will diligently work in a consistently courteous and professional manner to meet your specific site conditions and needs. We look forward to becoming your sole source provider for water-related services.

Thank you for the opportunity to be your water resource solution.

Project Estimate

Company:	Stantec
Contact:	William Li
Address:	8211 South 48th Street
City, State, Zip:	Phoenix, AZ 85044-5355
Project:	Arsenic Treatment System
Phone:	602.438.2200
Fax:	602.431.9562

Date:	August 5, 2011
Estimated By:	Michael Boyd
Location:	Phoenix, AZ
Prevailing Wage:	No
Type of Tax:	Sales
Tax Rate:	9.30%

Description	Unit	Quantity	Price	Total
LABOR & MATERIALS				
1. LayneRT Arsenic Treatment System: Base Bid (Item 1)	LS	1	$433,050.00	$433,050.00
2. Optional pH Adjustment	LS	1	$24,300.00	$24,300.00
REGENERATION				
1. LayneRT Media Regeneration	Cubic-Foot	0	$160.00	$0.00
- When media needs to be regenerated, the cost of $160 per cubic-foot				
includes unloading, transportation, regeneration, waste disposal and				
re-installation of the media into the vessels.				
- The waste generated passes TCLP and CA-WET, but as we anticipate				
regulations to change, we include in our $160, the cost to dispose of the				
waste in a hazardous landfill.				
- Media will be regenerated in 250 cubic-foot increments.				
			Subtotal	$457,350.00
			Sales Tax	$42,533.55
			Total	$499,883.55

Clarifications

1. Client to provide legal access.
2. Client to provide all applicable permits.
3. Client to provide on-site water source.
4. This quote is valid for 30 days from above date.
5. Based upon Layne Christensen's attached Terms & Conditions.
6. Layne's payment terms are "Net Due Upon Receipt Of Invoice".
7. The installation hours will be billed based on actual hours in the field.
8. Signing this project estimate authorizes Layne Christensen Company to proceed with your project.

Layne Christensen Company

8/5/2011

Michael Boyd - Account Manager DATE

Stantec

William Li DATE

August 5, 2011

Re: 850 GPM Arsenic Removal System for EPCOR USA Chaparral City Water System, Arizona
Scope Letter Q-11-047

I. BASE BID

The following items and/or services will be included as specified:

1. Two (2) Adsorption Vessels, 120" diameter x 5'-4" straight shell, carbon steel construction, designed to a maximum allowable working pressure of 75 psig, ASME Code section VIII, Div.1, stamped and National Board registered. Vessel interior shall be shall be factory prepared and epoxy coated per Layne standard in compliance with NSF 61. Vessel exterior shall be factory prepared and coated per Layne standard. Two (2) 14" x 18" manway per exchanger vessel. Vessel connections as required.

2. Inlet water distribution/backwash water collection header/lateral system, Schedule 80 PVC header and Schedule 80 PVC up-turned elbow laterals with Gr.304 stainless steel supports, installed prior to shipment.

3. Lined carbon steel curved plate underdrain with stainless steel filter nozzles located on approximately 9" centers, installed prior to shipment.

4. One (1) Structural support steel pipe rack, hot dipped galvanized after fabrication.

5. 250 cu.ft. of LayneRT™ adsorption media per vessel, shipped separately for field installation by others.

6. Face piping will be cement lined (and seal coated) ductile iron in accordance with AWWA/ANSI C115/A21.15 125# flanged. All piping for media fill or removal will be Schedule 80 PVC. Exterior surface for ductile iron piping shall be coated per Layne standard. Piping includes all piping between Layne supplied equipment.

7. All hardware and gaskets for Layne supplied piping.

8. One (1) Combination air/vacuum release valve, with manual isolation valve, per vessel.

9. Exchanger on/off operating valves, Bray Series 30 wafer style butterfly valves with manual operators, as follows :

Quantity	Description	Actuator
8	8" Exchanger inlet/outlet	Manual / Handwheel *
2	8" Bag filter isolation	Manual / Handwheel

* Mounted on pipe rack

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10. Media fill/removal valves, stainless steel ball valves with manual lever operators, as follows :

Quantity	Description	Actuator
2	3" Media fill	Manual
2	3" Media removal	Manual

11. Drain valves, stainless steel ball valve with manual lever operators, as follows :

Quantity	Description	Actuator
2	2" Vessel drain	Manual
1	2" Bag filter drain	Manual

12. One (1) Pressure relief valve, 6 inch, at common adsorber inlet.

13. One (1) Propeller flow meter, 8 inch, McCrometer Model MW506 with integral mounted flow indicator and totalizer, for common adsorber inlet.

14. One (1) Bag filter, Fil-Trek Model LPA28-812-8F-EX-S4-U, epoxy lined carbon steel construction, ASME Code stamped, capable of holding eight (8) filter bags, 8" flanged connections, 150 psig design pressure, with 316 SS strainer baskets, shipped loose for field installation by others.

15. Three (3) Pressure gauges with sample ports, pipe rack mounted.

17. One (1) Differential pressure indicator/switch across bag filter.

18. One (1) Lot Engineering Services including shop drawings, equipment data sheets submittal package, start-up plan and O&M manuals.

II. OPTIONAL PH ADJUSTMENT

The following items and/or services will be included :

1. One (1) 93% Sulfuric acid storage tank, double wall XLPE construction, capacity : 405 gallon, complete with level transmitter, seismic restraint system and flex connection, shipped loose for field installation by others.

2. One (1) Sulfuric acid feed chloride complete with the following components, shipped loose for field installation by others (All piping and manual valving to be provided by others) :

   - One (1) LMI Model AA951-392SI chemical feed pump, capacity : 1.0 gph @ 110 psig. Pump constructed with PVDF head, PVDF fittings, ceramic balls, Polyprel seals and O-rings, fluorofilm diaphragm and includes four function valve, foot valve/strainer, injection/check assembly, and tubing
   - One (1) Griffco Model CC100-K 100 ml borosilicate glass calibration cylinder with PVDF ends
   - One (1) Blacoh CTK1005T-5 4 cubic inch PVDF pulsation dampener with PTFE bellows

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3. One (1) pH analyzer, shipped loose for field installation by others.

4. One (1) NEMA 12 Control Panel with level display and controller for pH pump, shipped loose for field installation by others.

III. CLARIFICATIONS AND EXCEPTIONS

1. All items, except adsorber internals, valves, and instrumentation mounted on pipe rack as noted above, will be shipped separately for field installation by others.

2. All piping and valving outside our scope limits (including by-pass piping and valving), both material and design, will be provided by others.

3. All valves and instruments, where supplied, will be furnished with manufacturer's standard coating.

4. No on-site technical service is included in our scope. If field services are required, please refer to Section V below for our rates.

IV. SCOPE OF SUPPLY EXCLUSIONS

- any items or services not listed above as part of this proposal;
- P.E. services of any kind;
- rigging, offloading equipment at the jobsite and setting the equipment in place;
- equipment or component installation;
- design, supply or installation of anchor bolts;
- design, supply or installation of support below Adsorbers;
- electrical wiring or conduit of any kind, except as noted above;
- piping or pipe fittings, hardware and gaskets, except as detailed above;
- off-skid pipe supports of any kind;
- field painting of any kind;
- procedures for disinfection of equipment, disinfection chemicals and disinfection labor;
- operating chemicals and utilities, except as noted above;
- pumps or pumping equipment of any kind, except as detailed above;
- electrical controls or instrumentation, except as noted above;
- loading of media;
- building permits, including electrical and plumbing, and permits of any kind;
- any civil work such as housekeeping pads, drain trenches, etc;
- grounding lugs;
- heat tracing or insulation of any kind;
- initial backwashing of filter media;
- motor starters and motor control centers, except as noted above;
- bonding of any kind;
- sales taxes, duties, tariffs, import/export fees, etc.

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V. ADDITIONAL TECHNICAL FIELD SERVICES

- Per diem rate of $1,200 for standard 8-hour work or travel days, excluding weekends or holidays.
- Travel and living expenses are billed at cost plus ten percent.
- Overtime in excess of 8 hours per day is billed at 1.5 times hourly rate.
- Saturday work is billed at 1.5 times standard daily rate.
- Sundays and holidays are billed at 2 times standard daily rate.

VI. INSTALLATION SERVICES

No installation is provided under this scope. All Layne supplied equipment terminates at skid boundaries. All physical and electrical installation shall be by others. No electrical wire (grounding, power, signal or other), conduit, junction boxes (except noted above), and/or other material and hardware pertaining to the installation of the proposed equipment is included. No mounting, fastening and support hardware and materials (such as nuts, bolts, washers, unistrut, channels etc.), except as noted above, special brackets, pipe support hangers, and concrete pads or bases required to mount equipment is included.

Please refer to our (2) page Standard Terms and Conditions of Sale attached, which are a part of this proposal. This proposal and the attached Standard Terms and Conditions of Sale cannot be modified in any way except by the express written permission of Layne. Price quoted is FOB Shipping Points, with freight allowed to jobsite, and will remain valid for 30 days from quotation date.

Our standard delivery terms for the equipment are: drawings - 4 to 5 weeks after receipt of written order; shipment 12 to 14 weeks after receipt of approved drawings. All delivery estimates are approximate. Layne will work with you to meet your specific delivery requirements. All deliveries, including estimated time of arrival of equipment on site, are approximate and cannot be guaranteed. Freight carriers are not under Layne's control and are subject to unpredictable delays. Layne will not accept any backcharges due to shipments arriving at times other than the estimated time. This includes, but is not limited to, consequential damages, costs of delay, standby charge for equipment or personnel, etc.

Please do not hesitate to call our office if you have any questions or need more information regarding this scope of work.

Regards,

LAYNE CHRISTENSEN WATER TECHNOLOGIES

Roshan Ismail
Process Engineer

97 Chimney Rock Road • Bridgewater, New Jersey 08807 • Phone: (732) 469-8720 • Fax: (732) 469-7966

Li, William

From: Mike R. Boyd <mrboyd@laynewater.com>
Sent: Friday, August 05, 2011 1:48 PM
To: Li, William
Cc: Dennis M. Tharan; Mike C. Havener; scott@swestcp.com
Subject: RE: LayneRT Arsenic Treatment
Attachments: Project Estimate - Stantec LayneRT ATS.pdf; Scope of Supply.pdf; PES120 P&ID.pdf; BR-LAYNERT 06-11.pdf; BR-RTREGEN.pdf; CERT_Regenerated LayneRT.pdf; PES120 Equip.pdf; LayneRT Gold Seal Certificate.pdf; LayneRT MSDS.pdf

William,

Please see attached proposal and supporting documents per your request. I have a meeting tomorrow morning with our contracting group to go over the scope of work for the construction phase. We should be able to put a cost together for you by the end of next week for the turn-key option.

I'm not sure what your availability is in the next few weeks, but we would be happy to have you and your client come by our local regeneration facility for a tour and detailed explanation in regards to the process.

System Description:

Model	**PES120**
Flow Rate (GPM)	850
Vessel Size (DIA x STR.), in.	120 x 64
Vessel Design Pressure, psig	75
Total Vessel Volume, cu. ft.	433.0
Media Volume/Vessel	250.0
Media Max. Flowrate, gpm	1044
EBCT (minutes)	2.2
Actual Bed Expansion	73%
Min Bed Expansion	15%
Vessel Flux Rate (gpm/sqft)	10.83
PSI/ft of Bed Depth	1.60
Bed Depth (ft)	3.18
Pressure Drop/Vessel	5.10
Pipe Size, in.	8.00
Skid Dimensions, ft. (LxWxH)	25'-1.5" x 12'-10.63 x 13'-0.25"
Skid Empty Weight, lbs	14,900
Media Weight, lbs	12,500

If you have any questions, please don't hesitate to contact my cell.

Thank you.

Michael R. Boyd
Technical Sales Engineer

LayneChristensen
WATER TECHNOLOGIES

3804 E. Watkins Street
Phoenix, AZ 85034
Main Office (602) 345.8600 • Fax (602) 345.8632
Cell (909) 821.0195
email MRBoyd@laynechristensen.com
www.laynechristensen.com • Online Catalog • YouTube Overview

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From: Li, William [mailto:william.li@stantec.com]
Sent: Wednesday, July 20, 2011 10:20 AM
To: Mike R. Boyd
Subject: RE: LayneRT Arsenic Treatment
Importance: High

Hi Mike,

Attached are the well water test results. I don't how critical the pH data is for the arsenic treatment, but I don't have the pH data right now and hope I can have the data soon.

As you can see the arsenic level varies. The highest test value is 11 ug/l based on grab samples from 2008 to present. So the design value for the arsenic shall be 12 ug/l with 1 ug/l safety factor since the test data are based on grab samples.

The well pump operating flow is 1700 gpm. We desires to split the flow 50/50. 50% of the pump flow (850 gpm) will be treated by arsenic unit and the other 50% of the pump flow will be bypassed. The bypassed flow and the treated flow will then be blended to produce a 6.5 ug/l arsenic level in the blended flow.

Based on the above flow condition, we desire a 2 units in parallel operation configuration. Each unit will treat 425 gpm flow. Assuming a 1 ug/l arsenic level in the treated water, in the event of one unit is taken out of service, the blended flow will contain 9.3 ug/l arsenic, which is still below the required limit.

Our client is intended to operate the well at 1700 gpm 24 hours/day, 7 days/week except in the emergency events that prevent the operation.

As a minimum, your proposal shall include the following information:

1. Media data

Matrix/active ingredient
Physical form
Color
Bulk density (lbs/cf)
Moisture content (%)
Grain size (mm)
Adsorption density (g/kg)
Backwash requirement
Arsenic residuals (fines)
Regenerable
Disposal requirement
Optimal pH operating range
Minimum contact time (minutes)

2. Design data

Number of vessels
Equipment Model
Configuration (series or parallel)
Vessel pressure rating (psi)
Vessel dimensions (height, diameter)
Vessel materials
Media volume (cubic ft)
Media depth (ft)
EBCT at design flow (minutes)
Hydraulic loading rate (gpm/sq ft)
Design peak flow to each vessel (gpm)
Design average flow to each vessel (gpm)
Backwash flow rate (gpm)
Backwash loading rate (gpm/sq ft)
Backwash duration (minutes)
Backwash frequency (times/month)
Working capacity (BV)
Breakthrough BV (at 10 ug/l As)
Headloss with clean media (psi)
Headloss when backwash is required (psi)
Media replacement method
Media regeneration recovery rate (%)
Operation Mode (auto/manual)
Testing and Monitoring Parameters and Frequency Requirements
Pre-treatment requirement
Post-treatment requirement
Vessel effluent As levels (ug/l)
5-year guaranteed media replacement/disposal or regeneration cost ($/cf)

3. Equipment & service cost and O&M cost
   Please provide equipment price including freight and with required services.
   Please provide a life cost analysis for minimum 5-year. Please assume that our client will have the vendor to deliver new media, replace the spent media and dispose of spent media.

I hope the above has sufficient information for you to provide me with a proposal. Please let me know if you have any questions. Thanks!

William Li, PE
Stantec
8211 South 48th Street
Phoenix AZ 85044-5355
Ph: (602) 438-2200 Ext. 9457
Fx: (602) 431-9562
Cell: (480) 280-0720
william.li@stantec.com
stantec.com

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Please consider the environment before printing this email.

From: Mike R. Boyd [mailto:mrboyd@laynechristensen.com]
Sent: Thursday, June 09, 2011 11:23 AM
To: Li, William
Subject: LayneRT Arsenic Treatment

William,

It was a pleasure speaking with you this morning. I have listed below some of the information that will be required to properly design this system and be able to produce a capital and operational cost.

Water Chemistry:

- Arsenic (speciated)
- Iron
- Manganese
- pH
- Silica
- Phosphate (detection limit of 100ppb)
- Vanadium
- Hardness

You mentioned that the total capacity was 1800GPM and the system would be designed for 900GPM. Is that because you plan on blending or because the other 900GPM is going to go elsewhere (irrigation)? If the arsenic level is 11ppb, this would be a perfect system for blending.

If you would like to come take a tour of the facility here in Phoenix, let me know and I would be happy to give you a tour of the 60,000 square foot regeneration facility, DI regeneration facility, membrane cleaning room and laboratory.

Thank you.

Michael R. Boyd
Technical Sales Engineer
LayneChristensen
WATER TECHNOLOGIES

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Phoenix, AZ 85034
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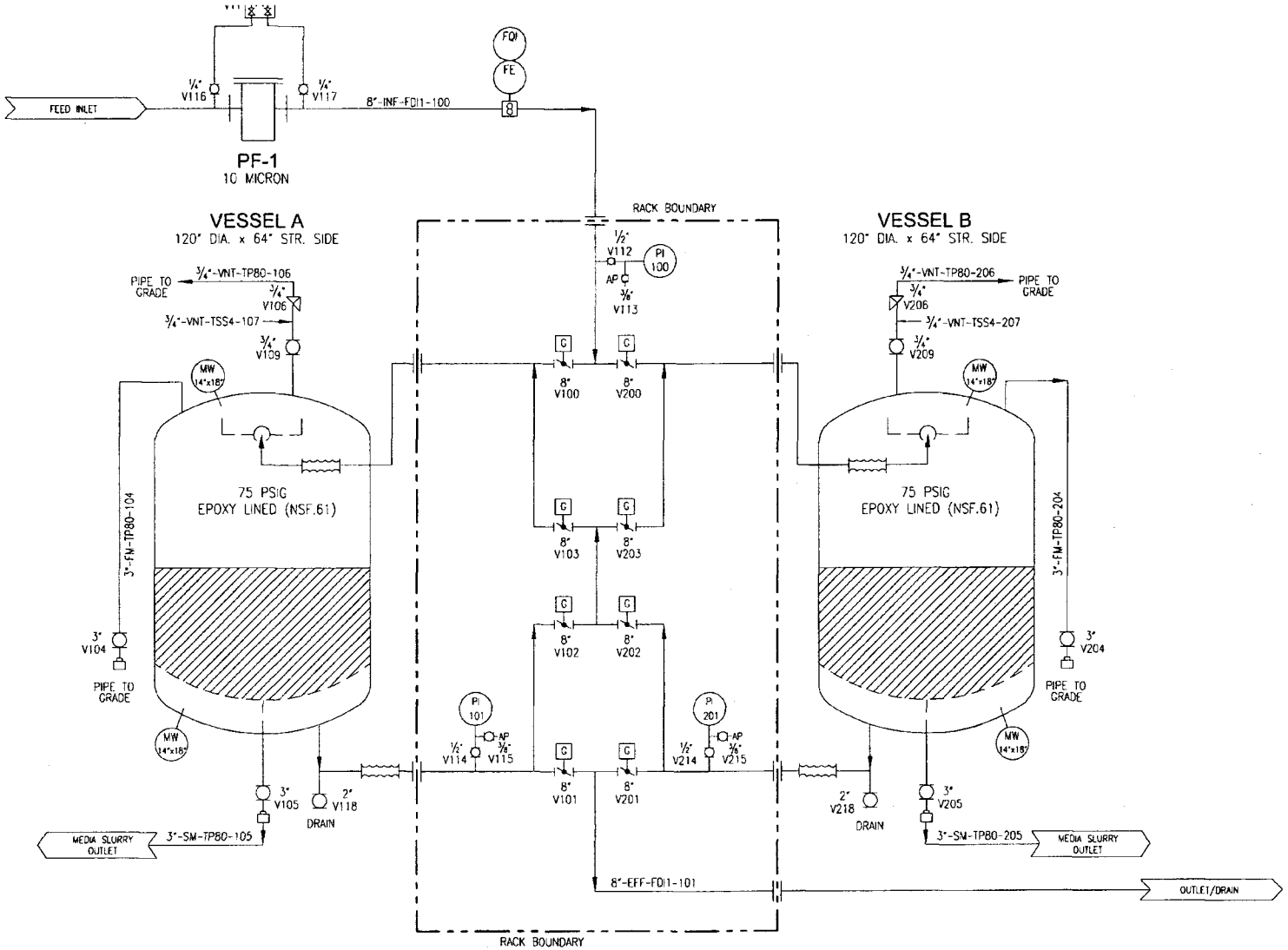
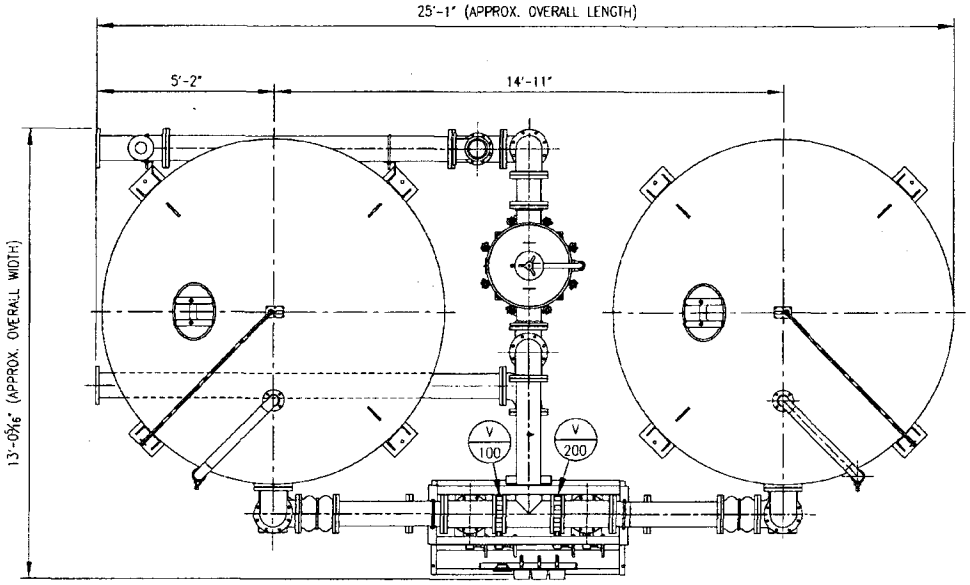
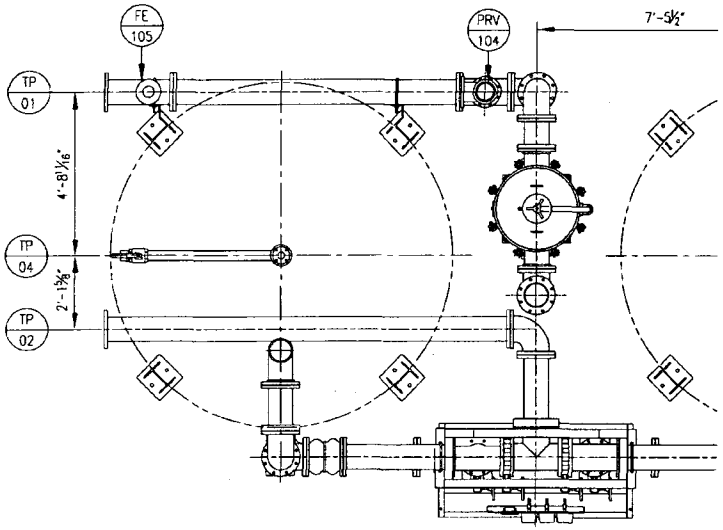

FEED INLET
1/4" V116
1/4" V117
8"-INF-FDI1-100
FQI
FE
PF-1
10 MICRON
RACK BOUNDARY
VESSEL A
120" DIA. x 64" STR. SIDE
VESSEL B
120" DIA. x 64" STR. SIDE
1/2" V112
PI 100
AP
3/8" V113
PIPE TO GRADE
3/4"-VNT-TP80-106
3/4" V106
3/4"-VNT-TSS4-107
3/4" V109
3/4"-VNT-TP80-206
3/4" V206
3/4"-VNT-TSS4-207
3/4" V209
MW 14"x18"
75 PSIG
EPOXY LINED (NSF.61)
3"-FM-TP80-104
3"-FM-TP80-204
3" V104
3" V204
8" V100
8" V200
8" V103
8" V203
8" V102
8" V202
8" V101
8" V201
PI 101
1/2" V114
3/8" V115
PI 201
1/2" V214
3/8" V215
3" V105
2" V118
DRAIN
2" V218
3" V205
MEDIA SLURRY OUTLET
3"-SM-TP80-105
3"-SM-TP80-205
8"-EFF-FDI1-101
OUTLET/DRAIN

SHIPPING: 12,025 lbs.	SHIPPING: 2,255 lbs.
OPERATING: 66,880 lbs.	OPERATING: 2,730 lbs.

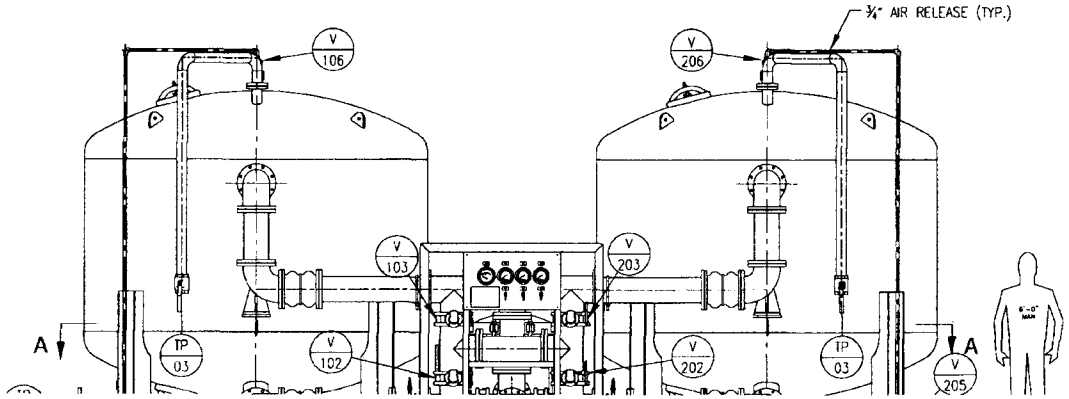
TRENCHES, ETC.
VALVE RACK, BAG FILTER AND

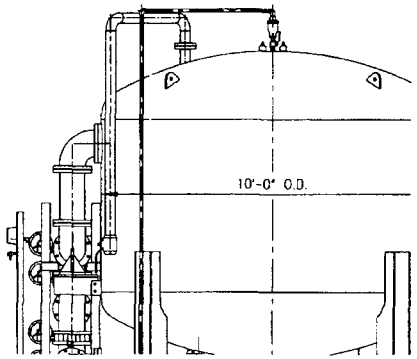


PLAN VIEW



SECTION A-A





SolmeteX™ A Division of Layne Christensen 50 Bearfoot Road Northborough, MA 01532 800-216-5505 508-393-5115	**Material Safety Data Sheet** complies with OSHA's Hazard Communication Standard, 29 CFR 1910.1200

IDENTITY (As Used on Label and List)		**LayneRT** Hybrid Ion Exchange Resin
CAS #		

SECTION 1 Manufacturer's Name & Contact Information		**SolmeteX Hazard Rating**		**Scale**
SolmeteX *A Division of Layne Christensen* 50 Bearfoot Road Northborough, MA 01532 , USA	Emergency Telephone Number: 508-393-5115 Telephone # for Information: 508-393-5115	Toxicity	1	4 = Extreme 3 = High 2 = Moderate 1 = Slight 0 = Insignificant
		Fire	1	
		Reactivity	0	
		Special	-	
	Date Prepared: February 2009			

SECTION II Ingredients/Identity Information

Components (Specific Chemical Identity: Common Name(s))	OSHA	PEL	ACGIH TLV	Other Limits
Quaternary amine styrene divinylbenzene copolymer in the Sulfate/Iron Oxide Form – 35% - 65% Water – 35% - 65%	N/A	N/A	N/A	N/A

SECTION III Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H_2O = 1)	Approx 1.6	Solubility in Water	Negligible
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (Butyl Acetate =	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Appearance and Odor	Spherical beads dark brown, slight amine odor when new		

SECTION IV Fire and Explosion Hazard Data

Flash Point (Method Used)	None	Flammable Limits auto/ign. 427°C / 800° F (estimated) No flash point	LEL	UEL
			N/A	N/A
Extinguishing Media		CO_2, Dry chemical, Water fog		
Special Fire Fighting Procedures		Wear MSHA /NIOSH approved, pressure demand, self contained breathing apparatus		
Unusual Fire and Explosion Hazards		None		

SECTION V - Reactivity Data

Stability	Stable	Conditions to Avoid	Avoid temperatures over 220°C (424°F)
Incompatibility (Materials to Avoid)		Avoid contact with concentrated nitric acid, or strong oxidizing agents.	
Hazardous Decomposition or Byproducts		CO, CO_2, Styrene monomer, $N(CH_2OH)$, NH_3, Divinylbenzene	
Hazardous Polymerization	Will not occur	Conditions to Avoid	N/A

SECTION - VI Health Hazard Data

Route(s) of Entry: N/A	Inhalation?	N/A	Skin?	N/A	Ingestion?	N/A
Health Hazards (Acute and Chronic)	Eye Contact: Like other foreign bodies, particles may cause mechanical irritation of the eye					
Carcinogenicity: N/A	NTP?	N/A	IARC Monographs?	N/A	OSHA Regulated?	N/A
Signs and Symptoms of Exposure	N/A					
Medical Conditions Generally Aggravated By Exposure	Eye Contact: Like other foreign bodies, particles may cause mechanical irritation of the eye					
Emergency and First Aid Procedures	Eye contact: Flush with large amount of water for at least 15 minutes. Consult physician if irritation persists					

SECTION VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled:

Resin beads on floor may mechanically cause floor to be slippery. Use care to avoid falls. Sweep up and transfer to containers for recovery or disposal

Waste Disposal Method	Dispose of in accordance with Federal, State and Local Regulations
Precautions to be Taken in Handling and Storing:	Keep drums and plastic bags sealed to prevent drying or moisture loss.
Other Precautions:	Store below 49° (120°F) and above 0°C (32°F)

SECTION VIII - Control Measures

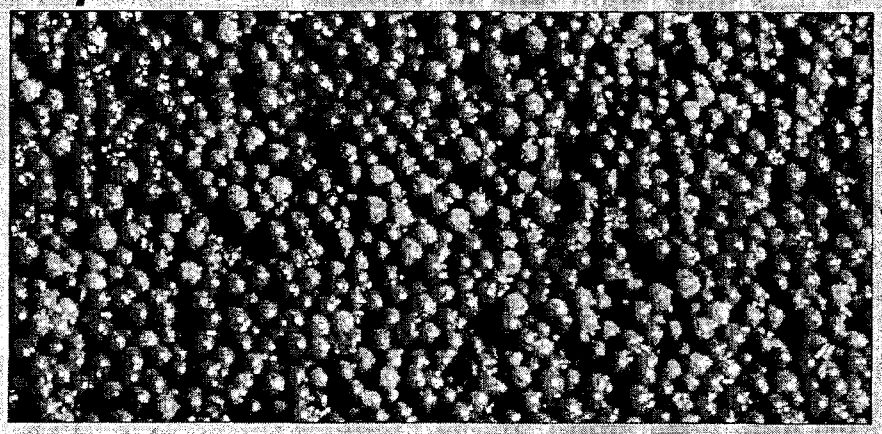
Respiratory Protection (Specify Type)	None			
Ventilation	Local Exhaust	Normal room ventilation	Special	N/A
	Mechanical (General)	N/A	Other	N/A
Protective Glove:	Cloth gloves	Eye Protection:	Safety glasses (ANSI Z 87.1)	
Other Protective Clothing or Equipment	None			
Work/Hygienic Practices	Cleanliness is recommended.			

SECTION IX – Regulatory Information

Workplace Classification: http://www.osha.gov/OshStd_toc/OSHA_Std_toc.html	Non-Hazardous under 29 CFR 1910.1200
DOT Classification: http://www.dot.gov/	Non-Regulated under 49 CFR 172.101 (Class 50 – Harmonized Code 3914.00.0000)
RCRA Hazardous Waste No: http://www.epa.gov/rcraonline/	Not Listed (40 CFR 261.33)
CERCLA Hazardous Substance: http://www.epa.gov/superfund/whatissf/cercla.htm	Not Listed (40 CFR 302.4)
SARA Toxic Chemical: http://www.epa.gov/swercepp/rules/epcra.html	Not Listed (40 CFR 372.65)
SARA Extremely Hazardous Substance:	Not Listed (40 CFR 355)
OSHA Specifically Regulated Substance: http://www.osha.gov/	Not Listed (29 CFR 1910)
TSCA Status: http://www.epa.gov/region5/defs/html/tsca.htm	Listed on the TSCA Inventory

Arsenic Removal

LayneRT Arsenic Removal Media



Meet the Arsenic MCL Using the Best Arsenic Removal Media Available

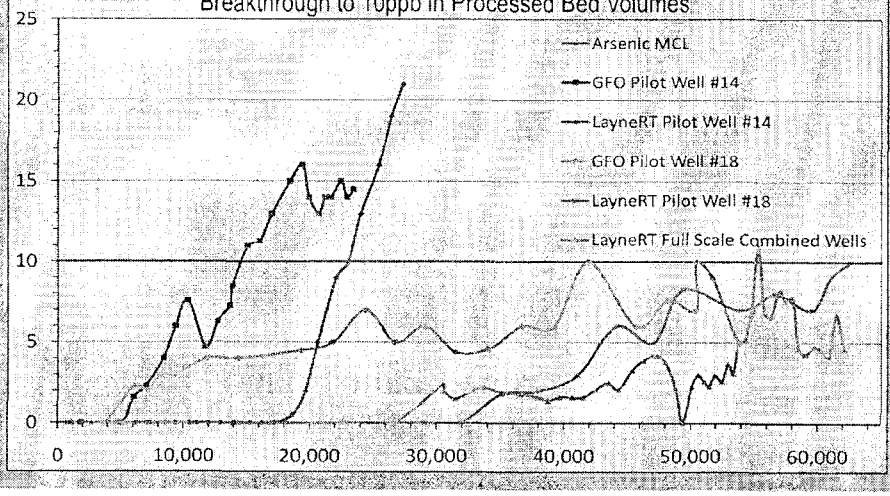
The LayneRT difference: LayneRT has been developed as a significant improvement on the efficiency and longevity of adsorptive arsenic media, thus lowering the operating cost associated with removing arsenic (arsenate and arsenite) from water. Its ideal blend of selectivity and durability means that LayneRT can reliably and efficiently reduce arsenic to safe consumption levels.

LayneRT is a long lasting, high capacity technology that provides rapid adsorption kinetics without generating any fines. Not only does LayneRT provide optimal flow dynamics, no backwashing (no onsite residuals), and a low pressure drop, but it is also regenerable, thereby mitigating the liability associated with waste disposal.

LayneRT Out-Performs All Current Technologies

Sahuarita Water Company - Centralized Arsenic Treatment System

Breakthrough to 10ppb in Processed Bed Volumes



The LayneRT Difference:

- NSF/ANSI Standard 61 Certified
- Longest lasting
- Highest capacity
- Lowest operating cost
- Proven iron chemistry
- No fines
- No backwash
- Regenerable
- Limits liability associated with disposal
- Optimal flow dynamics
- Rapid adsorption kinetics
- Low pressure drop
- Spent media passes Toxicity Characteristic Leaching Procedure (TCLP)

LayneRT™

Certified to NSF/ANSI 61

Layne Christensen Company

Water Technologies:
Define.
Develop.
Deliver.

Comparison of Arsenic Sorbents

Sorbent	LayneRT	GFO/Sorb33	GFH	Adsorbsia
Company	Layne Christensen	Severn Trent, AdEdge	Siemens	Dow
Material	Hybrid Resin Bead	Granular	Granular	Granular
Backwash	Not Required	Yes	Yes	Yes
Arsenic Residuals	No residuals or fines	Yes-backwashed fines	Yes-backwashed fines	Yes-backwashed fines
Disposal	Regenerable/Return/Landfill	Landfill	Landfill	Landfill
Regenerable	Yes	No	No	No
Minimum Contact Time	2 minutes	4 minutes	4 minutes	2 minutes
Chemistry	Hydrous Iron Oxide	Hydrous Iron Oxide	Hydrous Iron Oxide	Titanium Dioxide

Material: LayneRT is comprised of a hybrid resin bead that is attrition resistant and does not generate fines. Media comprised of granulated materials are friable and generate fines, which can lead to increased backpressure during operation requiring backwash, additional system complexity and more frequent maintenance.

No Backwash Required: Backwash requirements add operational complexity, and generate fines containing an arsenic residual.

Arsenic Residuals: LayneRT requires no backwash and does not generate arsenic-containing fines.

Disposal: LayneRT in residential systems may be returned for environmentally responsible disposal. Spent LayneRT in municipal systems is regenerable. Although most spent media pass TCLP, research supports that they leach arsenic under actual landfill conditions. "TCLP Underestimates Leaching of Arsenic from Solid Residuals Under Landfill Conditions" Ghosh A., Mukhibi M., Ela W., Environ. Sci. Technol., 2004, 38(17), pp 4677-82.

Regenerable: Regeneration lowers long-term operating and maintenance costs and reduces the volume of solid waste disposal by a factor of ten!

Minimum Contact Time: A lower contact time enables systems using LayneRT to have a smaller system footprint, reducing facility requirements and system costs.

Chemistry: Hydrous metal oxides are the industry accepted chemistry for binding arsenic.

Characteristic	Value
Structure	Macroporous Polystyrene Bead
Functional Group	Hydrous Iron Oxide
Bulk Density (as sold)	790–840 g/l (49–52 lb/cu.ft)
Specific Gravity	1.25–1.30 g/ml
Minimum Contact Time	2 minutes
Operating Temperature Range	1-80° C (33–172° F)
Particle Size	300–1200 microns
Operating pH Range	5.5–8.5

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All services and products of Layne Christensen Company are subject to change without notice.

The Layne Media Assurance Program

The annual media regeneration costs of PES systems using LayneRT can be determined by completing a pilot test. Our Pilot/Performance program is unique in the industry and is illustrative of our confidence in our technologies and in the systems that we install. Pilot evaluations, which are usually completed in 3-6 months, provide enough information for Layne to warrant your annual media regeneration costs.

Contact your
Layne Christensen Company
water technologies representative:

877-358-8813
www.laynechristensen.com

BR-LAYNERT 06-11 supercedes BR-LAYNERT 01/11

Comparison of Arsenic Sorbents

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Regenerable	Yes	No	No	No
Minimum Contact Time	2 minutes	4 minutes	4 minutes	2 minutes
Chemistry	Hydrous Iron Oxide	Hydrous Iron Oxide	Hydrous Iron Oxide	Titanium Dioxide

Material: LayneRT is comprised of a hybrid resin bead that is attrition resistant and does not generate fines. Media comprised of granulated materials are friable and generate fines, which can lead to increased backpressure during operation requiring backwash, additional system complexity and more frequent maintenance.

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Arsenic Residuals: LayneRT requires no backwash and does not generate arsenic-containing fines.

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Chemistry: Hydrous metal oxides are the industry accepted chemistry for binding arsenic.

The Layne Media Assurance Program

The annual media regeneration costs of PES systems using LayneRT can be determined by completing a pilot test. Our Pilot/Performance program is unique in the industry and is illustrative of our confidence in our technologies and in the systems that we install. Pilot evaluations, which are usually completed in 3-6 months, provide enough information for Layne to warrant your annual media regeneration costs.

Characteristic	Value
Structure	Macroporous Polystyrene Bead
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Bulk Density (as sold)	790–840 g/l (49–52 lb/cu.ft)
Specific Gravity	1.25–1.30 g/ml
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Particle Size	300–1200 microns
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water technologies representative:

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BR-LAYNERT 06-11 supercedes BR-LAYNERT 01/11

LayneRT Arsenic Removal Media

The LayneRT Difference

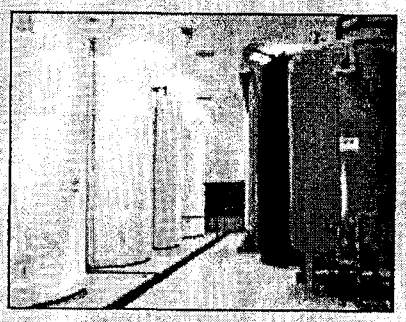
- NSF/ANSI Standard 61 Certified
- Longest lasting
- Highest capacity
- Lowest operating cost
- Proven iron chemistry
- No fines
- No backwash
- Regenerable
- Limits liability associated with disposal
- Optimal flow dynamics
- Rapid adsorption kinetics
- Low pressure drop
- Spent media passes Toxicity Characteristic Leaching Procedure (TCLP)

Media Assurance Program

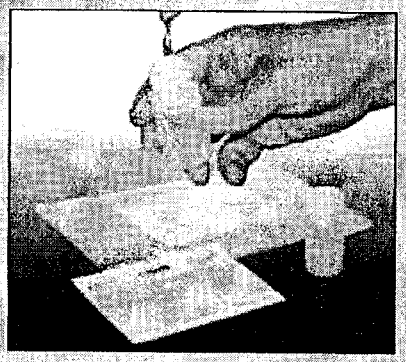
The annual media regeneration costs of Pre-Engineered Systems (PES) using LayneRT can be determined by completing a pilot test on the site to be treated.

Our Pilot/Performance program is unique in the industry and is illustrative of our confidence in our technologies and in the systems that we install.

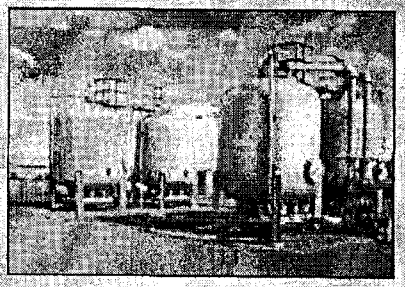
Pilot evaluations, which are usually completed in 3-6 months, provide enough information for Layne to warrant your annual media regeneration costs under certain conditions.



The LayneRT Media Regeneration Facility located in Phoenix, Arizona.



Layne offers free arsenic monitoring.



LayneRT arsenic removal system installed for Sahuarita Water Company in southern Arizona.

Variables Affecting Arsenic Removal From Drinking Water

Media used for arsenic removal is affected by a number of water parameters. To provide a life estimate, Layne requires a full water analysis that must include arsenite (As(III)), arsenate (As(V)), pH, silica, phosphate, iron, and manganese.

Total Arsenic - Total arsenic concentration above 0.30 mg/L will reduce media life.

Arsenite As(III) - The arsenic removal media removes both As(III) and As(V) but has approximately four times the capacity for As(V) over As(III). If arsenite is present it is recommended to oxidize the water ahead of the arsenic removal media.

pH - Adsorption media operate most effectively between 5.5-8.5. The media will reduce arsenic outside of this range but the capacity may be compromised. At elevated pH, silica becomes a more aggressive interfering species. Note: Do not use organic acids (such as citric or acetic) to adjust the pH ahead of the media.

Silica - Levels above 20 mg/L begin to interfere with media arsenic adsorption when combined with a pH above 7.5.

Phosphate - Levels above 0.15 mg/L will reduce media life for arsenic adsorption.

Iron and Manganese - Soluble iron and manganese may precipitate onto the media bed. If iron and manganese are above the secondary MCLs (0.30 mg/L and .050 mg/L respectively), it is recommended to filter them before the arsenic removal system.

Hardness - Does not affect the performance of the arsenic removal media.

Contact your
Layne Christensen Company
water technologies representative:

877-358-8813
www.laynechristensen.com

Water Quality Association
International Headquarters & Laboratory

4151 Naperville Road
Lisle, Illinois 60532-3696 USA
Phone 630 505 0160
Fax 630 505 9637
www.wqa.org

A not-for-profit organization

GOLD SEAL CERTIFICATE

This is to certify that the drinking water system component herein has been independently tested and certified by the Water Quality Association in accordance with "Drinking Water System Components - Health Effects," NSF/ANSI-61. The material safety of the component listed has earned the Gold Seal.

Manufacturer:	SolmeteX, Inc., A Division of Layne Christensen
Address:	50 Bearfoot Road Northborough, MA 01532
Model:	LayneRT
Brand:	N/A
Product Type:	Adsorption Media
Size:	14-52 Mesh
Water Contact Temp:	CLD 23
Water Contact Material:	SYN
Listing Notes:	This adsorption media has a minimum flow rate requirement of 0.46 gpm per cubic foot of media.
AB 1953 Complaince:	Not Evaluated
Certificate Type:	Final
Issue Date:	Friday, February 27, 2009
Expiration Date:	Monday, June 01, 2009
Test Unit Number	6042.0802C.01
Certificate Number:	CRT.120108.60420802C01.R1

Joseph F. Harrison

Joseph F. Harrison, P.E., CWS-VI

10 March 2009

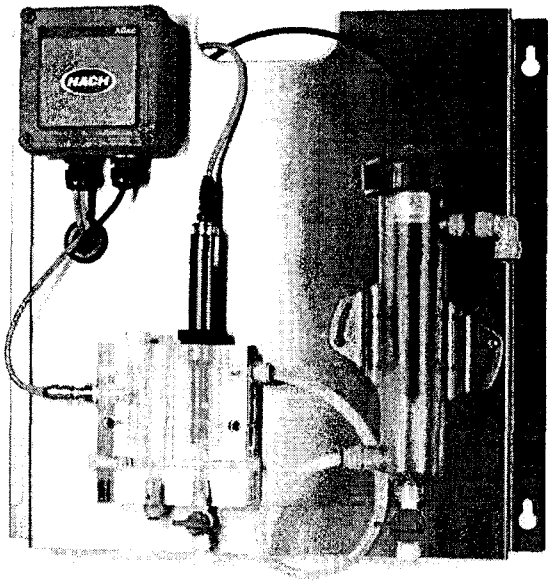
Effective Date

APPENDIX F

Hach Chlorine Residual Analyzer Cut Sheets

CLF10 sc and CLT10 sc Free and Total Reagentless Chlorine Analyzers

EPA COMPLIANT



From the leaders in disinfection monitoring, the right instrument for reagentless chlorine analysis.

Overview

With over 60 years of industry leadership, Hach provides you with the best products and application knowledge for chlorine monitoring. Our portfolio includes the CLF10 sc and CLT10 sc reagentless chlorine analyzers and the market-leading CL17 chlorine analyzer, as well as Hach laboratory colorimeters, spectrophotometers and chemistries. Let Hach guide you to the best disinfection solution.

Features and Benefits

Exclusive Self Diagnostics

The CLF10 sc and CLT10 sc analyzers leverage Hach's exclusive self diagnostics to alert users whether the process has changed or the instrument needs servicing. Diagnostic features include the Cal Watch algorithm for warning of pH and chlorine calibration deviation and a non-contacting flow sensor for notification of insufficient sample flow.

No Reagent Replacement, No Waste Stream

Chlorine measurement with an amperometric analyzer, such as the CLF10 sc or CLT10 sc, does not require reagents, eliminating the need for routine reagent replacement and waste stream management.

Real-Time Process Control

The CLF10 sc and CLT10 sc analyzers allow for real-time control of disinfection processes by providing continuous readings that indicate when treatment conditions have changed.

Compatible with Hach's "Plug and Play" Digital Controllers

The CLF10 sc and CLT10 sc analyzers can be used with any Hach sc digital controller. Whether you're measuring turbidity or chlorine, you only need to learn one controller for all your water analysis measurement points. Hach sc controllers, have no complicated wiring or setup procedures. Just plug in any Hach digital sensor and it's ready to use without software configuration.

EPA Compliant According to Method 334.0

In accordance with EPA Method 334.0, the CLF10 sc and CLT10 sc analyzers can be used for reporting chlorine residual measurements. Additionally, Hach has created a suite of laboratory products and methods to help with startup and quality control procedures required in Method 334.0. (See page 4 for a partial listing of accessories.)

Applications

The CLF10 sc and CLT10 sc analyzers are best suited for static applications where sample pH, flow, temperature and chlorine concentration are stable. Hach recommends these analyzers for trending in dynamic applications where these parameters vary. Be sure to consult a Hach application expert to match the best instrument to your application.

Drinking Water— The CLF10 sc and CLT10 sc analyzers can be used in applications where waste stream management is a challenge, such as residual chlorine monitoring in ground water systems and the distribution system. Additionally, these analyzers can be used for process control in at-the-plant applications where real-time continuous results are beneficial.

Power Plants— The CLF10 sc and CLT10 sc analyzers can be used for the control of disinfection processes in boiler operations and cooling systems.

General Industrial— The CLF10 sc and CLT10 sc analyzers can be used to monitor chlorine residual to prevent biological build-up in applications serving various industrial processes (feed water), HVAC operations (cooling water), or in food and beverage applications.

Wastewater— The total chlorine analyzer, CLT10 sc, can be used to monitor chlorine residual and control chlorination processes in wastewater treatment. For this application, Hach recommends using the acidification/cleaning kit to ensure continuous operation.

Specifications*

Chlorine Sensor

Measurement Range
0 to 10 ppm

Lower Limit of Detection (LOD)
30 ppb (0.03 ppm) or lower

Limit of Quantitation (LOQ)
90 ppb (0.09 ppm) or lower

Resolution
0.001 ppm (1 ppb)

Accuracy
Free Chlorine:
- ±3% of the reference test** (DPD) at constant pH less than 7.2 (±0.2 pH unit)
- ±10% of the reference test** (DPD) at stable pH less than 8.5 (±0.5 pH unit from the pH at calibration)

Total Chlorine:
- ±10% of the reference test** (DPD) at stable pH less than 8.5 (±0.5 pH unit from the pH at calibration)
- ±20% of the reference test** (DPD) at stable pH greater than 8.5

Repeatability
30 ppb or 3%, whichever is greater

Response Time
Free Chlorine: 140 seconds or less for 90% change (T90) at a stable temperature and pH

Total Chlorine: 100 seconds or less for 90% change (T90) at a stable temperature and pH

Sampling Time
Continuous

Interferences
Free Chlorine: Monochloramine, chlorine dioxide, ozone, and chalk deposits

Total Chlorine: Chlorine dioxide, ozone, and chalk deposits

Pressure Limit
0.5 bar, no pressure impulses and/or vibrations

Sample Flow Rate
30 to 50 L/hour (7.9 to 13.2 gal/hour),
Optimal is 40 L/hour (10.5 gal/hour)

Sample pH
4-9

Sample Temperature (compensated for fluctuations)
5 to 45°C (41 to 113°F)

Temperature Compensation
Internal temperature sensor

Storage Temperature
Sensor: 0 to 50°C (32 to 122°F) dry, without electrolyte

Electrolyte: 15 to 25°C (59 to 77°F)

Power Requirements
12 Vdc, 30 mA maximum (supplied by controller)

Dimensions (sensor only)
195 mm (7.68 in.)/25 mm (0.98 in.) (length/diameter)

Cable Length
1 m (between gateways and sc-controller)

Cable Connection
5 pin, M12 connector

Measurement Method
Reagentless, electrochemical, three-electrode amperometric system

Calibration Methods
1-point or 2-point (zero and slope) calibration

Material
Corrosion-resistant materials, fully-submersible (stainless steel, PVC, silicon rubber and polycarbonate)

Warranty
1-year warranty on the electrode body, includes the electronics

Panel (including SS Panel, Gateway, Chlorine Sensor Flow Cell, pH Sensor Flow Cell)

Operating Temperature
0 to 45°C (32 to 113°F)

Storage Temperature (panel only)
-20 to 60°C (-4 to 149°F)

Power Requirements
12 Vdc ±10%, at 100 mA maximum (supplied by sc controller)

Mounting
Flat, vertical surface

Connections
Sample Line: 1/4-inch OD

Drain Line (pH Flow Cell Outlet): 1/2-inch ID

Panel Dimensions
Length 482.6mm (19 in.) x Width 495.3mm (19.5 in.) x Depth 151.2mm (5.95 in.) (with panel-mounted components)

Weight
Approximately 5.5 kg (12 lbs)
(panel and empty panel-mounted components only)

Controller Platform
sc controller models

Complete Analyzer (Panel + Sensor)

Waterproof Rating
Current rating for Sc100/1000/200 controllers, gateway, and sensors – IP65 (NEMA 4X)

Certification
CE / ETL, EMC

Shipping Weight
Approximately 9.1 kg (20 lbs)

***Reference measurement must be conducted at the analyzer sampling point.*

**Specifications subject to change without notice.*

Principle of Operation

Amperometry is an electrochemical technique that measures the change in current resulting from chemical reactions taking place on the electrodes. The generated current is proportional to the analyte concentration. A typical amperometric sensor consists of two dissimilar electrodes—an anode and a cathode (i.e. silver/platinum or copper/gold, respectively).

Typically, the electrodes are covered with a membrane cap containing electrolyte, providing for better selectivity of the analysis. Additionally, a small constant electrical voltage is applied across the electrodes.

Below is a general schematic of the reduction-oxidation reaction taking place in a simple 2-electrode amperometric system:

Cathode (working electrode):

$HOCl + H^+ + 2\bar{e} \rightarrow Cl^- + H_2O$ (reduction of hypochlorous acid)

Anode (reference electrode):

$Cl^- + Metal \rightarrow Metal\text{-}Cl + \bar{e}$ (oxidation of the anodic material)

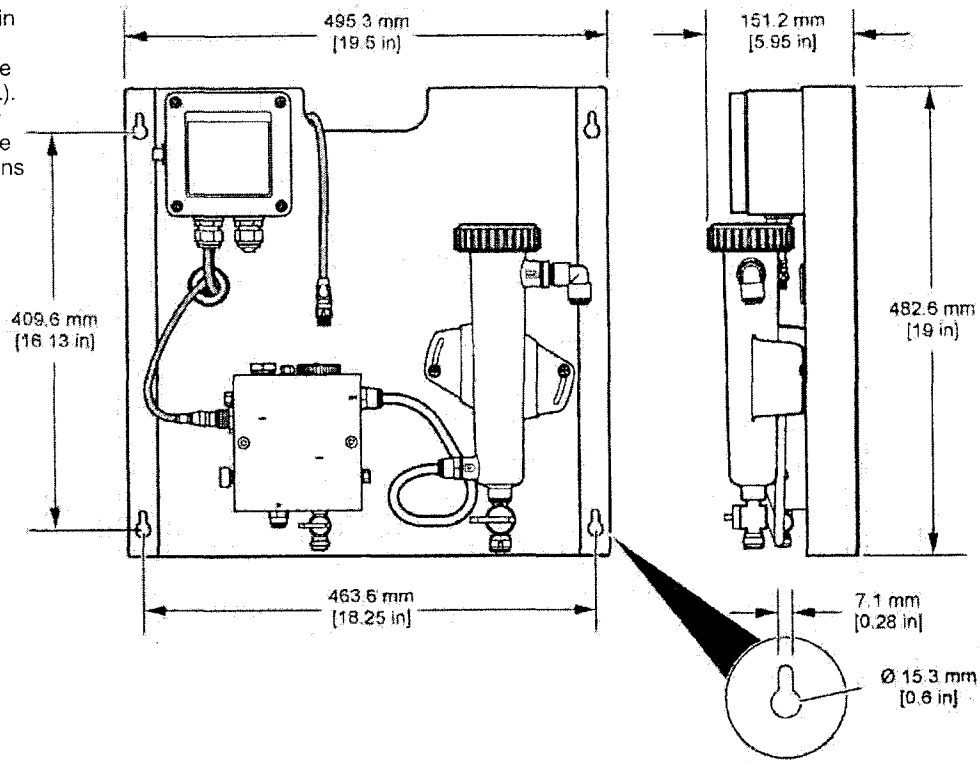
In a three-electrode amperometric system, such as used in the CLF10 sc and CLT10 sc, the anode is essentially split into two parts—a reference and an auxiliary (or counter) electrode. These systems are always supported by special electrical circuit directing the voltage between all electrodes. The three-electrode design generally makes the measurements more stable and provides longer life for the working and reference electrodes.

Engineering Specifications

1. The analyzer shall come with a rugged corrosion resistant mounting panel bearing pre-mounted equipment to provide easy installation.
2. The instrument shall be a continuous-reading analyzer that utilizes amperometric technology with a three-electrode sensor design.
3. The measurement range shall be 0 to 10 ppm of (free or total) chlorine in relation to a standard reference method.
4. The response time (T90) shall be 140 seconds or less.
5. The low Limit of Detection (LOD) shall be 0.03 ppm or lower.
6. The Practical Limit of Quantitation (PLOQ) shall be 90 ppb or lower
7. The instrument shall be equipped with a flow-through cell containing a non-contacting flow sensor.
8. The instrument shall provide both visual and electronic notification of insufficient sample flow.
9. The instrument shall provide chlorine residual measurements within sample pH range of 4 to 9 and temperature range of 5 to 45 degrees Celsius or 41 to 113 degrees Fahrenheit.
10. The sensor shall internally compensate for the sample temperature and pH fluctuations.
11. The analyzer shall provide monitoring for pH and/or chlorine measurement deviations using Hach Calibration Watch algorithm.
12. The analyzer shall provide reagent-free operation without the need for sample conditioning in clean water applications.
13. The instrument shall be connected to a controller from the Hach sc controller family.
14. The analyzer shall be compatible with the optional Hach cleaning system.
15. The instrument shall be the CLF10 sc or CLT10 sc analyzer manufactured by Hach Company.

Dimensions

The analyzer should be installed in an accessible location. It can be mounted on a flat, vertical surface (such as a wall, panel, stand, etc.). It should allow for access for any checking or maintenance. Sample flow should meet the specifications on previous page.



Ordering Information

CLF10 sc Free Chlorine Sensor with sc200 Controller and SS Panel

2980900	CLF10sc, sc200 Single Input, pHD
2981000	CLF10sc, sc200 Single Input, Combo pH
2981100	CLF10sc, sc200 Single Input, Grab Sample
2982200	CLF10sc, sc200 Dual Input Combo pH
2982100	CLF10sc, sc200 Dual Input, pHD
2982300	CLF10sc, sc200 Dual Input, Grab Sample
2981200	CLF10sc, sc200 Single Input, pHD, Metric
2981300	CLF10sc, sc200 Single Input, Combo pH, Metric
2981400	CLF10sc, sc200 Single Input, Grab Sample, Metric
2982400	CLF10sc, sc200 Dual Input, pHD, Metric
2982500	CLF10sc, sc200 Dual Input, Combo pH, Metric
2982600	CLF10sc, sc200 Dual Input, Grab Sample, Metric
2987500	CLF10sc, sc200 Single Input, pHD, 24 Vdc, Metric
2987600	CLF10sc, sc200 Single Input, Combo pH, 24 Vdc, Metric
2987700	CLF10sc, sc200 Single Input, Grab Sample, 24 Vdc, Metric

CLT10 sc Total Chlorine Sensor with sc200 Controller and SS Panel

2981500	CLT10sc, sc200 Single Input, pHD
2981600	CLT10sc, sc200 Single Input, Combo pH
2981700	CLT10sc, sc200 Single Input, Grab Sample
2982700	CLT10sc, sc200 Dual Input, pHD
2982800	CLT10sc, sc200 Dual Input, Combo pH
2982900	CLT10sc, sc200 Dual Input, Grab Sample
2981800	CLT10sc, sc200 Single Input, pHD, Metric
2981900	CLT10sc, sc200 Single Input, Combo pH, Metric
2982000	CLT10sc, sc200 Single Input, Grab Sample, Metric
2983000	CLT10sc, sc200 Dual Input, pHD, Metric
2983100	CLT10sc, sc200 Dual Input, Combo pH, Metric
2983200	CLT10sc, sc200 Dual Input, Grab Sample, Metric
2987400	CLT10sc, sc200 Single Input, pHD, 24 Vdc, Metric
2987800	CLT10sc, sc200 Single Input, Combo pH, 24 Vdc, Metric
2987900	CLT10sc, sc200 Single Input, Grab Sample, 24 Vdc, Metric

Note: See LIT #2665 for more information about the combinations possible with the sc200.

CLT10 sc Total Chlorine Analyzer Panel Only

LXV45B.99.13022	w/ pHD Differential Sensor
LXV45B.99.12022	w/ pH Combination Sensor
LXV45B.99.11022	Grab Sample Only

Metric sizing available for all configurations.

Accessories

LZY051	Acidification/Cleaning Kit
9159900	Sample Conditioning Kit
9181500	pHD Differential Analog pH Sensor, Ryton
9181600	Combination Analog pH Sensor, Ryton

Replacement Parts

9150400	Sensor, Free Chlorine
9150300	Sensor, Total Chlorine
9160200	Membrane Replacement Kit, Free Chlorine Sensor
9180900	Membrane Replacement Kit, Total Chlorine Sensor
9160600	Electrolyte, Free Chlorine Sensor 100 mL
9181400	Electrolyte, Total Chlorine Sensor 100 mL

Lab Products for Method 334.0

5870062	Pocket Colorimeter II System, Chlorine MR/HR
1426810	Chlorine Standard Solution, 10-mL Voluette® Ampule, 50–75 mg/L 16/pkg
2980500	DPD Chlorine-MR Spec✔ Secondary Standards Kit

For more information on this method, please visit: www.hach.com/method334

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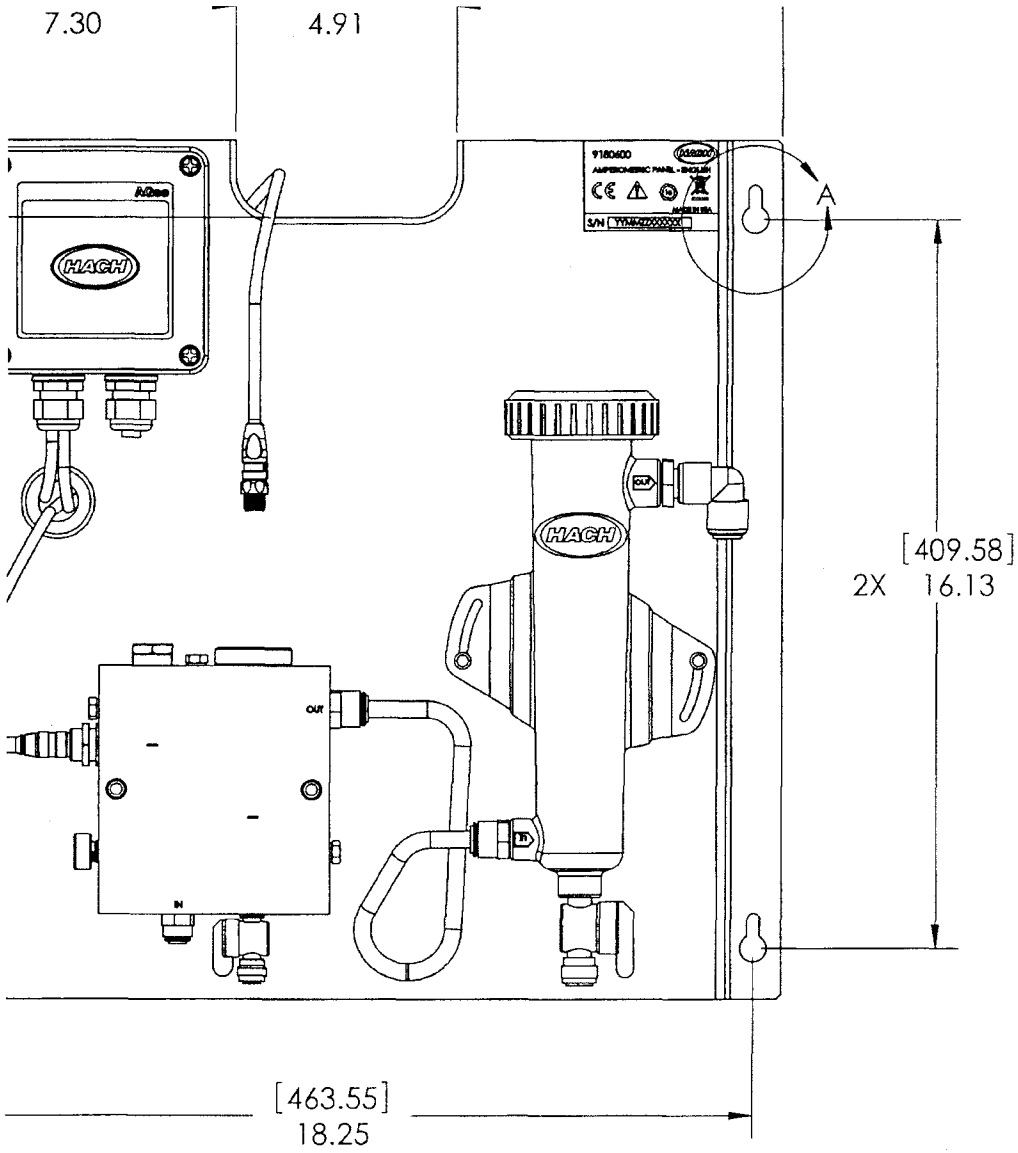

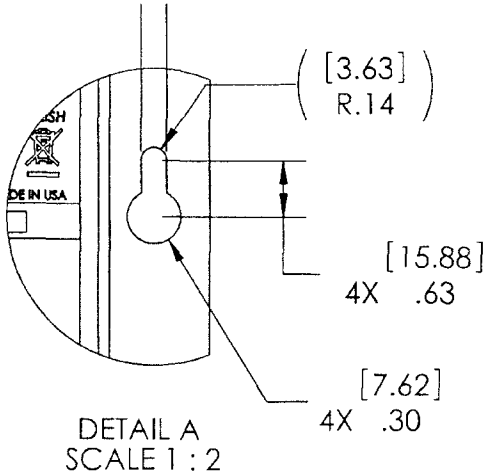

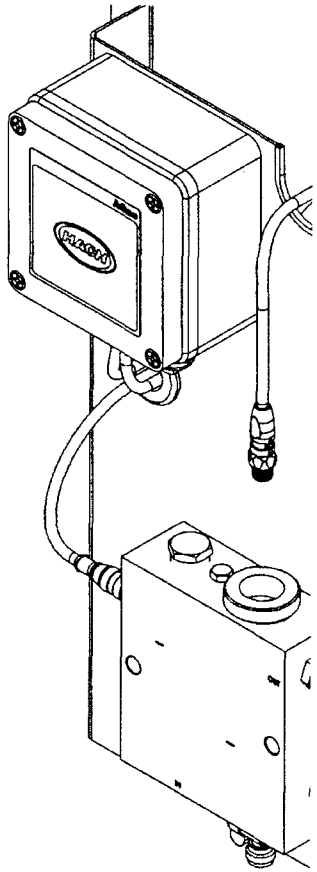

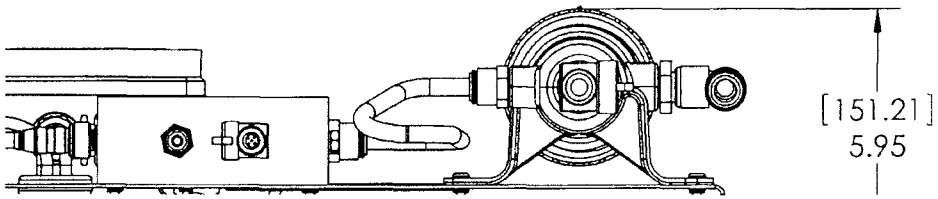

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MATERIAL	UNLESS OTHERWISE SPECIFIED:		NAME	DATE
	DIMENSIONS ARE IN INCHES TOLERANCES: .X = ±.03 .XX = ±.01 .XXX = ±.005 ANGLES = ± 25°	DRAWN		
		ENGINEER		
		THIRD ANGLE PROJECTION		TITL

APPENDIX G

System Comparison Calculations and Cost Estimates

Severn Trent Arsenic Treatment System Cost Analysis

Cost Analysis without pH Adjustment

1. Media replacement cost estimate without pH adjustment

Design BV:		94,000	per vessel	
Vessel volume:		267	cf	
Design treatment flow:		850	gpm	
Treated water volume per cycle =94,000*267*7.48 =		187,733,040	gallons per vessel	
2 vessels treated water volume:		375,466,080	gallons	
Treated time=375,466,080 ga/850 gpm =		441,725	minutes,=	10.23 months
Media unit cost:	$	205	per cubic ft	
Media replacement cost =267*2*$205 =	$	109,470	per vessel cycle	
Monthly media cost =$109,470/10.23 =	$	10,706		
Annual media cost =$10,706*12 =	**$**	**128,472**		
Daily cost =$128,472/365 =	**$**	**352**		

2. Treated water volume per cubic ft media 703,120 gal/cf

3. Treated water cost per 1000 gal: $ 0.34

4. Capital cost per GPM design flow

Capital cost:	$	354,675
Unit capital cost without pH adjustment:	$	417

Cost Analysis with pH Adjustment

1. Sulfuric acid feed cost estimate

Purpose:	To adjust water pH for increasing arsenic removal.			
Annual usage:		4636	gallons 93% sulfuric acid	
Bulk Price:	$	0.28	lbs	
Specific gravity		1.84		
Acid weight:		115	lbs/cf,=	15.3 lbs/gal
Price per gallon:	$	4.22		
Annual cost:	$	19,569		

other incidental operating cost:	$	2,500
Total cost:	**$**	**22,069**

2. Media replacement cost estimate

Design BV:		128,000	per vessel
Vessel volume:		267	cf
Design flow:		850	gpm
Treated water volume per cycle:		255,636,480	gallons per vessel
2 vessels treated water volume:		511,272,960	gallons
Treated time:		601,498	minutes,= 13.92 months
Media unit cost:	$	205	per cubic ft
Media replacement cost:	$	109,470	per vessel cycle
Monthly media cost:	$	7,862	
Annual media cost:	**$**	**94,347**	

3. Treated water volume per cubic ft media 957,440 gal/cf

4. Treated water cost per 1000 gal: $ 0.18

5. Capital cost per GPM design flow

Capital cost:	$	378,975
Unit capital cost with pH adjustment:	$	446

6. BV comparisons

Severn Trent BV without pH adjustment=	94000	
Siemens BV without pH adjustment=	55000	
Layne Christensen BV without pH adjustment=	68000	
Severn Trent BV with pH adjustment=	128000	
Siemens BV with pH adjustment=	110000	
Layne Christensen BV with pH adjustment=	100000	
Severn Trent BV is :	71%	higher than Siemens without pH adjustment
	38%	higher than Layne Christensen without pH adjustment
	16%	higher than Siemens with pH adjustment
	28%	higher than Layne Christensen with pH adjustment

Siemens Arsenic Treatment System Cost Analysis

1. Sulfuric acid feed cost estimate

Purpose:		To adjust water pH for increasing arsenic removal.			
Annual usage:		4,636	gallons 93% sulfuric acid		
Bulk Price:	$	0.28	per lbs		
Specific gravity		1.84			
Acid weight =62.4*1.84 =		115	lbs/cf,=	15.3	lbs/gal
Price per gallon =15.3*0.28 =	$	4.22			
Annual cost =4636*$4.22 =	$	19,569			
other incidental operating cost:	$	2,500			
Total cost:	**$**	**22,069**			

2. Media replacement cost estimate without pH adjustment - 3 vessels full flow treatment

Design BV:		55,000	per vessel		
Vessel volume:		377	cf		
Design flow:		1700	gpm		
Treated water volume per cycle=55,000*377*7.48=		154,960,667	gallons per vessel		
3 vessels treated water volume:		464,882,000	gallons		
Treated time=464,882,000/1700 =		273,460	minutes,=	6.33	months
Media unit cost:	$	216	per cubic ft		
Media replacement cost =3*377*$216=	$	244,080	per vessel cycle		
Monthly media cost=$244,080/6.33=	$	38,559			
Annual media cost=$38,559*12=	**$**	**462,704**			

3. Media replacement cost estimate with pH adjustment -3 vessels full flow treatment

Design BV:		110,000	per vessel		
Vessel volume:		377	cf		
Design flow:		1700	gpm		
Treated water volume per cycle:		309,921,333	gallons per vessel		
3 vessels treated water volume:		929,764,000	gallons		
Treated time:		546,920	minutes,=	12.66	months
Media unit cost:	$	216	per cubic ft		
Media replacement cost:	$	244,080	per vessel cycle		
Monthly media cost:	$	19,279			
Annual media cost:	**$**	**231,352**			
Annual media and pH adjustment cost:	**$**	**275,491**			

4. Media replacement cost estimate without pH adjustment - 2 vessels

Design BV:		55,000	per vessel		
Vessel volume:		377	cf		
Design flow:		729	gpm		
Treated water volume per cycle:		154,960,667	gallons per vessel		
2 vessels treated water volume:		309,921,333	gallons		
Treated time:		425,132	minutes,=	9.84	months
Media unit cost:	$	216	per cubic ft		
Media replacement cost:	$	162,720	per vessel cycle		
Monthly media cost:	$	16,535			
Annual media cost:	**$**	**198,418**			

5. Media replacement cost estimate with pH adjustment -2 vessels

Design BV:		110,000	per vessel

Vessel volume:		377	cf		
Design flow:		729	gpm		
Treated water volume per cycle:		309,921,333	gallons per vessel		
2 vessels treated water volume:		619,842,667	gallons		
Treated time:		850,264	minutes,=	19.68	months
Media unit cost:	$	216	per cubic ft		
Media replacement cost:	$	162,720	per vessel cycle		
Monthly media cost:	$	8,267			
Annual media cost:	**$**	**99,209**			
Annual media and pH adjustment cost:	**$**	**121,279**			

6. Treated water volume per cubic ft media :		411400	gal/cf, 3 vessels without pH adjustment
		822800	gal/cf, 3 vessels with pH adjustment
		411,400	gal/cf, 2 vessels without pH adjustment
		822,800	gal/cf, 2 vessels with pH adjustment
7. Treated water cost per 1000 gal:	$	1.00	3 vessels without pH adjustment
	$	0.30	3 vessels with pH adjustment
	$	0.64	2 vessels without pH adjustment
	$	0.20	2 vessels with pH adjustment
8. Capital cost per GPM design flow			
Capital cost without pH adjustment:	$	783,000	3-vessel full flow treatment
Capital cost with pH adjustment:	$	807,300	3-vessel full flow treatment
Capital cost without pH adjustment:	$	495,000	2-vessel treatment/bypass/blend
Capital cost with pH adjustment:	$	519,300	2-vessel treatment/bypass/blend
Unit capital cost without pH adjustment:	$	461	3-vessel full flow treatment
Unit capital cost with pH adjustment:	$	475	3-vessel full flow treatment
Unit capital cost without pH adjustment:	$	582	2-vessel treatment/bypass/blend
Unit capital cost with pH adjustment:	$	611	2-vessel treatment/bypass/blend

Layne Christensen Arsenic Treatment System Cost Analysis

1. Sulfuric acid feed cost estimate

Purpose:		To adjust water pH for increasing arsenic removal.			
Annual usage:		4636	gallons 93% sulfuric acid		
Bulk Price:	$	0.28	lbs		
Specific gravity		1.84			
Acid weight:		115	lbs/cf,=	15.3	lbs/gal
Price per gallon:	$	4.22			
Annual cost:	$	19,569			
other incidental operating cost:	$	2,500			
Total cost:	**$**	**22,069**			

2. Media replacement cost estimate without pH adjustment

Design BV:		68,000	per vessel		
Vessel volume:		250	cf		
Design flow:		850	gpm		
Treated water volume per cycle=68000*250*7.48=		127,160,000	gallons per vessel		
2 vessels treated water volume:		254,320,000	gallons		
Treated time = 254,320,000/850 =		299,200	minutes,=	6.93	months
Certified regeneration cycles:		5			
Design regeneration cycles:		10			
Operating time based on certified reg cycles=6.93*5/12=		2.9	years		
Operating time based on design reg cycles=6.93*10/12 =		5.8	years		
Media unit regeneration cost:	$	160	per cubic ft		
Virgin media unit cost:	$	280	per cubic ft		
Media regeneration cost = 160*250*2 =	$	80,000	per regeneration cycle		
Media replacement cost =250*280*2 =	$	140,000	per replacement		
Equalized monthly replacement cost based on 5 cycles =$140,000/(6.93*5)=	$	4,043			
Equalized monthly replacement cost based on 10 cycles =$140,000/(6.93*10) =	$	2,021			
Monthly media cost based on 5 regen cycles =$4,043+ $80,000/6.93=	$	15,594			
Monthly media cost based on 10 regen cycles =$2,021+$80,000/6.93 =	$	13,572			
Annual media cost based on 5 regen cycles =$15,594*12 =	**$**	**187,123**			
Annual media cost based on 10 regen cycles = $13,572*12 =	**$**	**162,866**			

3. Media replacement cost estimate with pH adjustment

Design BV:		100,000	per vessel

Vessel volume:		250	cf		
Design flow:		850	gpm		
Treated water volume per cycle:		187,000,000	gallons per vessel		
2 vessels treated water volume:		374,000,000	gallons		
Treated time:		440,000	minutes,=	10.19	months
Certified regeneration cycles:		5			
Design regeneration cycles:		10			
Operating time based on certified reg cycles:		4.2	years		
Operating time based on design reg cycles:		8.5	years		
Media unit regeneration cost:	$	160	per cubic ft		
Virgin media unit cost:	$	280	per cubic ft		
Media replacement cost:	$	80,000	per vessel cycle		
Media replacement cost:	$	140,000	per replacement		
Equalized monthly replacement cost based on 5 cycles	$	2,749			
Equalized monthly replacement cost based on 10 cycles	$	1,375			
Monthly media cost based on 5 regen cycles:	$	10,604			
Monthly media cost based on 10 regen cycles:	$	9,229			
Annual media cost based on 5 regen cycles:	**$**	**127,244**			
Annual media with 5 cycle and pH adjustment cost:	**$**	**149,313**			
Annual media cost based on 10 regen cycles:	**$**	**110,749**			
Annual media with 10 cycle and pH adjustment cost:	**$**	**132,818**			

4. Treated water volume per cubic ft media :

508,640	gal/cf, without pH adjustment	
748,000	gal/cf, with pH adjustment	

5. Treated water cost per 1000 gal:

$	0.74	5 regen cycle without pH adjustment
$	0.64	10 regen cycle without pH adjustment
$	0.40	5 regen cycle with pH adjustment
$	0.36	5 regen cycle with pH adjustment

6. Capital cost per GPM design flow

Capital cost:	$	445,750	without pH adjustment
Capital cost:	$	470,050	with pH adjustment
Unit capital cost :	$	524	without pH adjustment
Unit capital cost:	$	553	with pH adjustment

Chaparral City Water Company Well 10 Arsenic treatment System

Preliminary Opinion of Probable Cost Estimate

Item No	Item Description	Units	Quantity	Equipment Cost	Installation Cost	Total Item Cost	Notes
1	Chlorine analyzer	EA	1	$4,130	$2,065	$6,195	Hach Model CLF product
2	Arsenic treatment system	EA	1	$354,675	$177,338	$532,013	Severn Trent price quote
3	PH adjustment system (optional)	EA	1	$30,000	$15,000	$45,000	Price quote with H2SO4 feed
4	Chloramine system	EA	1	$35,000	$17,500	$52,500	Provisional item
5	Site work	LS	1	$50,000	iincluded	$50,000	
6	Yard piping	LS	1	$42,500	iincluded	$42,500	
7	Demolition work	LS	1	$17,500	iincluded	$17,500	
8	Electrical and I&C work	LS	1	$100,000	iincluded	$100,000	
	Sub total					**$845,708**	
9	Bonds, insurance etc (5%)	LS	1			$42,285	
10	mobilization (4%)	LS	1			$33,828	
11	Construction adminstration (8%)	LS	1			$67,657	
12	Contingency (25%)	LS	1			$211,427	
	Grand Total					**$1,210,000**	

EXHIBIT ICC -3

Maricopa County

Environmental Services

Water and Waste Management Division

1001 N. Central Ave., Suite 150
Phoenix, AZ 85004
Phone: (602) 506-6666
Fax: (602) 506-6925
TDD: 602 506 6704
www.maricopa.gov/envsvc

Date: April 05, 2013
Owner: EPCOR USA Chaparral City Water Co.

MCESD Project #: 2012028
SYSTEM ID #: 04-07-017

CERTIFICATE OF APPROVAL OF CONSTRUCTION WITH STIPULATIONS

PROJECT DESCRIPTION: Fountain Hills, Chaparral City Water Company- Well 10 Arsenic Removal System (ARS). The facility involves wellhead treatment for removal of total arsenic by adsorption to meet the 10 micrograms per liter (μg/l) maximum contaminant limit (MCL). Well 10 is also known as the Palisades Well and has a total depth of 738', a flow of 1,700 gallons per minute (gpm) of groundwater, and a total arsenic concentration of 11 μg/l; Arizona Department of Water Resources (ADWR) Well #55-604786. The well and ARS are located on the north side of East Palisades Blvd approximately 1,000' east of Fountain Hills Blvd. Surface water from the Shea Water Treatment Plant no longer blends with Well 10 raw water to meet the MCL; the surface water feed pipe to Well 10 conveyance piping has been disconnected and a blind flange inserted. Blended water from Well 10 bypass and the ARS shall supply the Zone 1 distribution network.

The ARS project involves transmitting 850 gpm through the ARS and blending 850 gpm of Well 10 bypass flow. Components of the ARS include: two 10'-diameter carbon steel vessels operated in parallel; pressure relief valves for each vessel; flow switch transmitters for each vessel interlocked with the Well 10 pump; Severn Trent Services Bayoxide® E33 granular ferric oxide disposable media (the Media) with a bed depth of 3.4'; and a new Hach chlorine analyzer downstream of the ARS effluent blend point. Existing equipment utilized for this project includes: supervisory control and data acquisition (SCADA) with wireless transmission; a sodium hypochlorite system; and a lined pond for wasting with 4"-diameter drain to sanitary sewer. Chloranimation is not approved under this project.

LOCATION: Fountain Hills, Maricopa County
Arizona Parcel Number (APN)-
176-13-617M
Fountain Hills, AZ 85268

PROJECT OWNER: EPCOR USA Chaparral
City Water Company
Attn. Mr. Travis Nuttall, PE
12021 N Panorama Dr
Fountain Hills, AZ 85268

SOURCE WELLS:

1) Well 10 (Palisades Well)
ADWR #55-604786
APN # 176-13-617E
Fountain Hills, AZ 85268
1,700 gpm
Total Arsenic = 11 μg/l

Pursuant to Arizona Administrative Code, Title 18, Chapters 4 and 9 (AAC R18-4 and 9) and Maricopa County Environmental Health Code (MCEHC) Chapters II and V, this Certificate of Approval of Construction (AOC) for the above-described facility as represented in the approved plan documents on file with the Department is hereby given subject to the following provisions:

1. This AOC is issued based on submission of: commissioning data for ARS performance from 02/07/2013 to 03/20/2013; an operation and maintenance (O&M) manual dated and sealed 03/27/2013 by Wei Li, PE (#46531); and as-built drawings sealed and certified 04/02/2013 by Wei Li, PE (#46531);

2. Any change in the approved plan that may affect capacity, quality, flow, location, or operational performance of the system shall be submitted to this Department for review, and Department approval shall be obtained prior to undertaking the work affected by the change.
3. The AOC is void if major modifications occur to this system without the knowledge and consent of the Department.
4. Failure to comply with all conditions of this certificate may result in forfeiture and cancellation of this certificate and may require the facility to be immediately taken out of service.
5. This approval is based on the following conditions:
   - No other sources shall be connected to the facility or mixed with the proposed supply and finished water without Department approval;
   - All hand-operated valves that are capable of throttling flow through the facility shall be locked into position or have their handles removed to reduce the possibility of tampering and blending bypass;
   - The vessels shall only be operated in parallel; if Owner desires to run the vessels in series, then they must demonstrate to Department that the parameters of treatment can be met; and
   - No other types or formulas of new or regenerated media shall be installed in the vessel without Department approval.
6. The water facility shall meet all applicable sampling and reporting requirements under the Safe Drinking Water Act Rule, AAC R18-4 and subsequent amendments.
7. Operation and maintenance records shall be made available upon Department request.
8. A Grade 2 water treatment operator certified by the Arizona Department of Environmental Quality (ADEQ) is required for operation of this facility. Shift foremen or other operators in charge of the facility in the absence of the Operator shall be certified at a grade no lower than one grade below the grade of the facility.
9. Operations of this facility shall be monitored with a minimum of one visit per day to this facility by the Operator, when the well is operating.
10. All chemicals and equipment that come into contact with drinking water shall conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) 60 and 61, respectively and in accordance with AAC R18-4-213.
11. No connection may exist between potable water and non-potable water.
12. Provide hose racks at all hose bibb locations (both potable and non-potable).
13. MCESD reserves the right to modify this AOC pursuant to future state regulations.
14. Representative(s) of the Department shall be allowed access to the site to conduct inspections during reasonable hours.
15. A change in operating status of ADWR #55-604786 requires formal notification of the Department's Drinking Water Program.
16. The Owner is responsible for obtaining all other permits related to the project from other agencies and authorities.

WATER AND WASTE MANAGEMENT DIVISION

By Eric J. Kaufanger, PE for.
Dale Bodiya, PE
Manager, MCESD Treatment Plant Program

Plan Approval Date: April 05, 2013

cc: ADEQ Drinking Water Section, 1110 W. Washington Street, Phoenix, AZ 85007
Kevin Chadwick, PE, MCESD Manager, Water and Waste Management Division
Korissa Entringer, RS, MCESD Manager, Drinking Water Program
MCESD Project File
MCESD Sequential File
Utilities Division - Engineering Section, Arizona Corporation Commission, 1200 W. Washington, Phoenix, AZ 85007-2996
Wei Li, PE, Stantec Consulting Services Inc, 8211 S 48th St, Phoenix, AZ 85044

EXHIBIT ICC -4

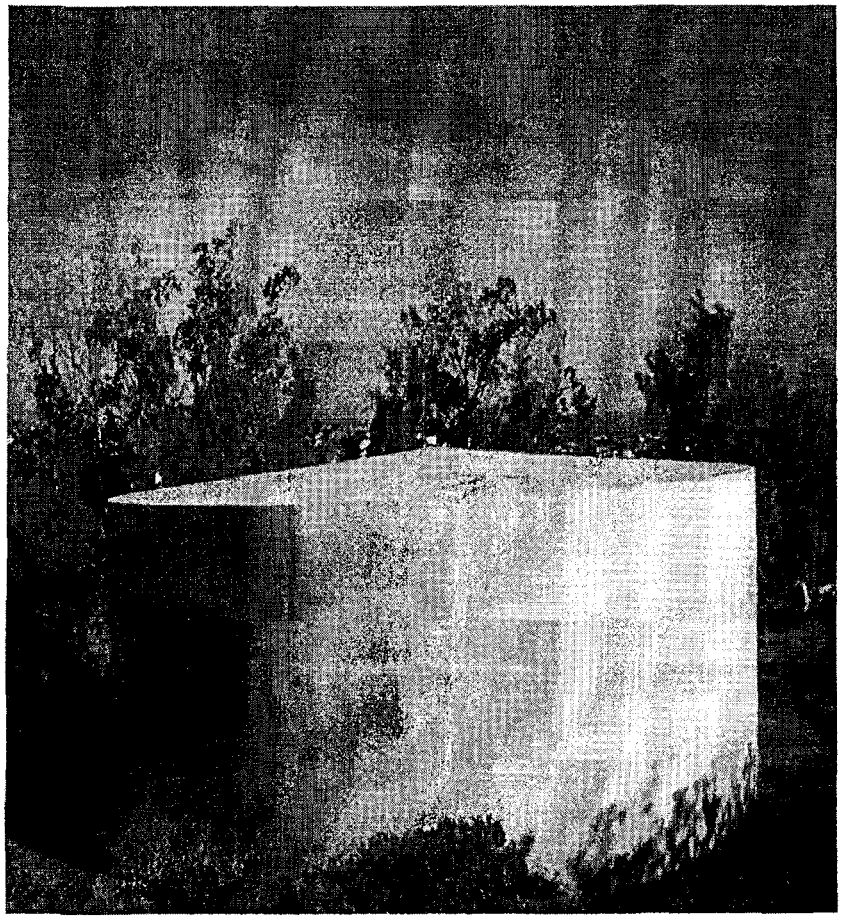
401 N. Alma School Road
Unit # 3
Chandler Arizona 85224
Office – (480) 899-1228 - Cell (505) 608-4067
russellb@rileyindustrial.com

Potable Water Tank Inspection Report
For Reservoir # 2
A 1,500,000-gallon GST
Chaparral City Water Company
Fountain Hills Arizona 85268

Prepared By Russell W. Brown

For:
Mssrs. Lee Jenkins & James Moore

www.rileyindustrial.com

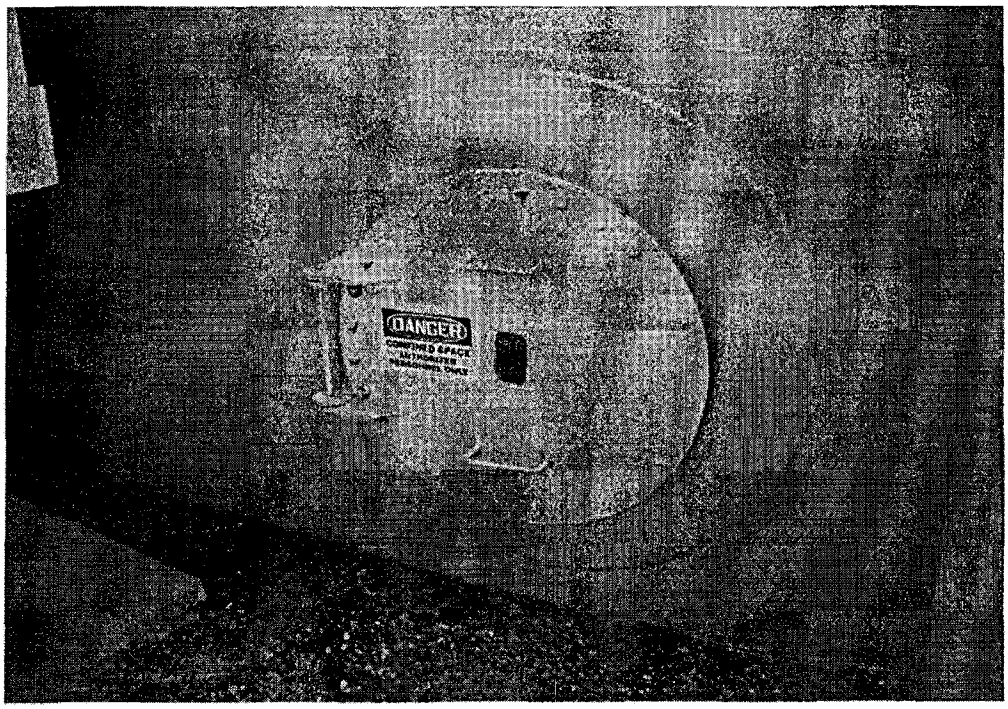


Reservoir # 2

1,500,000-gallon Ground Storage Tank

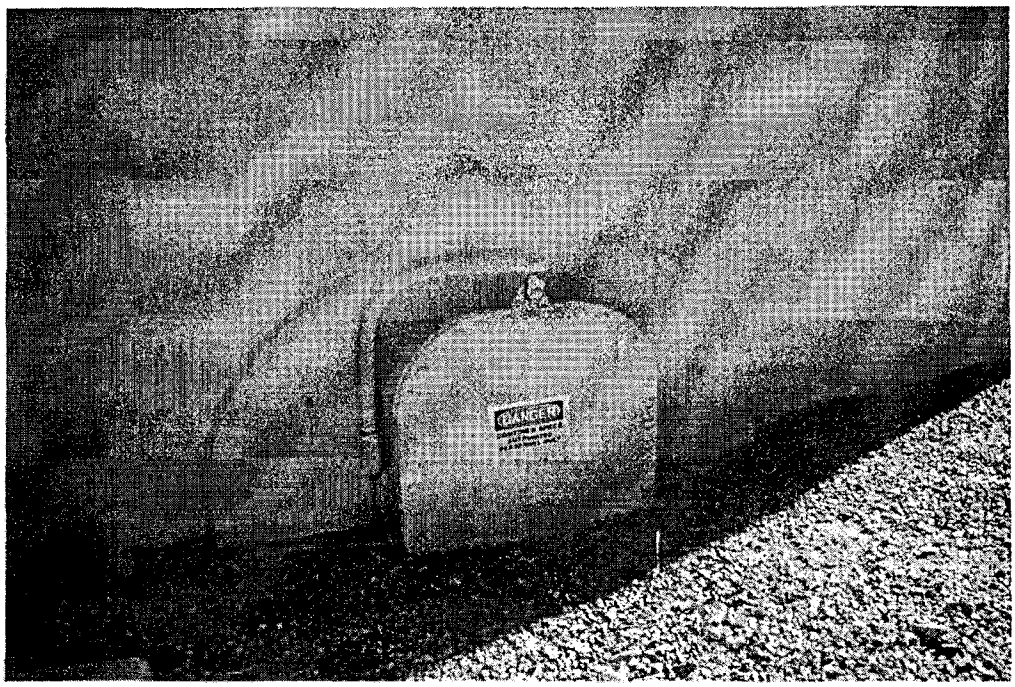
93' Diameter X 30' High

On February 27, 2012 the writer and two men entered an already drained GST to do a washout and then conduct a visual inspection of this potable water tank. As the tank was cleaned the writer conducted a survey of the conditions and it is our intent to show and discuss those conditions initially though this report. The tank was encrusted on the shell and covered on the floor with built up minerals and silt. Using normal washout techniques we were not able to budge most of the large blistered areas nor were we able to water clean the walls so that we could tell exactly how pitted they might be. We decided to use snow and ice scrapers to break away the majority of the rough surface on the floor and column bases. Buckets of debris were then hand carried out and dumped onto the ground to dry. Silt was then washed out through the floor drain and the shell mounted cleanout door using multiple 1,500 psi water pumps and clean water taken from your system.



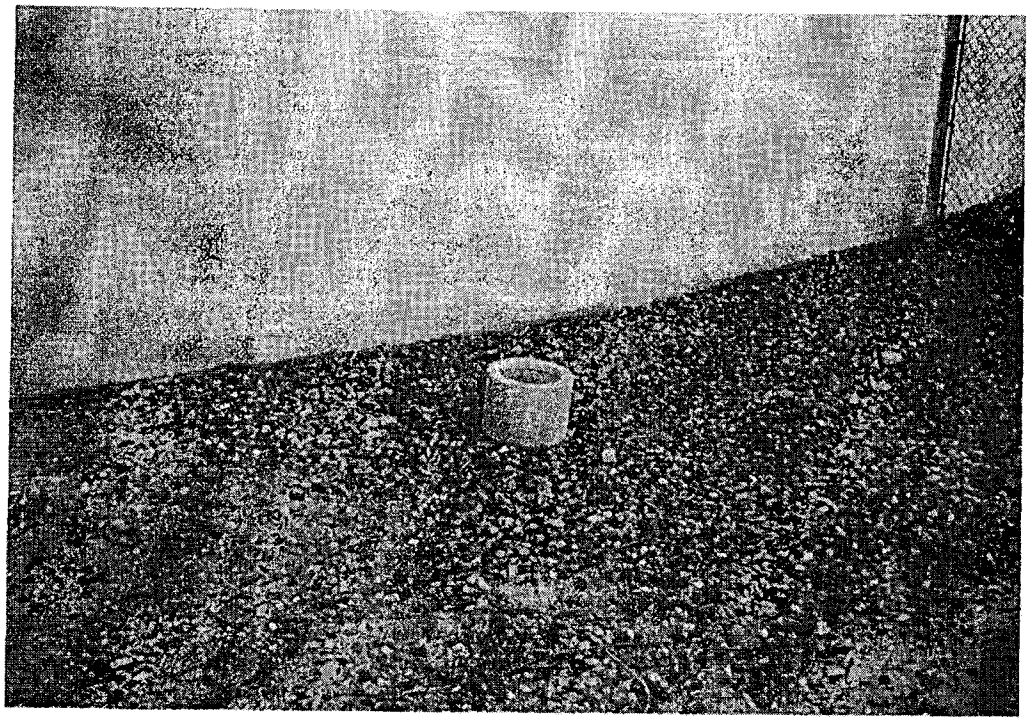
Res # 2
Picture - 1

This is the sole shell Manway. It is a 24″ conventional bolted style Manway



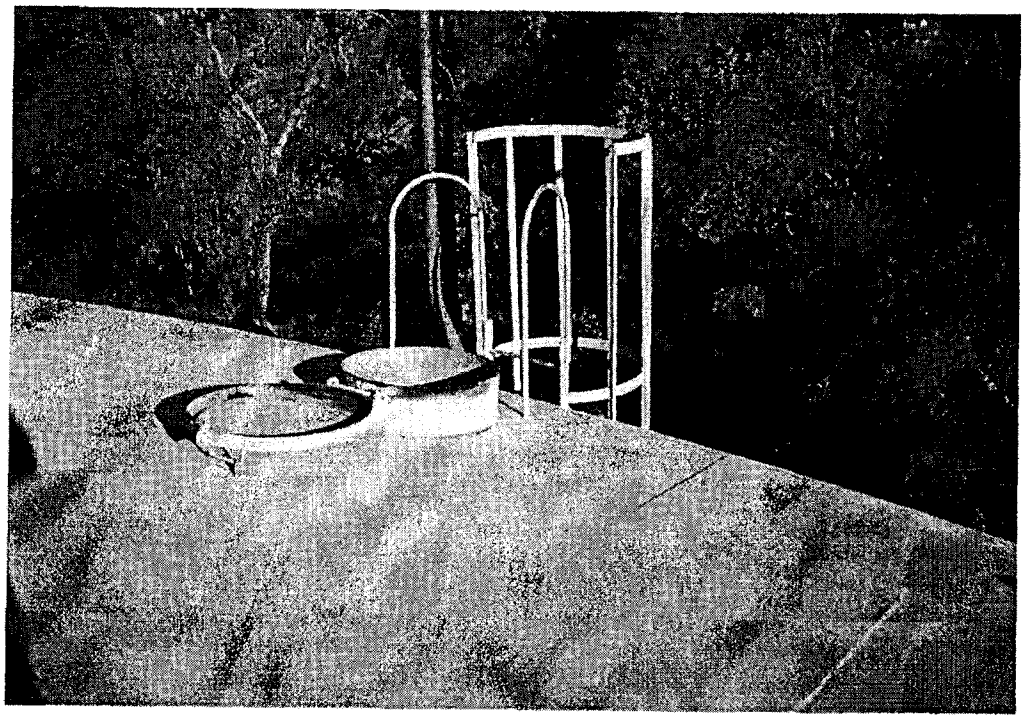
Res # 2
Picture - 2

This is the 24″ wide by 30″ diagonal dimension API style cleanout door



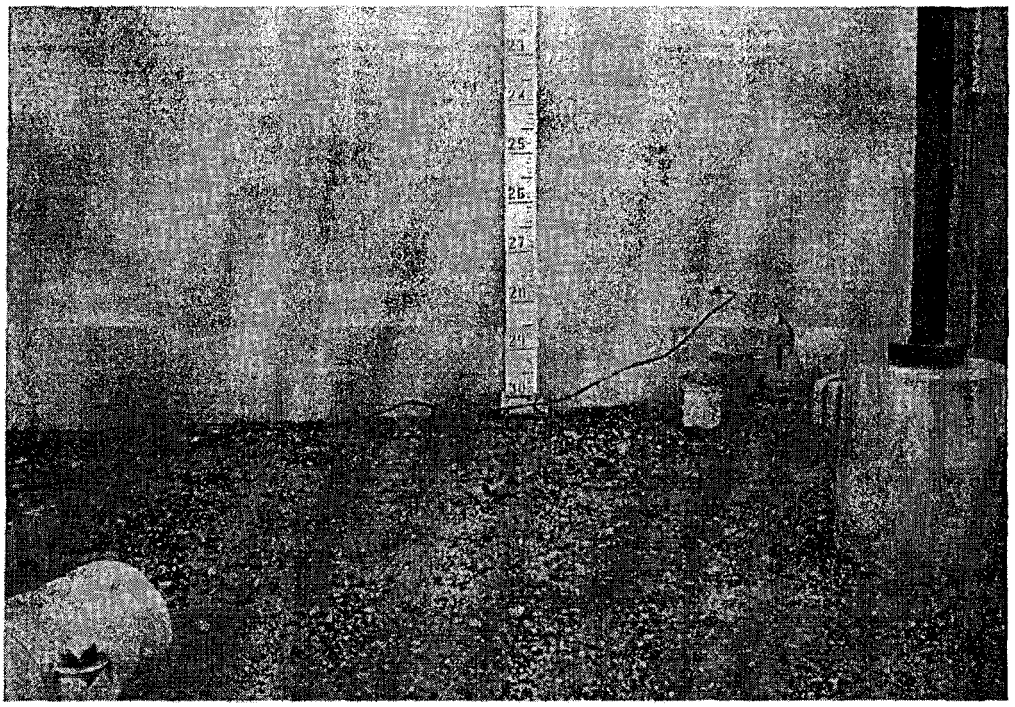
Res # 2
Picture - 3

This opens and closes the in-floor drain that leads underground to a spill point outside the fenced enclosure.



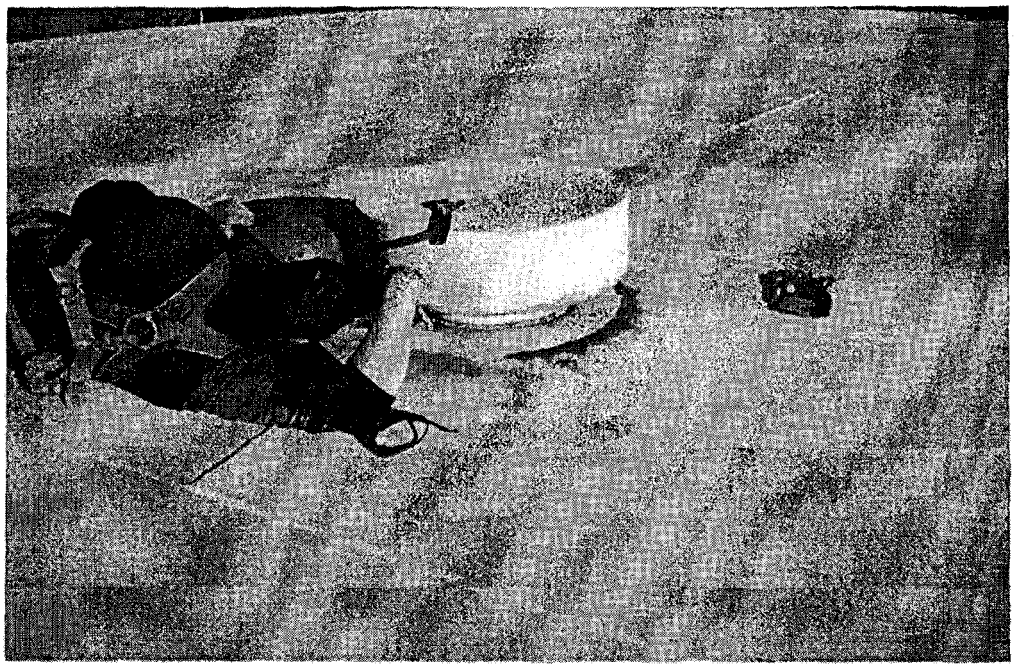
Res # 2
Picture - 4

This is the only roof Manway. It is 24" I.D. and is hinged and lockable. It is not seal-welded under the roof deck. The landing area has no handrails at either side of the ladder. OSHA requires them for safe use of this roof access



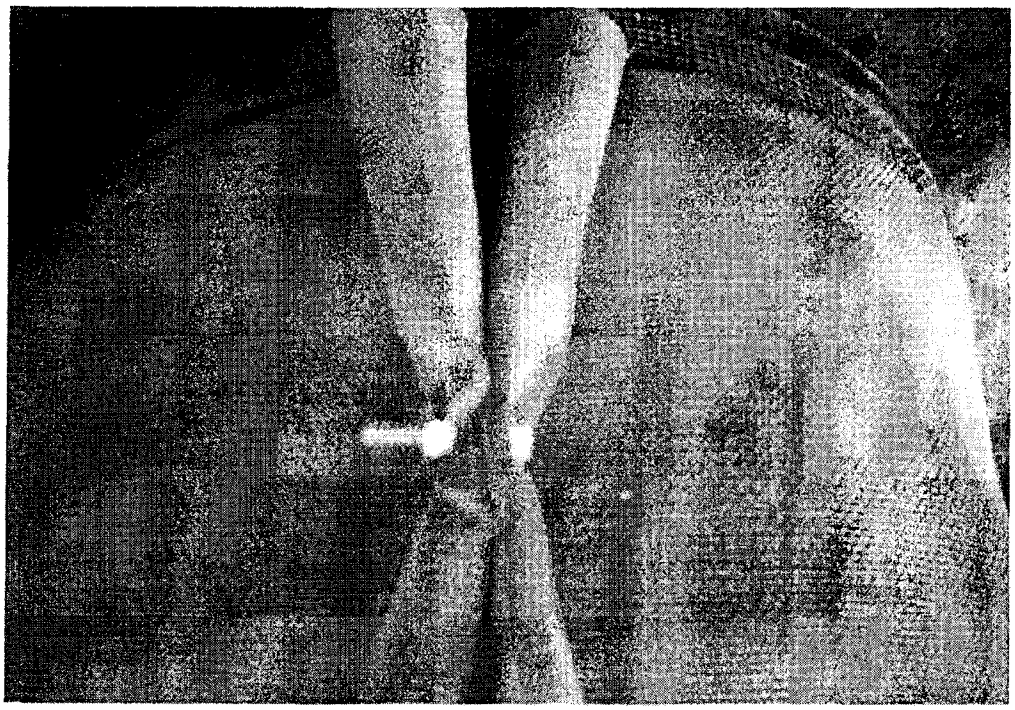
Res # 2
Picture - 5

This mechanical float level gage is no longer used. Our recommendation is that it be cut out when the tank is worked on next and 3 roof penetrations be seal-welded over with 6" wide X ¼" steel covers & shell welds ground flush



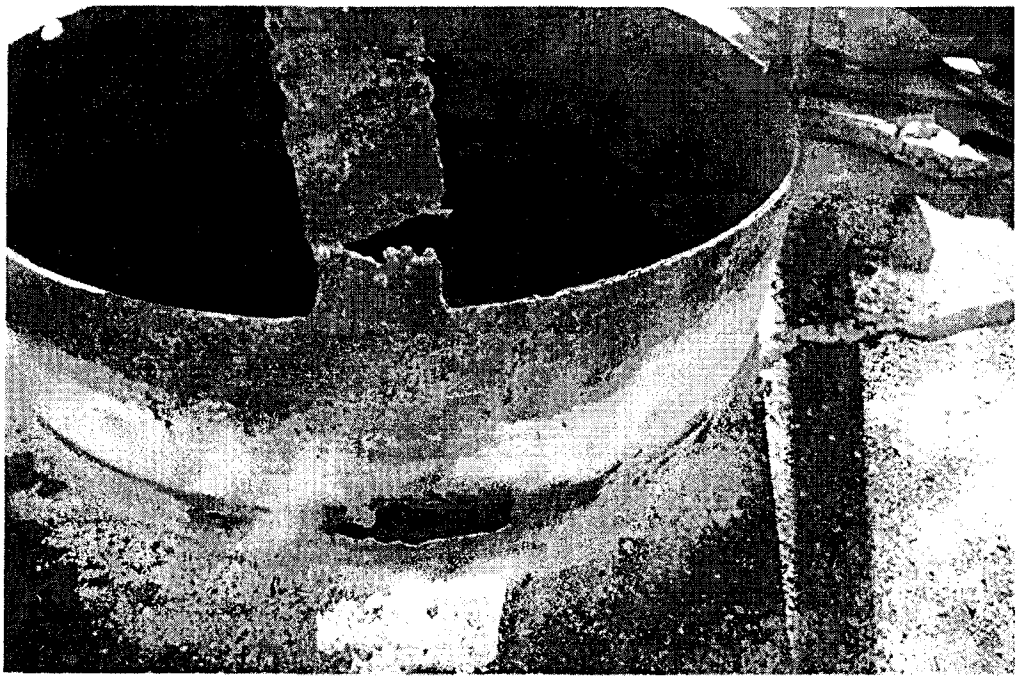
Res # 2
Picture – 6

This roof vent has a 12" ventilation shaft. It is too small and it is badly corroded. We removed it to look under it at the top of the dollar-plate and resting ends of interior roof rafters



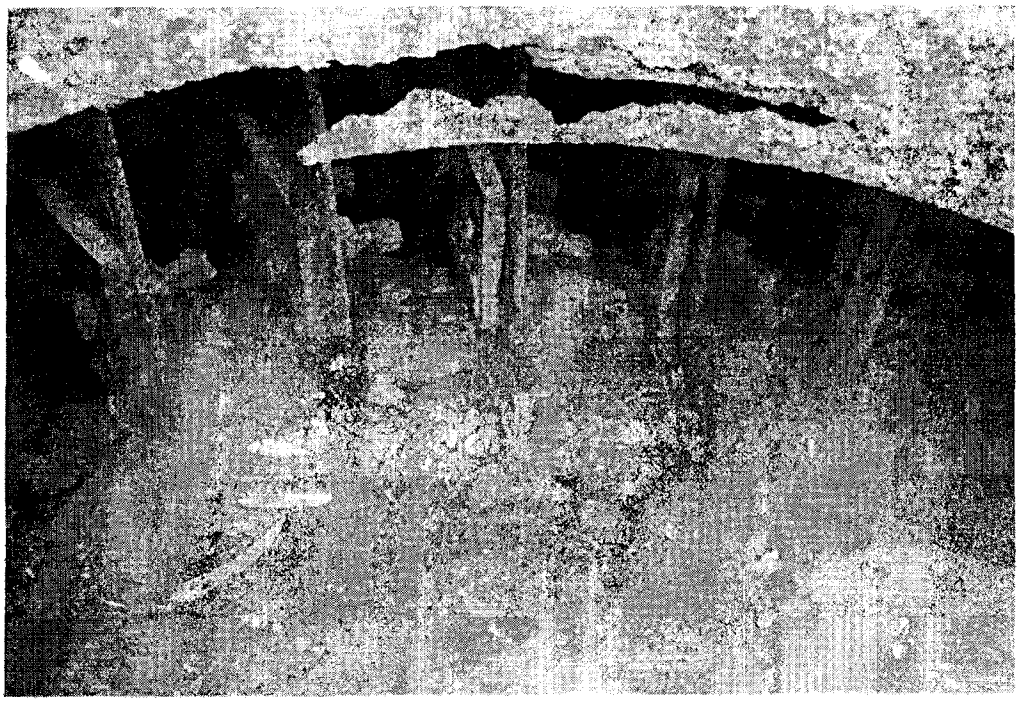
Res # 2
Picture - 7

The exterior of the vent was tightly screened. Both layers were corroded however and were destroyed when we took them off. The cover was tack-welded to the roof so we had to break those welds free as well



Res # 2
Picture - 8

This is what we saw as we opened the vent area to view

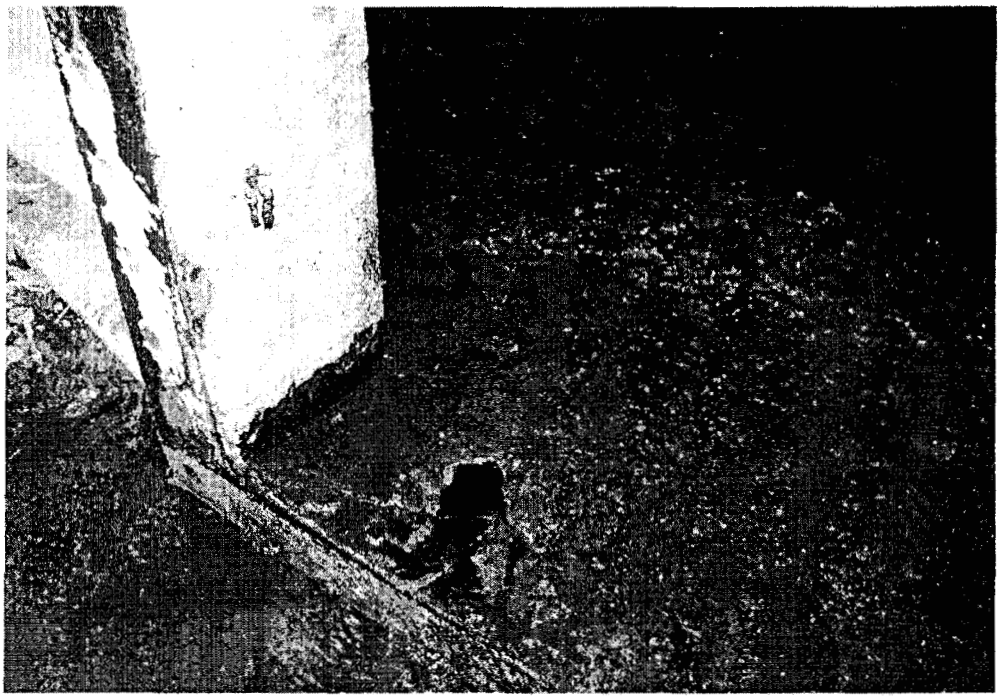


Res # 2
Picture - 9

This is a typical finding when one opens an older tank like this. Poorly painted when last done and then no subsequent follow up inspection and touchup done leaves low-carbon steel metal to corrode in a rich oxgen/electrolyte

Res # 2
Picture - 10

The nuts and bolts are badly corroded and will need changing. When some of these toe areas are blasted they will be very sharp and hard to coat properly unless addressed first with a grinder. The web areas may be too thin as well.



Res # 2
Picture - 11

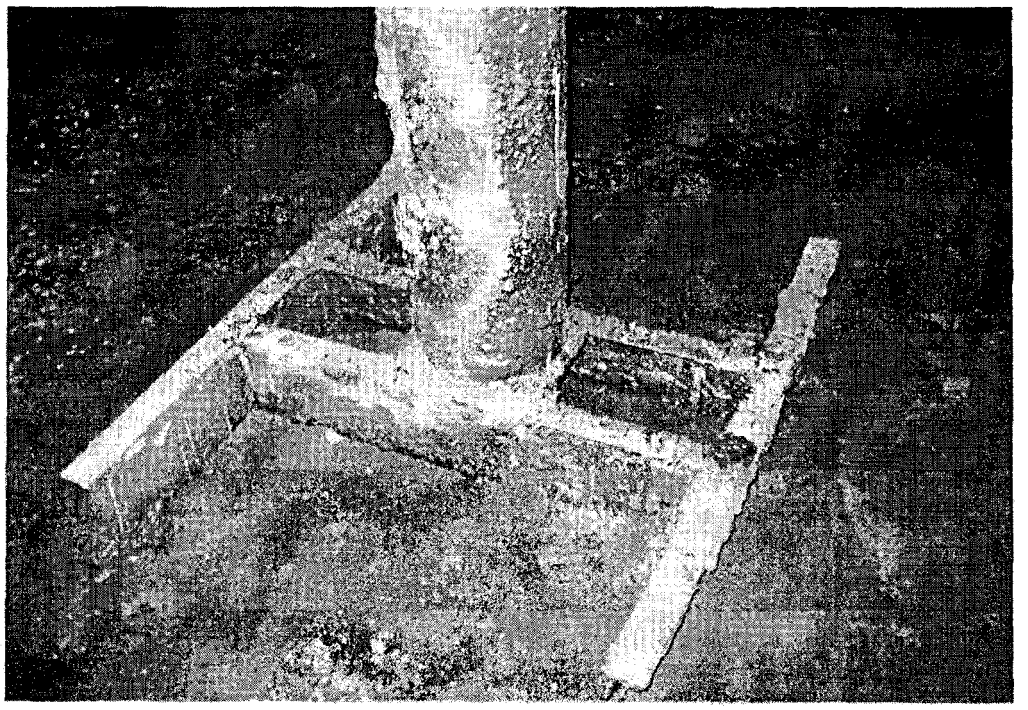
This was the first look we had at trying to clean the substrate well enough to judge its acceptability for modernization. Most of this buildup was resistant to water pressure and had to be hand scraped off using ice/snow removal equip

Res # 2
Picture - 12

A view from the inside of the same area. The only way to clean this tank other than sandblasting would be up to 10,000-psi (high-volume) water pumps with fan-shaped spray heads

Res # 2
Picture - 13

This is the interior access ladder. It is severely corroded in many places. Our advice it to take it out and leave it out when the tank is modernized. One doesn't make a safe OSHA vessel-entry using this access point anyway

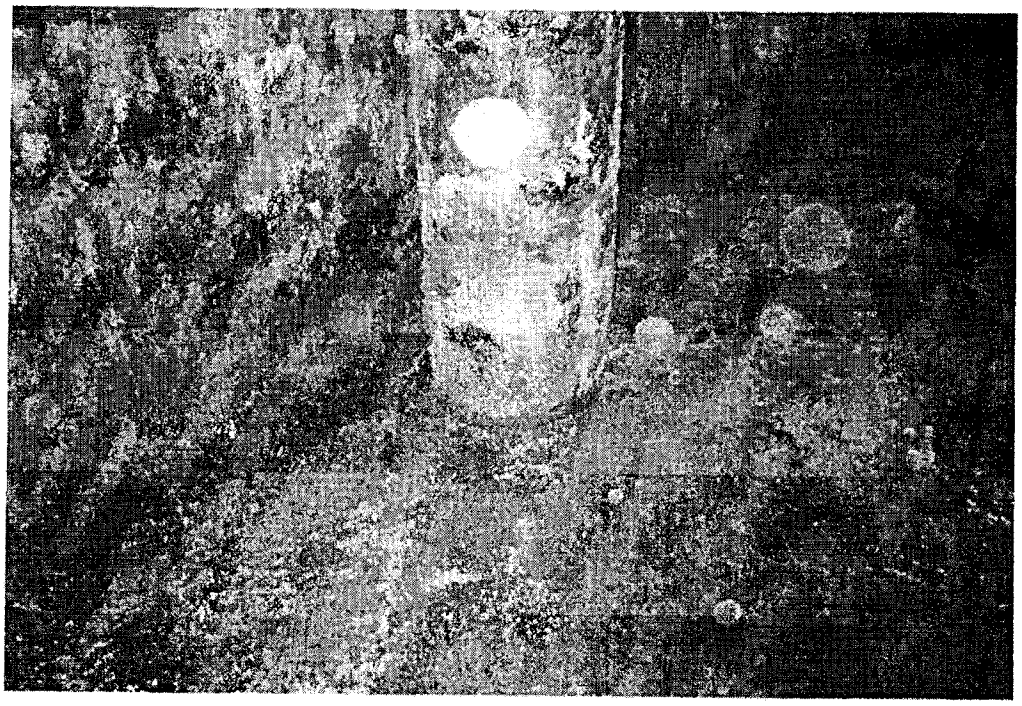


Res # 2
Picture - 14

There are six columns in this tank. They all have this awkward base stability design. It is very hard to place corrosion protection on these sections because they hold water long after the tank is emptied. They need weep-holes drilled

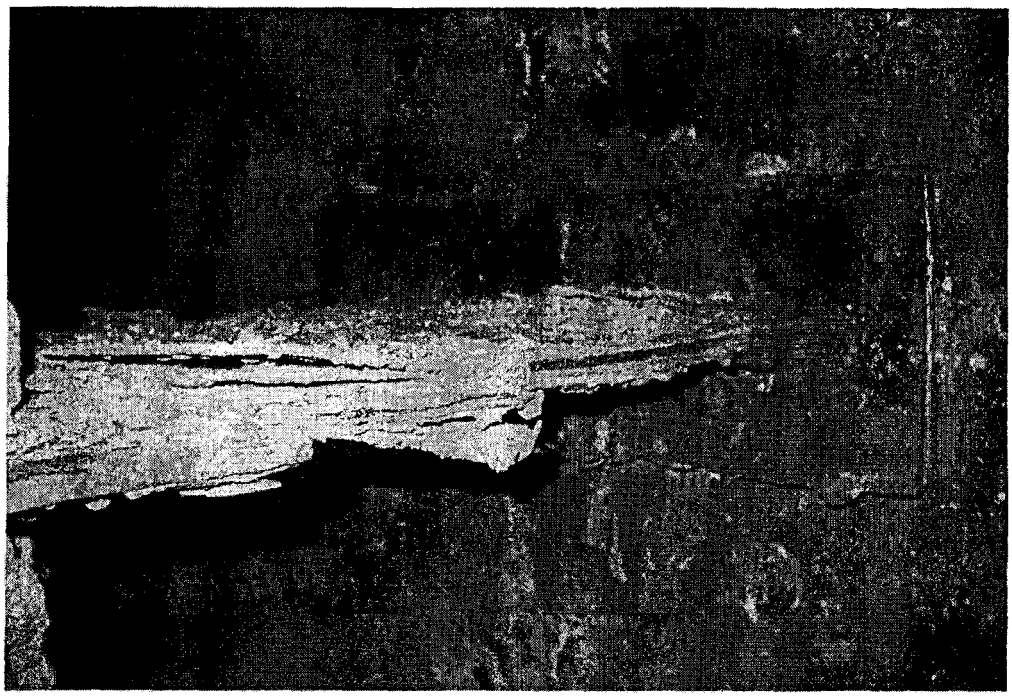
Res # 2
Picture - 15

This shows pack-rust and fallen dirt/disbonded coatings from the roof and upper shell areas. They were generally found all around the circumference of the tank interior. The existing lining appears to be a soft coal-tar solution



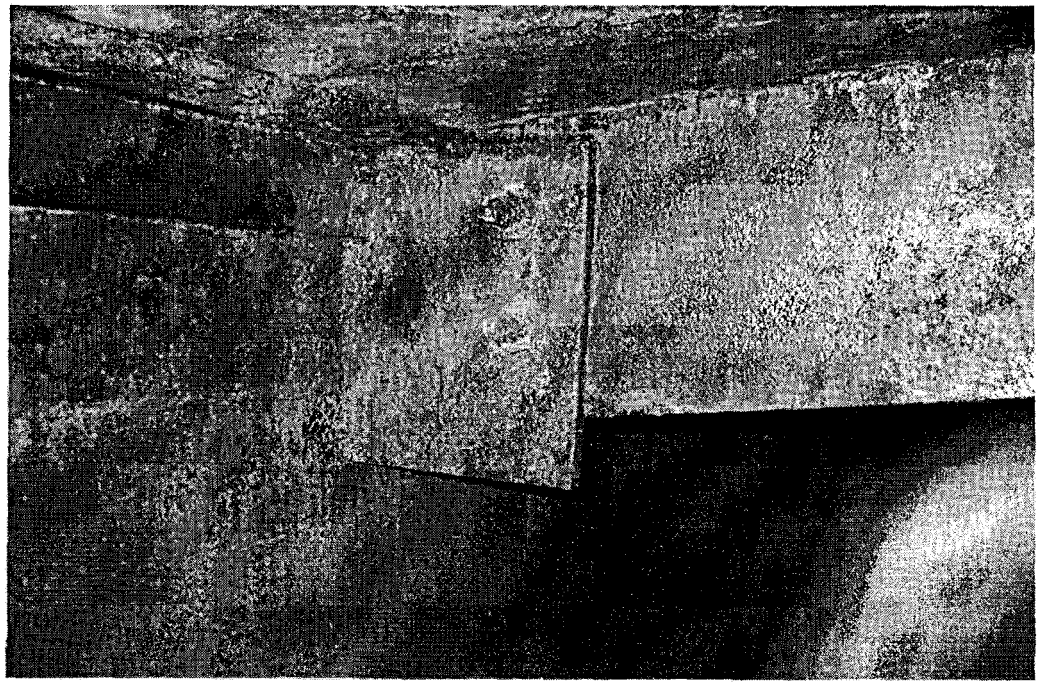
Res # 2
Picture - 16

This is where the overflow pipe penetrates the floor to go underground and drain out beyond the tank. Its top is very close to the rafter end-clips. We think it should be cut down 6" when recoated. No weir-box/vortex breaker



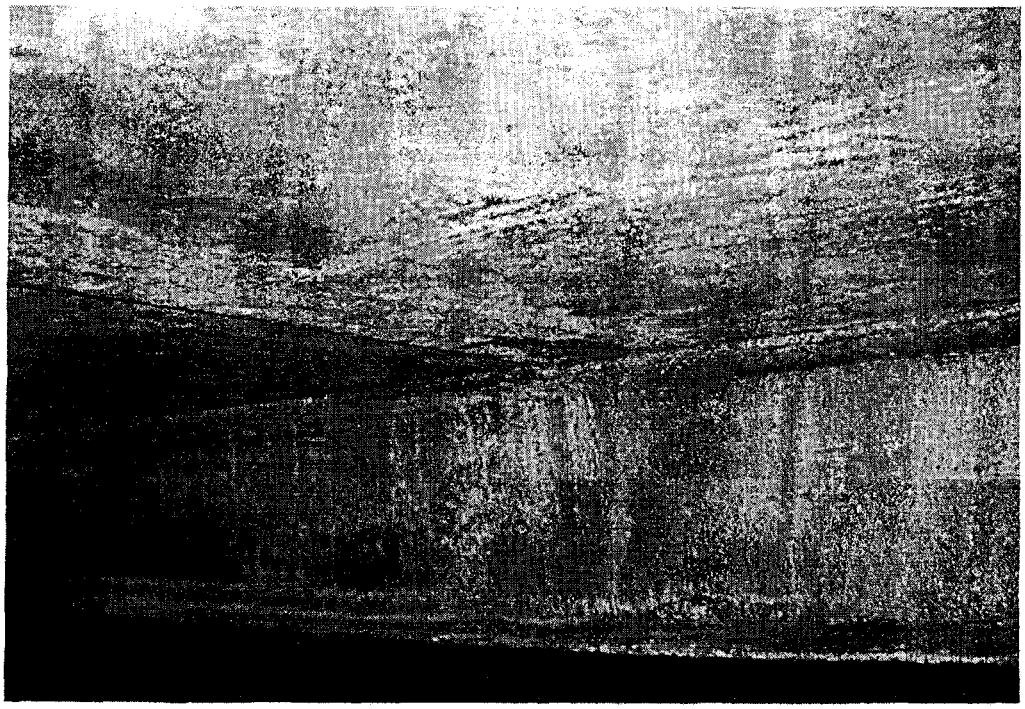
Res # 2
Picture - 17

The overflow pipe is braced at three points on the shell interior. They are all corroded like this one. They've been acting as anodes while they protect the mostly bare shell wall and floor. No re-pad was apparent at floor penetration



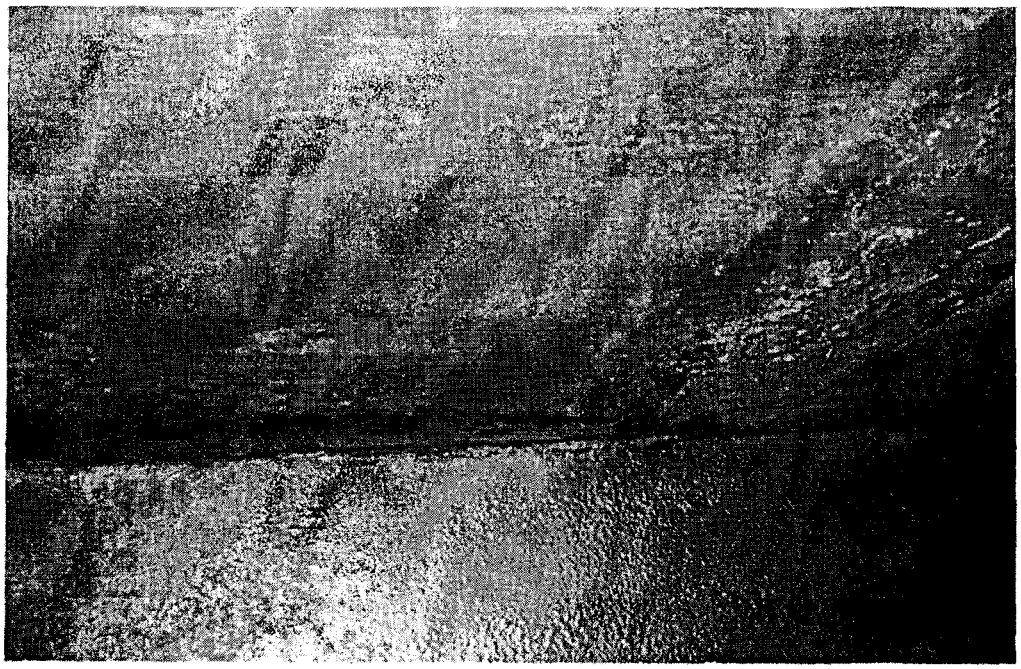
Res # 2
Picture - 18

This may be indicative of what metal loss is present in the shell mounted rafters. The nuts and bolts will need to be changed but maybe the rafter ends will re recoatable. Rim-angle is toed in and corroding on top in that lap-joint



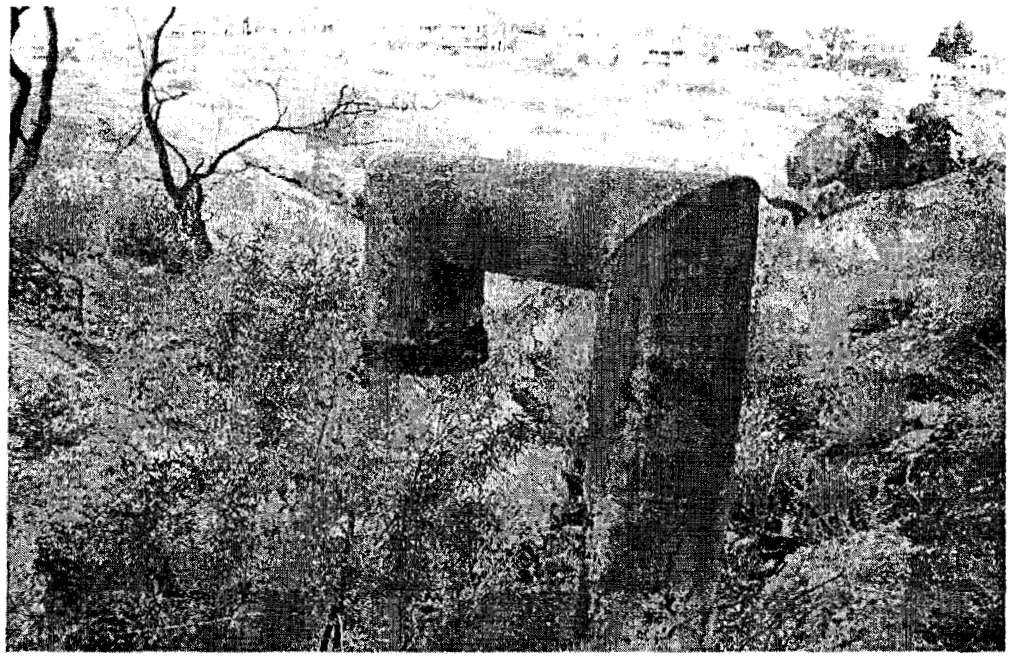
Res # 2
Picture - 19

AWWA D-100 allows roof plate lap-joints to be open in the design. Of course this is a prime corrosion focus high in the hot vapor-phase of this very large tank. The roof vent was too small to release vapor during seasonal changes



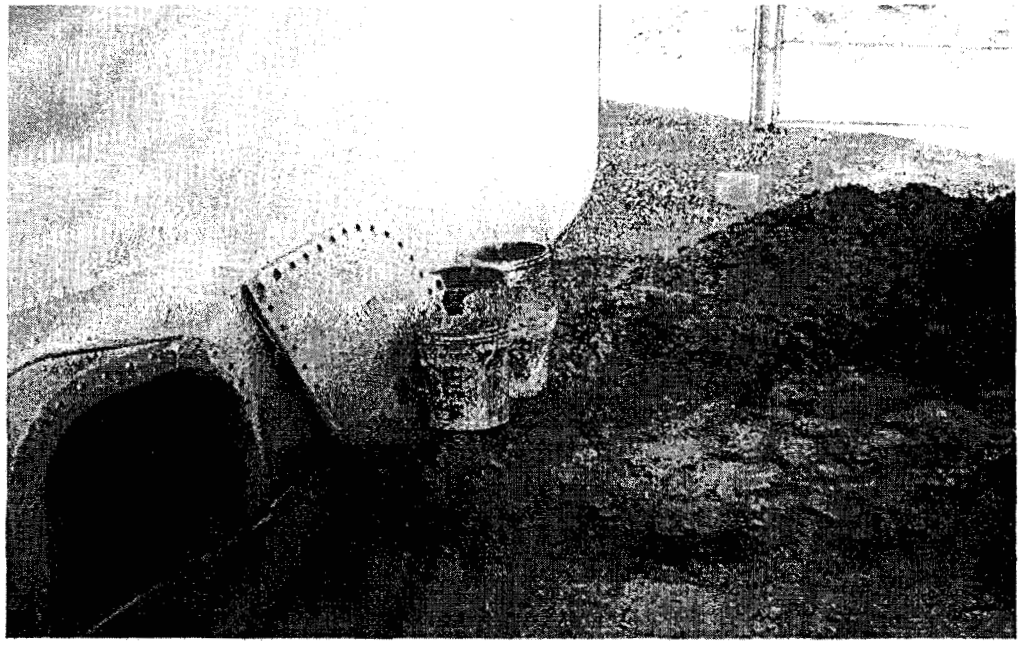
Res # 2
Picture - 20

Another good example. What coating is still bonded, runs from 6.0 mils to around 12.0 mils DFT. It is soft. Protection has been from the high amount of tar in the formula. This system may have lead and oil as well underneath it



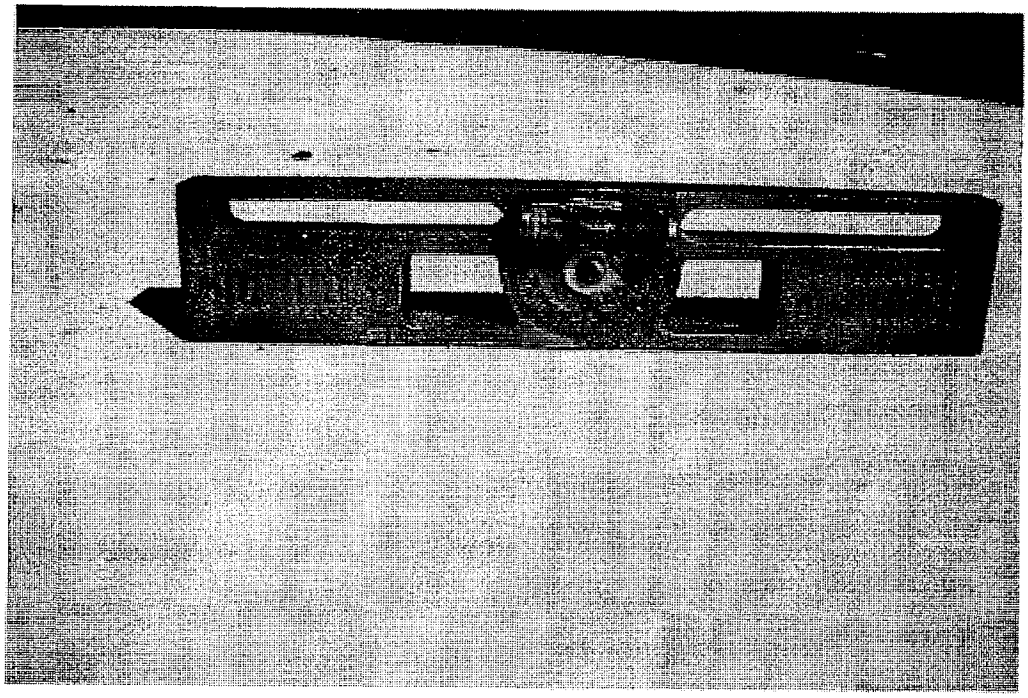
Res # 2
Picture - 21

Here is the 12" overflow coming out of the ground and then draining down into the wash. It is supported but not overly and it is screened but that screening needs to be replaced because it is corroded. It should be 16" I.D.



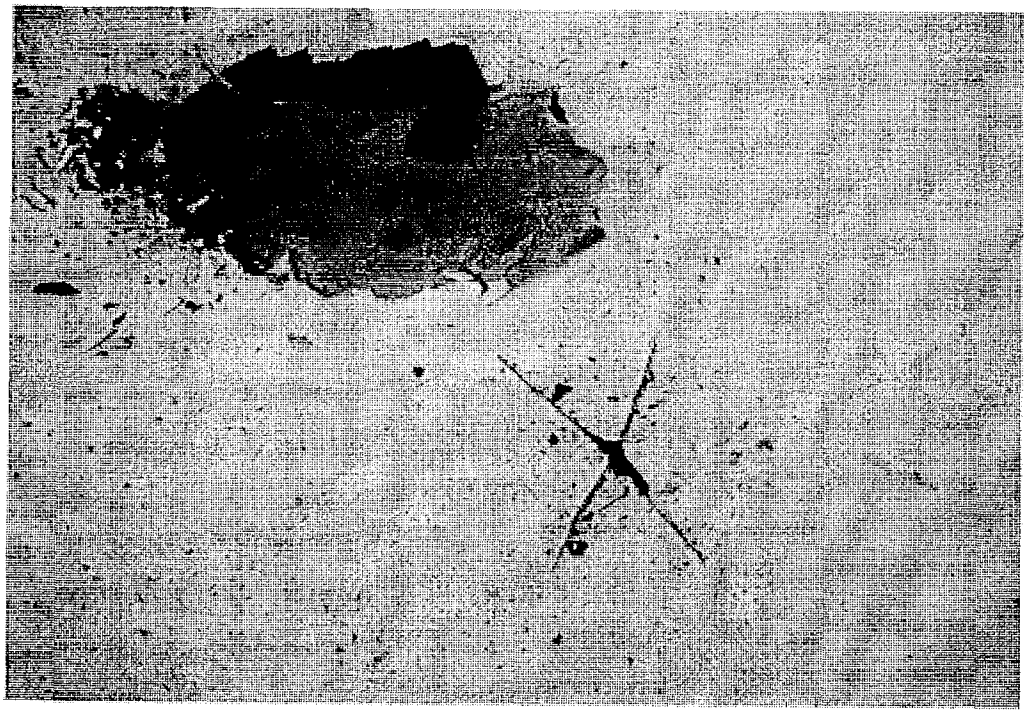
Res # 2
Picture - 22

Materials that were carried and flushed out of the tank. When it is dry it will need to be tested for acceptability by a landfill. Test blast material could be mixed with it and then a RECLA 8-metal TCLP test done by 3rd party lab.



Res # 2
Picture - 23

We measured the pitch in the roof and when a replacement piece is manufactured to anchor the new roof vent it will fit well and be easier to seal on the inside. Pitch is 5 degrees or 1.05 inches of fall per running foot of radius

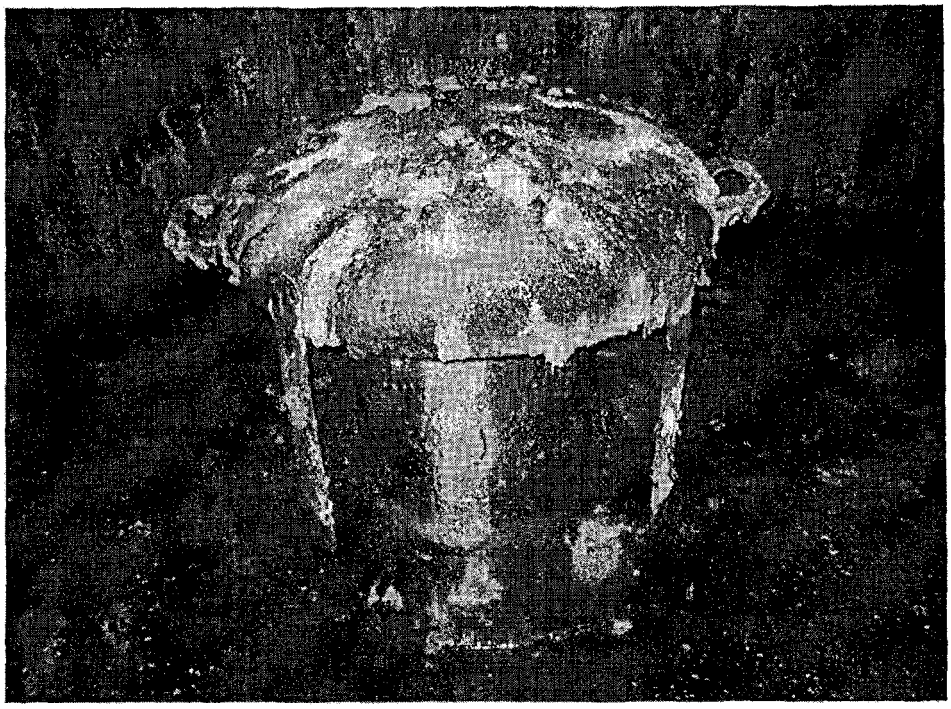


Res # 2
Picture - 24

No lead was apparent when tested with a chemical test-stick. The cross-hatch test showed that the adhesion and cohesion of the old exterior paint system is only fair. Best to overcoat - washing/spot priming/acrylic top coat

Res # 2
Picture - 25

This fill pipe is losing water when the valve is turned off. To prepare and relining the tank it will need valve work or we will have to place a mechanical stopper to keep application conditions dry enough to blast and coat areas



Res # 2
Picture - 26

We assume that this is the drain line for the tank. It is very close proximity to the fill line and might not allow for the best mixing conditions as presently used

EXHIBIT ICC -5

Office – (480) 899-1228 - FAX (505) 326-0305 – Cell (505) 608-4067

russellb@rileyindustrial.com

Report Prepared For:

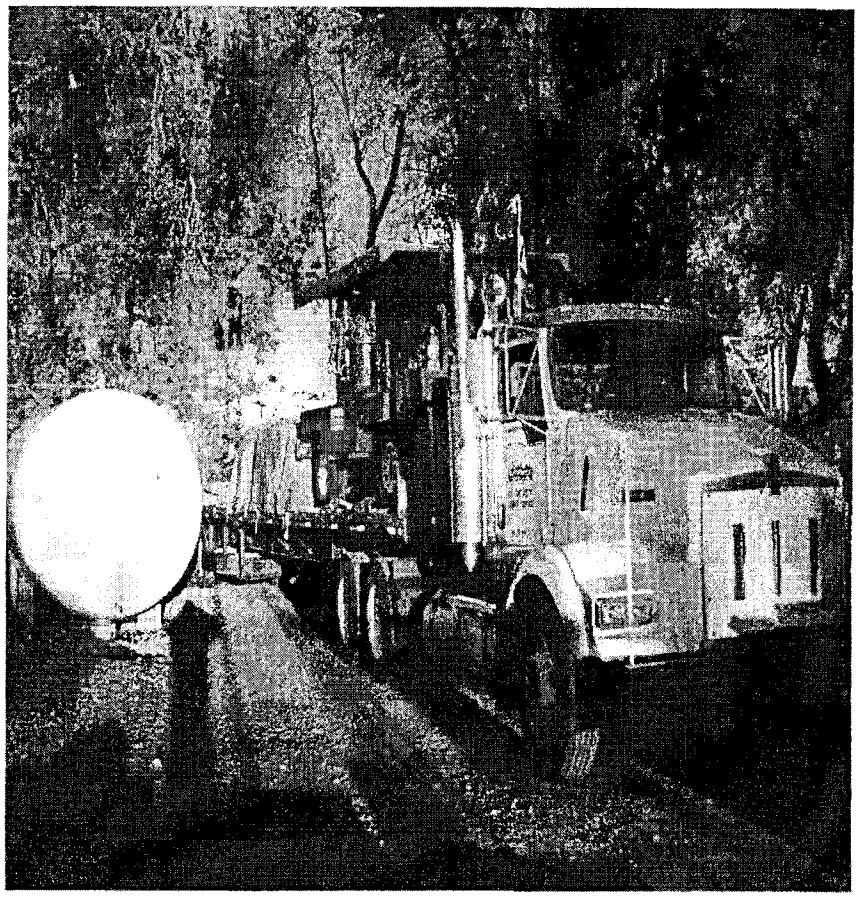
Mr. Lee Jenkins & James F. Moore
Chaparral City Water Company, Inc.
Fountain Hills Arizona

Test Blast / Pictorial Sampling / Inspection Results – Reservoir # 2
Conducted March 21, 22 & 23 2012

Prepared By:

Russell W. Brown
Riley Industrial Services, Inc.
401 N Alma School Road, Unit # 3
Chandler Arizona 85224

www.rileyindustrial.com



Reservoir # 2 – 2nd Stage Inspection Results & Comments

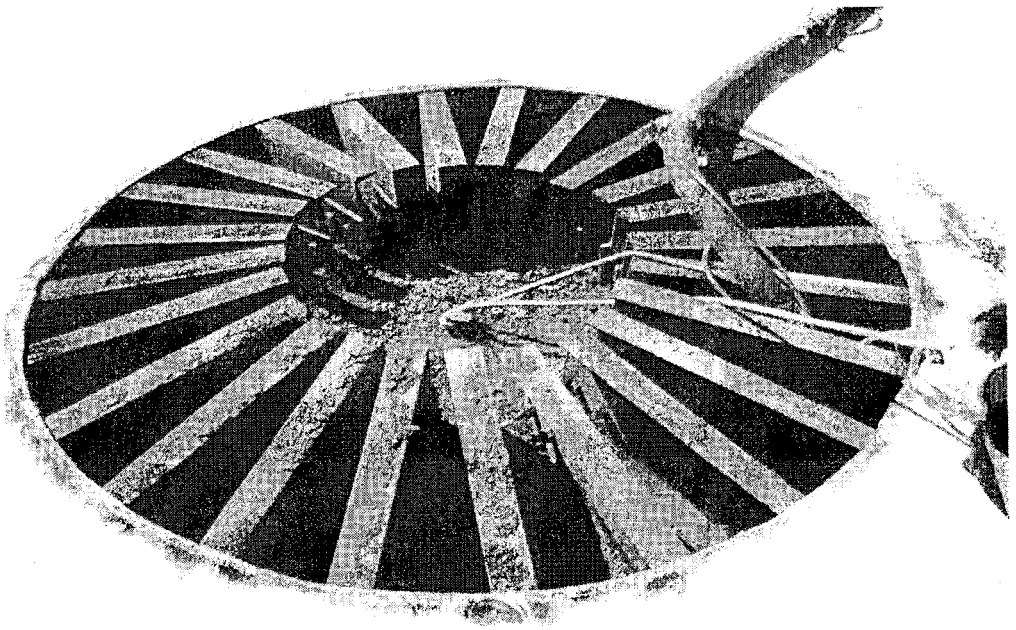
1,500,000-gallon Ground Storage Tank

93' Diameter X 30' High

The initial washout inspection yielded too many questions because of pronounced buildup on the interior wetted areas of the structure. To gain knowledge of any possible structural deficiencies the owner decided to initiate a test-blast procedure thereby yielding the actual substrates that would be apparent when blasted to an SSPC-SP-10, near-white level of cleanliness.

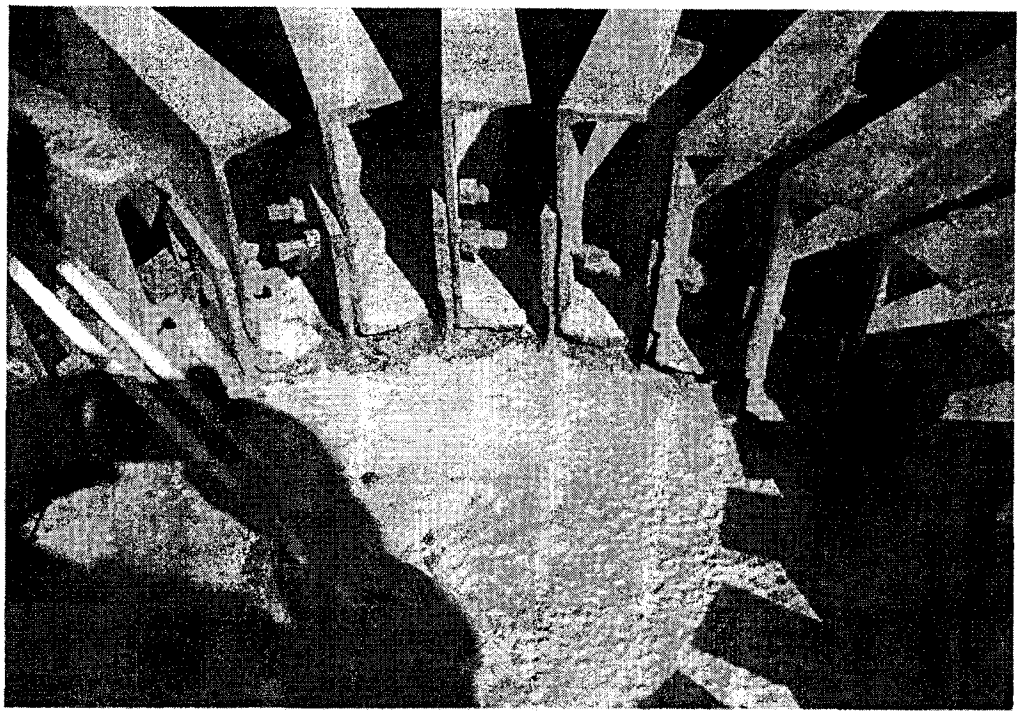
Res # 2
Picture - 1

The old roof vent was too small for this size of tank. Previously seen through the opening was substantial corrosion so it was decided to cut a 60″ wide opening in the roof to yield better underside views



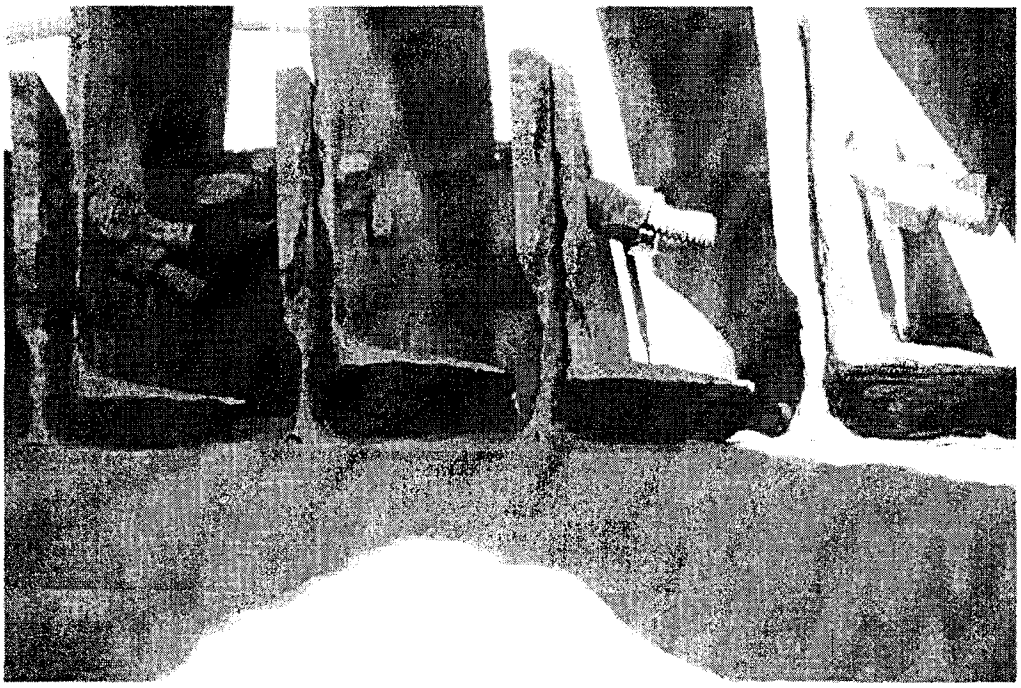
Res # 2
Picture - 2

The top of the dollar-plate and ends of selected rafters were blasted with copper-slag media to a near-white metal level of cleanliness



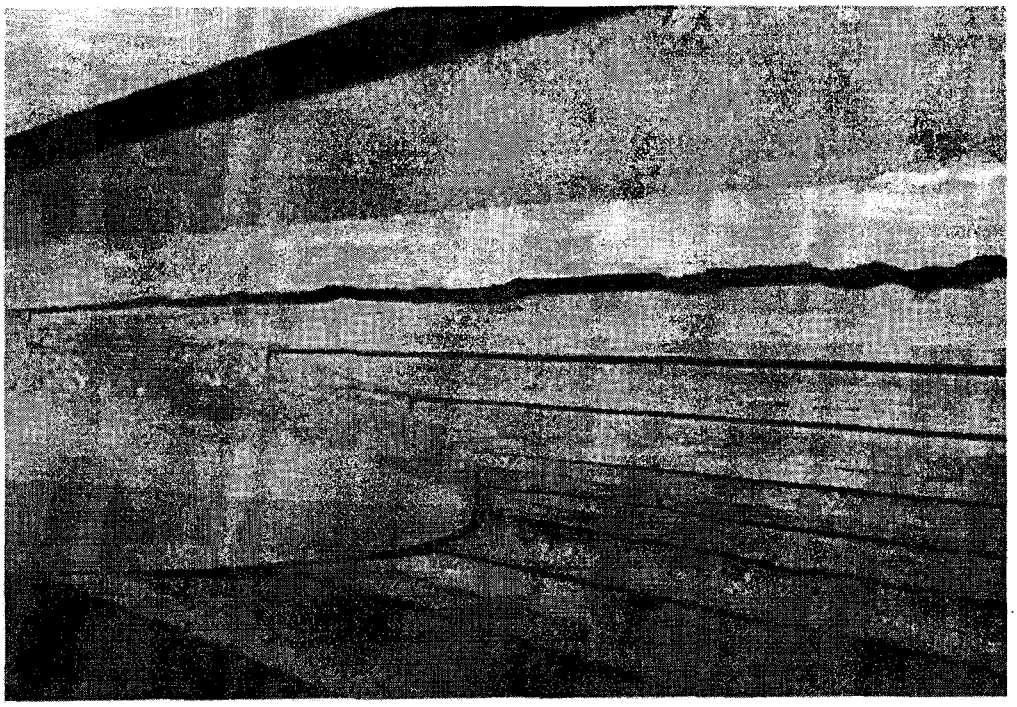
Res # 2
Picture - 3

The top of the dollar-plate was pitted but no holes were found in it. It started out at 1" thick and at this time writer saw no reasons to doubt its capabilities to carry a load when renovated. The column appeared sound as well



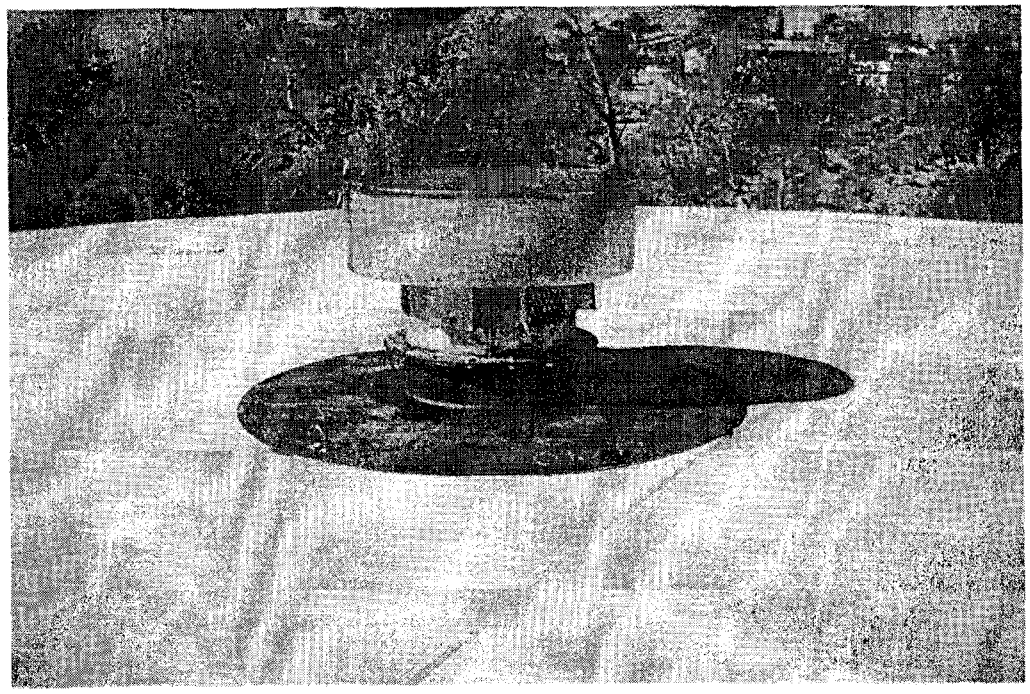
Res # 3
Picture - 4

The nuts and bolts and the holes they passed through were severely corroded. The toes on the lower and upper sections of these 8" X 30' long channel iron sections are corroded too badly to be successfully/long-term coated after blast



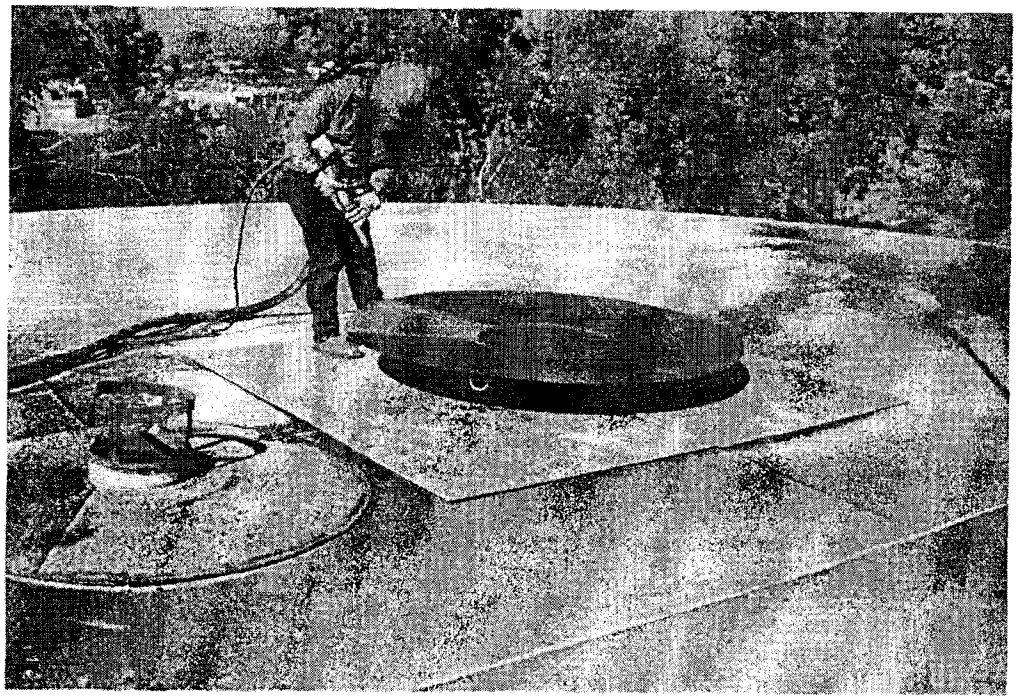
Res # 2
Picture - 5

This view is from the underside. The rafters don't presently rest on the dollar-plate. The load is taken on the fasteners that have pulled the back of each channel section up against welded clips each having two fasteners each



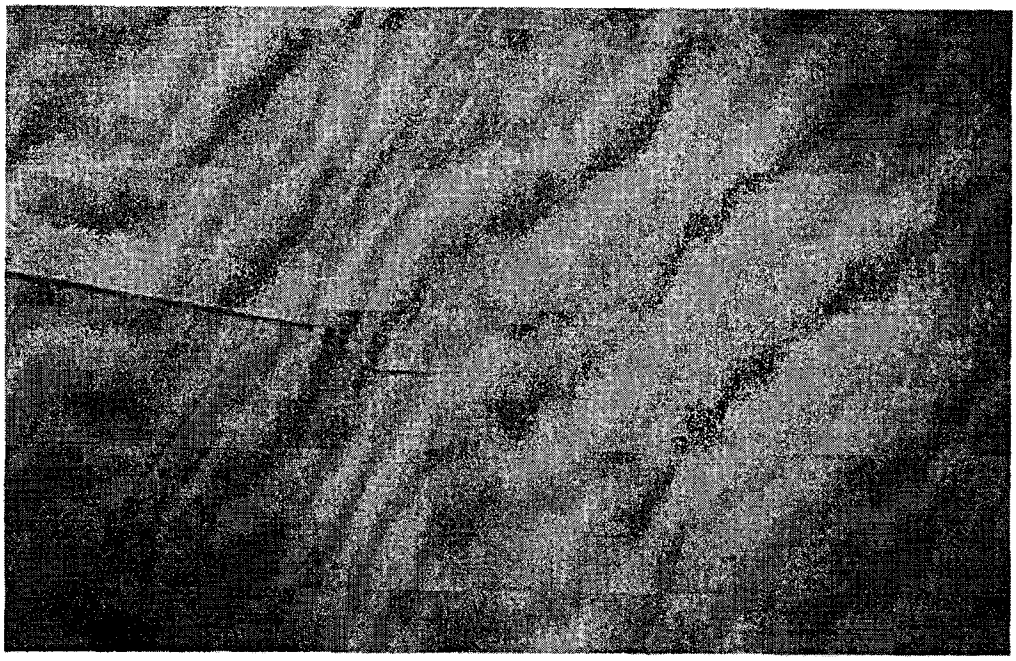
Res # 2
Picture – 6

The new carbon steel roof transition piece was temporarily tack-welded at four points and a rubber gasket placed between it and the new 24″ shaft stainless steel roof vent. It has three D-Clips for tie-off use when working on this roof



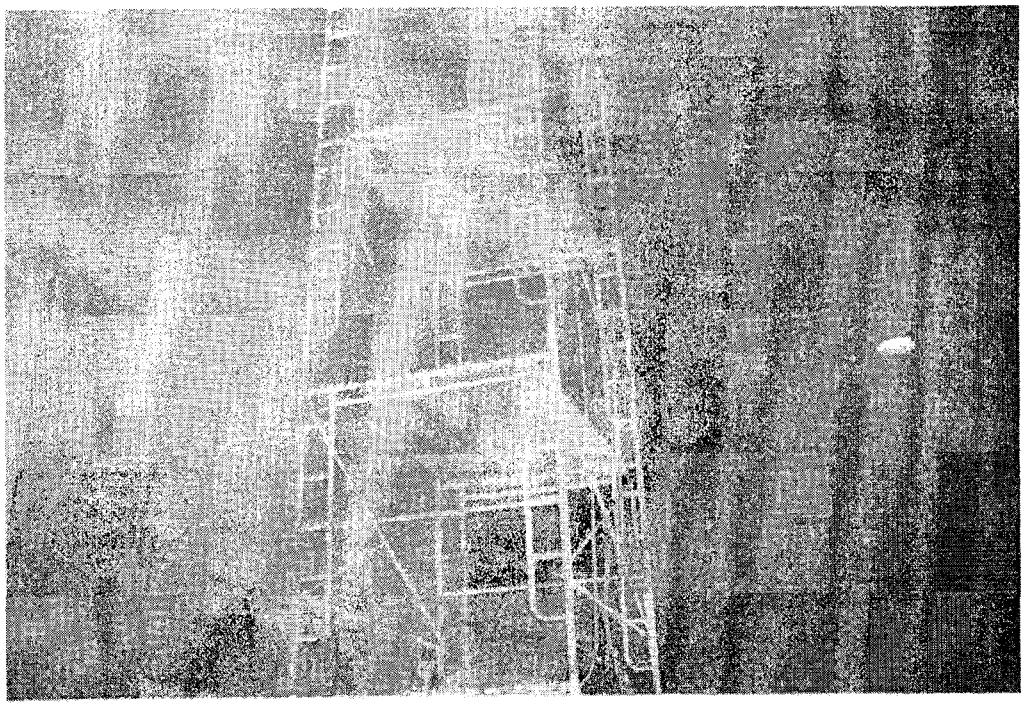
Res # 2
Picture - 7

Before it was set in place the complete underside was blasted and coated with epoxy to protect it while it is in short-term use before a later complete renovation of the interior



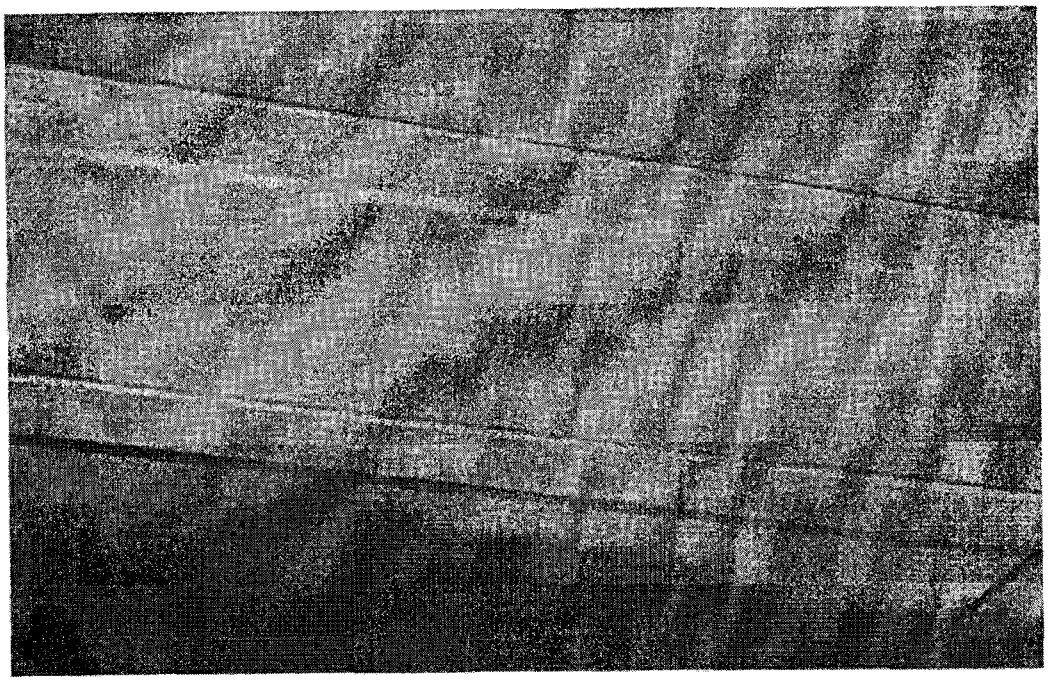
Res # 2
Picture - 8

This is the other end of the rafter array; where they meet the shell wall. Albeit pitted they aren't as bad as at the dollar-plate ends. The nuts and bolts should be changed however when blasting and painting work is started



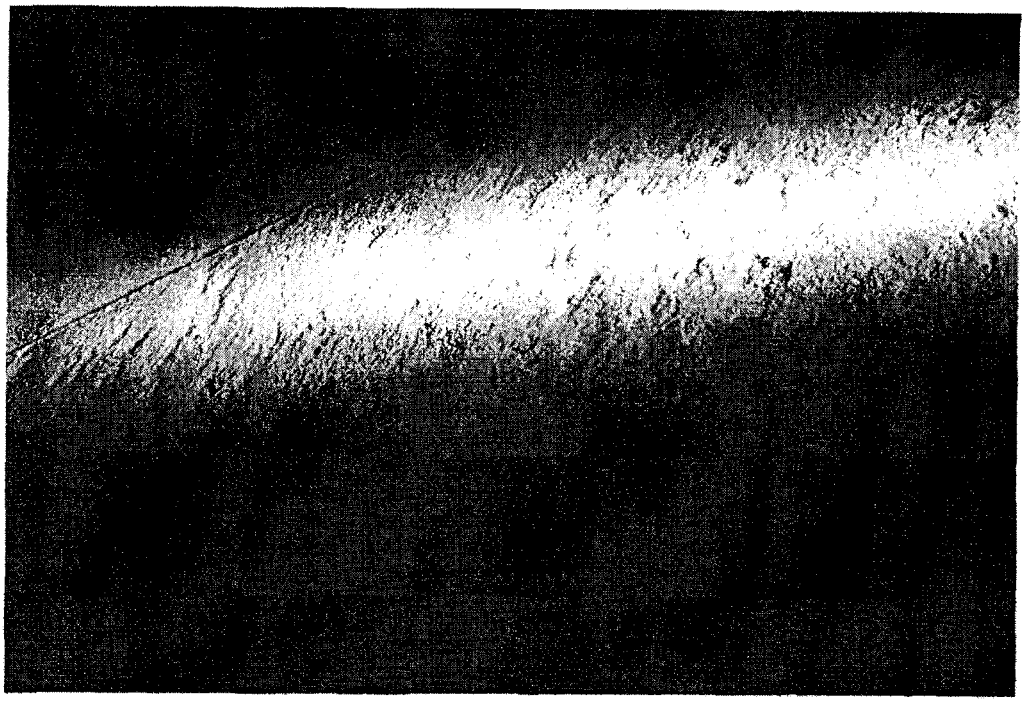
Res # 2
Picture - 9

These four scaffold sections were erected to get us up to the potential problem areas



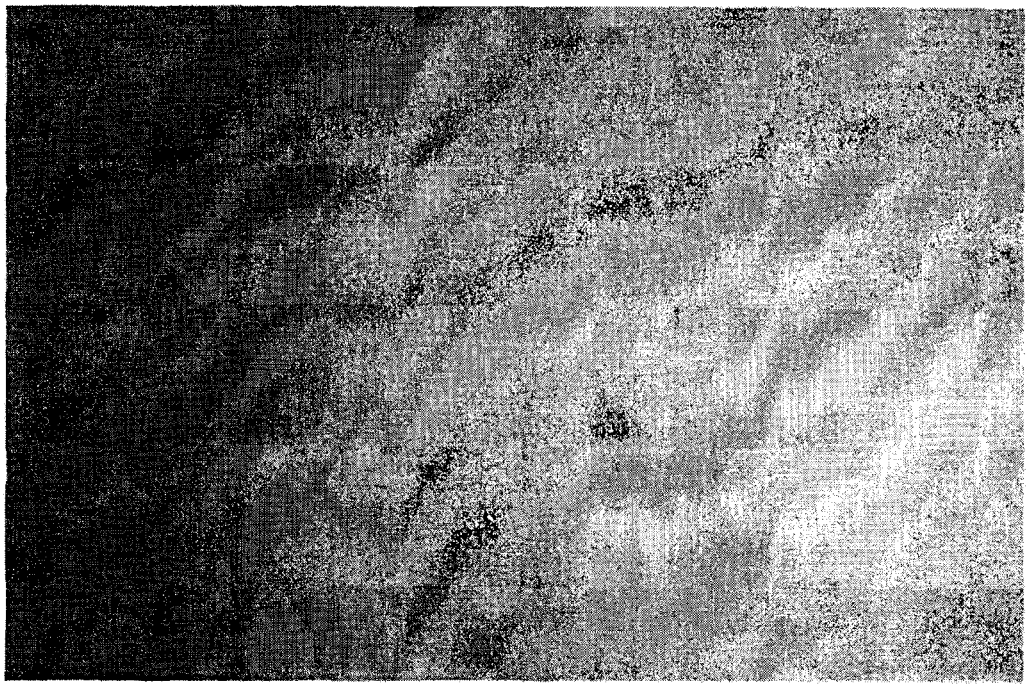
Res # 2
Picture - 10

When the roof plate underside/rafter-top interface was stress blasted there were no roof plate perforations apparent



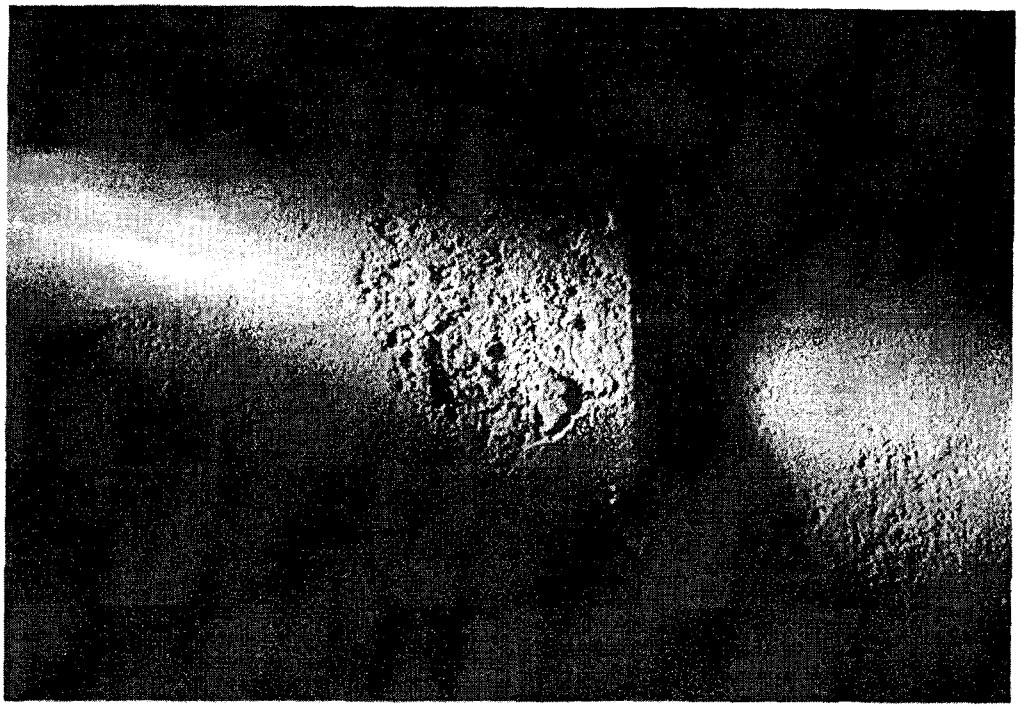
Res # 2
Picture - 11

This wall section was typical. General pitting everywhere. The substrate is rough enough that it would cause problems if a thin-film lining system were sprayed in place.



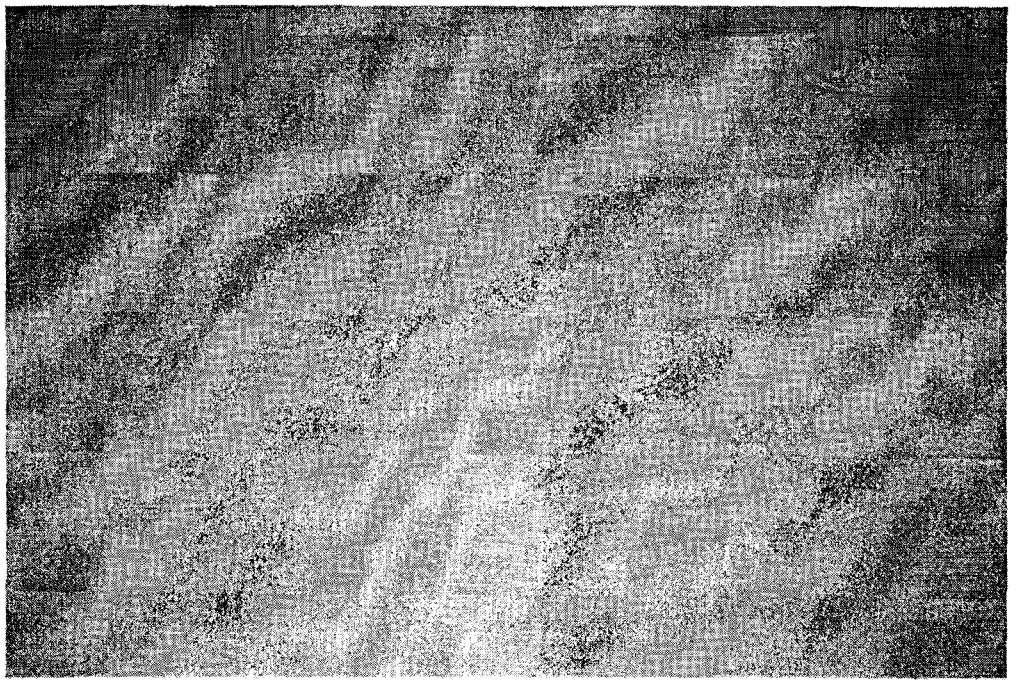
Res # 2
Picture - 12

Overnight the blast profile rusted. This was too quick for normal conditions. We then tested for excess chloride presence in the steel and found it >10 PPM, too high to paint over without first treating then repeating the SP10 blast



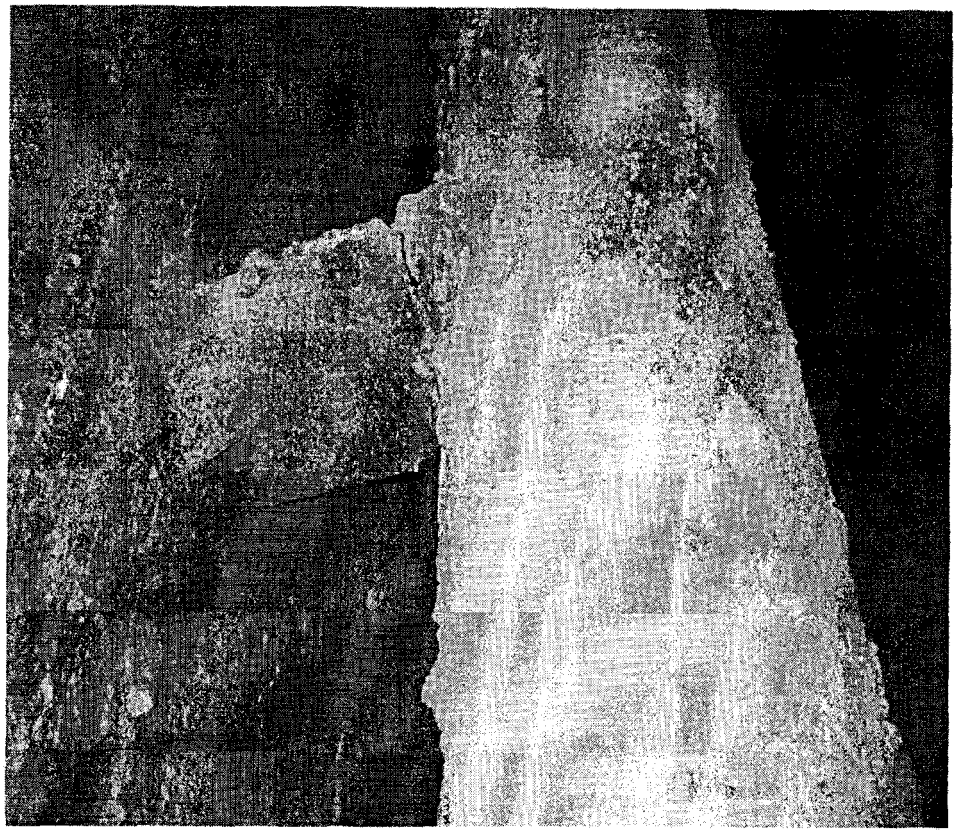
Res # 2
Picture - 13

We got this result in more than one place on the floor. We found no holes however. If holes are discovered when blasted, we would seal-weld ¼" X 6" round patches down and then blast again and coat the floor



Res # 2
Picture - 14

When we blasted the old coating off, it showed a complete lack of adhesion/cohesion. There has been no substrate protection for a very long period of time



There are three shell wall attachments for this internal side overflow pipe. Two of them are cracked badly like this one shows in the picture. The overflow can't be left like this. It has no vortex breaker at the very top and the writer believes this unit moves quite a lot when water rushes down to the eventual exit point. This unit should be high on a list for replacement items. First of all it is too small for a tank with a 16" fill pipe and a 16" drain pipe. Secondly it is inside the tank and if it breaks off or corrodes through the tank will automatically drain its self. It is set too high as well. We would recommend that its elevation be lowered by 6" to keep the high water line further away from the roof support steel attachments immediately above it.

Our recommendation is to remove it and replace it on the outside of the tank. It should then be 16" I.D to accommodate the possibility of severe overflow pressures on the roof underside. We have had to replace roofs that were severely deformed because of inadequate overflow system.

The floor drain (to waste) in this tank is presently 8". When the overflow is replaced we recommend that both the overflow pipe and the drain be aligned to run out the same final 16"flapper-valve equipped outlet. When we provide costs for this type of work that is the way they will be calculated.

Any changes of this sort will be accompanied by detailed drawings for your records.

Recommended Changes to Res # 2 when it is blasted and lined/overcoated

1. Seal-weld the bottom circumference gap of the existing roof Manway. Grind smooth
2. Add an 8' long OSHA approved handrail to each side of the existing exterior ladder landing on the roof
3. Add six more welded steel D-Clips to the tank roof spaced every 60 degrees, 15'in from the roof/shell-wall interface (These, including the three already on the new roof vent assembly will make nine tie-off points for men working on the roof)
4. Remove enough ladder cage to allow for a proper fit and then place an 8' tall, lockable, hinged, steel ladder-gate on the bottom of the existing exterior access ladder to stop unwanted access to the roof area of the tank. Blast and zinc prime the gate in the shop before installation
5. Remove the old interior access ladder, grind the old shell wall welds flush, cover the 3 roof penetrations with seal-welded 6" X ¼" thick circular blanks
6. Add a new 30" round, bolted type, davit-arm equipped, re-pad equipped, shell Manway towards the back side of the tank for safety reasons and added ventilation capability when working inside the tank, Blast and zinc-prime in the shop.
7. Cut a door-sheet and replace it. Will require an engineer stamped submittal for this effort. Door sheet can be cut in the 10' tall lower shell plate. It should be reinforced vertically on both sides of the door on interior wall side
8. Remove the existing overflow pipe assembly and rework it in onto the exterior of the tank, in a new size of 16" Sch. 40 pipe so that it has a weir-box set at 29' from the floor, immediately transferring out to the exterior shell where it would be braced and welded onto re-pads down to the ground. It would then enter the ground merging with a revised size and slightly moved 16" drain pipe c/w a matching valve that will still be buried for furtherance to an exit point down the hill. Add a vortex breaker to the weir-box. Blast and zinc prime the exterior sides while still in the shop. The diameter of this tank holds 51,913.1 gallons of water per vertical foot of storage; so at 29' the new stored volume will be 1,505,479.9 gallons
9. Note: The inlet valve is not holding. It needs to be changed before major blasting/painting or we need to pressure-type cover it so that it can't leak while we are working. This change is not in our price. If it is not possible to change the valve then we can place a mechanical stop on the unit to stem the flow from inside the tank. That price would be an extra to the contract at this time.
10. The vertical channel-iron sections forming the floor resting points for six columns within this tank need to be multiple 5/8" hole drilled before they are blasted and primed so that water isn't held in place thereby causing poor corrosion protection results. When the floor is coated with Polibrid extra material should be sprayed around the bases to seal them off from water contact
11. 25 only, 8" channel-iron rafters, and their fasteners, need to be changed on the inner ring of the tank roof support. They should be blasted and primed with a zinc-rich primer in the shop, brought to the site and then clip/bolt assembly fastened to each end of their resting points. They will then be field touched up and painted when the internal work starts on the tank
12. New rubber gaskets shall be placed on the three shell Manways after all blasting and painting is complete
13. Move gravel off the tank shell exterior before painting the exterior. Provide a slight drainage slope to the area outside the cleanout door exit so that good flow potential takes ponded water way from that tank underside

Roof and Support System – Interior Coating System
Aromatic Urethane, Organic Zinc-Rich Primer, epoxy stripe coat & then 2 C of High-Solids Epoxy
ANSI/NSF Standard 61 Recommended Interior System for Lining a Welded Steel Potable Water Storage Tank

Exterior Overcoat System
Power-Wash, SSPC-SP3 spot surface preparation, spot roller with Epoxy Mastic Primer and roller application of Hydrophobic Acrylic Polymer Emulsion Finish

SECTION 09970 - WATER TANK COATING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Work under this section consists of surface preparation, priming and painting necessary to complete work.
2. Use coating systems specified in this section to finish all water tank components, unless otherwise indicated. Without restricting volume or generality, work to be performed under this section may include, but is not limited to:
   a. Exterior steel
   b. Interior steel
   c. Surrounding, above ground piping, valves, pump exteriors adjacent to the tank

1.02 REFERENCES

A. Publications listed herein are part of this specification to extent referenced.

B. American Society for Testing and Materials:
1. ASTM D16 Terminology Relating to Paint, Varnish, Lacquer, and Related Products
2. ASTM D3359 Test Method for Measuring Adhesion by Tape Test
3. ASTM D4541 Test Method for Pull-off Strength of Coatings Using Portable Adhesion-Testers
4. ASTM D1005 Test for determining dry film thickness
5. ASTM D4417 Test for determining surface profile

D. The Society for Protective Coatings:
1. SSPC-SP1 Specification for Solvent Cleaning
2. SSPC-SP2 Specification for Hand Tool Cleaning
3. SSPC-SP3 Specification for Power Tool Cleaning
4. SSPC-SP5 Specification for White Metal Blast Cleaning
5. SSPC-SP6 Specification for Commercial Blast Cleaning
6. SSPC-SP7 Specification for Brush-Off Blast Cleaning
7. SSPC-SP10 Specification for Near White Metal Blast Cleaning
8. SSPC-SP11 Specification for Power Tool Cleaning to Bare Metal
9. SSPC-PA1 Painting Application Specification
10. SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gages
11. SSPC-SP12 Water Jetting

Roof and Support System – Interior Coating System

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Exterior Overcoat System

Power-Wash, SSPC-SP3 spot surface preparation, spot roller with Epoxy Mastic Primer and roller application of Hydrophobic Acrylic Polymer Emulsion Finish

1.03 DEFINITIONS

A. Terms PAINT shall in a general sense have reference to, zinc primers, hydrophobic acrylic polymer emulsions, epoxy type coatings and application of these materials.

B. DRY FILM THICKNESS (DFT): Thickness, measured in mils (1/1000 inch), of a coat of paint in cured state.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's literature describing products to be provided, giving manufacturer's name, product name, and product line number for each material.

2. Submit technical data sheets for each coating, giving descriptive data, curing times, mixing, thinning, and application requirements.
3. Submit color charts showing manufacturer's full range of standard colors.

B. Quality Assurance Submittals:
1. Certificates:
   a. Provide manufacturer's certification that products to be used comply with specified requirements and are suitable for intended application.
   b. Submit listing of not less than 5 of applicator's most recent applications representing similar scope and complexity to Project requirements. List shall include information as follows:
      i) Project name and address
      ii) Name of owner
      iii) Name of contractor
      iv) Name of Engineer
      v) Date of completion

2. Manufacturer's Instructions:
   a. Submit manufacturer's installation procedures, if not on product data sheets, which shall be basis for accepting or rejecting actual installation procedures.

1.05 QUALITY ASSURANCE

A. Qualifications:
1. Provide products from a company specializing in manufacture of coatings with a minimum of 5 years experience.

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Exterior Overcoat System

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2. Applicator shall be trained in application techniques and procedures of coating materials and shall demonstrate a minimum of 2 years successful experience in such application.
   a. Maintain, throughout duration of application, a crew of painters who are fully qualified.
3. Single Source Responsibility:
   a. Materials shall be products of a single manufacturer.
   b. Provide secondary materials, which are produced or are specifically recommended by coating system manufacturer to ensure compatibility of system.

B. Pre-Installation Meeting:

1. Schedule a meeting to be held on-site before field application of coating systems begins.
2. Meeting shall be attended by Contractor, Owner's representative, Engineer, Coating Applicators, and Manufacturer's representative.
3. Topics to be discussed at meeting shall include:
   a. A review of Contract Documents shall be made and deviations or differences shall be resolved.
   b. Review items such as environmental conditions, surface conditions, surface preparation, application procedures, protection following application, curing procedures and the return of tank to service.
   c. Establish which areas on-site will be available for use as storage areas and working area.
4. Prepare and submit, to parties in attendance, a written report of pre-installation meeting. Report shall be submitted within 3 days following meeting.

1.06 DELIVERY AND STORAGE

A. Packing and Shipping:

1. Deliver products in manufacturer's original unopened containers. Each container shall have manufacturer's label, intact and legible.

2. Include on label for each container:
   a. Manufacturer's name
   b. Type of paint
   c. Manufacturer's stock number
   d. Color name and number
   e. Instructions for thinning, where applicable

B. Storage and Protection:

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1. Store materials in a designated protected area, per manufacturer's printed data sheet instructions.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Apply coating materials per manufacturer's printed data sheet instructions:
   a. Refer to specific product data sheets for minimum surface temperature requirements. Surface temperatures shall be at least 5 degrees F (15 degrees C) above dew point and in a rising mode.
   b. Provide for proper ventilation using explosion proof equipment. Ventilation should run during surface preparation, painting and for at least 72 hours after painting is completed.
   c. Adequate illumination shall be provided using explosion proof lights and equipment.
   d. Atmosphere shall be free of airborne dust.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. This specification lists specific products manufactured by Sherwin-Williams Company and Polibrid Corporation. Materials specified herein are cited as a minimum standard of quality which will be acceptable.

B. Materials specified herein shall not preclude consideration of equivalent materials. Equivalent materials shall be submitted to Engineer for consideration and shall be made at least ten (10) days prior to the date of bids.
   1. Requests for substitution shall include evidence of satisfactory past performance on water tanks.
   2. Substitutions will not be considered that change number of coats or do not meet specified total dry film thickness.
   3. Contractor shall state in the bid the amount of deduct to use equivalent materials to those specified.
   4. Paints for interior wet applications must be listed by NSF International or Underwriters Laboratories (UL) as certified for potable water contact in accordance with ANSI/NSF Std. 61, Section 5, Protective (Barrier) Materials.

REPAINT – STEEL WATER STORAGE TANK

Interior Vapor Phase Only / Full Blast – Zinc/Stripe/Epoxy/Epoxy

Surface Preparation Remove all visible oil, grease, soil, dirt and other soluble contaminants in accordance with SSPC-SP1. Weld slag, weld spatter, rough edges and sharp edges of weld seams

shall be ground smooth. All rusted, abraded and unpainted areas shall be abrasive blast cleaned to a Near White Finish in accordance with the recommended methods outlined in The Society for Protective Coatings Specification SSPC-SP10 (NACE No. 2). A minimum surface profile of 2.0 to 2.5 mils is required.

Prime Coat: Immediately after abrasive blasting and before any rusting occurs, spray apply one coat of Sherwin-Williams Galvapac II (NSF) primer to all bare steel surfaces. The coating shall be applied at a dry film thickness of 2.5 to 3.0 mils.

Stripe Coat: After initial cure of the zinc primer, brush/roller apply a full highlight (stripe) coat of Sherwin-Williams 646 NSF Epoxy Series, white* in color, on all prominences within the tank's interior. This will add extra 1.5 to 2.0 mils of protection on edges, welds, etc.

Intermediate Coat: Spray apply one complete coat of Sherwin-Williams 646 NSF Epoxy Series, beige in color, to a dry film thickness of 4.0 to 6.0 mils.

Finish Coat: Spray apply one complete coat of Sherwin-Williams 646 NSF Epoxy Series, white* in color, to a dry film thickness of 4.0 to 6.0 mils.

Exterior – Roller Applied Spot Epoxy Primer/Acrylic Polymer Finish Coating System:

Surface Preparation: Remove all visible oil, grease, soil, dirt and other soluble contaminants if encountered in accordance with SSPC-SP1. All exterior surface areas shall be power-washed using an oscillating spray tip or fan shape, driven by a minimum of 1,500-psi water pressure. Broken down areas will be spot prepared to the extent of an SSPC-SP3 Power-tool cleaning. Edges will be tight and on the shell these edges will be feathered to display aesthetic continuity.

Spot Prime Coat: After surface preparation and before any new rusting occurs, apply one rolled coat of Epoxy Mastic Primer at a dry film thickness of not less than 2.0 to 3.0 mils.

First Finish Coat: Roller apply an even coat of Acrylic Polymer Finish, in a color approved by the owner, at a dry film thickness of 2.0 to 3.0 mils. To achieve complete cover, the final coat should be a noticeably different color than both the primer coat and the specified Polyurethane finish coat.

Final Finish Coat: Roller apply a full coat of Acrylic Polymer Finish to a minimum DFT of 2.5 to 3.0 mils.

Logo Work: There is no logo work on this site.

Note: Materials for both the interior and the exterior will be by the same manufacturer. Only ANSI/NSF Standard 61 Recommended Epoxies (interior use) will be allowed on this site. Only submitted and approved manufacture supplied thinners will be allowed on site. Any cleaners brought to the site and used will be new and unused previously.

Roof and Support System – Interior Coating System

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Exterior Overcoat System

Power-Wash, SSPC-SP3 spot surface preparation, spot roller with Epoxy Mastic Primer and roller application of Hydrophobic Acrylic Polymer Emulsion Finish

2.03 ACCESSORIES

A. Coating Application Accessories:
   1. Provide application accessories as indicated in coating manufacturer's application instructions, including but not limited to cleaning agents, etching agents, cleaning cloths, sanding materials, and clean-up materials.
   2. Material not specifically identified, but needed for proper application shall be of a quality not less than specified products.

2.04 MIXING Instructions: Specific product mixing and thinning instructions are to be found in the manufacturer's printed data sheets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:
   1. Examine areas and conditions under which application of coating systems shall be performed for conditions that will adversely affect execution, permanence, or quality of coating system application.
   2. Correct conditions detrimental to timely and proper execution of Work.
   3. Do not proceed until unsatisfactory conditions have been corrected.
   4. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Protection:
   1. Take precautionary measures to prevent fire hazards and spontaneous combustion. Remove empty containers from site at completion of each day's work.
   2. Provide drop cloths, shields, and other protective equipment.
   3. Protect elements surrounding work from damage or disfiguration.
   4. As Work proceeds, promptly remove spilled, splashed, or splattered materials from surfaces. Leave storage area neat and clean at all times.

B. Surface Preparation:

   1. General Requirements:

      a. Prior to application of primer, surfaces shall be prepared to receive specified paintings system in compliance with manufacturer's

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b. recommendations and specifications of The Society of Protective Coatings.

c. Surfaces to be coated shall be clean, dry and free from dust and any foreign matter which might adversely affect adhesion or appearance.

2. Ferrous Metal Surfaces:

a. For shop primed surfaces feather edges to make touch-up areas inconspicuous. Field welds and touch-ups shall be prepared to conform to original surface preparation standards.

b. Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in field. Use repair procedures which insure complete protection of adjacent primer

c. For surfaces not shop primed, surfaces shall be cleaned in compliance with specifications of The Society for Protective Coatings as indicated in Schedule of Coating Systems of this specification.

3.03 APPLICATION

A. General Requirements:

1. Apply coating systems in compliance with manufacturer's instructions and using application method best suited for obtaining full, uniform coverage and hide of surfaces to be coated.

a. Work shall be implemented in compliance with applicable sections of AWWA D102 and the latest revisions thereto.

2. Apply primer, intermediate, and finish coats to comply with wet and dry film thicknesses and spreading rates for each type of material as recommended by manufacturer and in accordance with SSPC-PA2.

3. Number of coats specified shall be minimum number acceptable. Apply additional coats as needed to provide a smooth, even application.

a. Closely adhere to re-coat times recommended by manufacturer. Allow each coat to dry thoroughly before applying next coat. Provide adequate ventilation for tank interior to carry off solvents during drying phase.

4. Employ only application equipment that is clean, properly adjusted, and in good working order, and of type recommended by coating manufacturer.

5. After surface preparation, spot primer on interior weld seams shall be brush applied.

B. Thinning: Thinning requirements for specified products are to be found in the paint. Manufacturer's printed data sheets and are to be strictly adhered to.

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C. Disinfection and Filling of Tank:

1. Provide adequate ventilation for proper drying of paint on interior surfaces and which will remove solvent vapors.
2. Following final application, tank shall not be disinfected or filled until coating system is fully cured.
3. Refer to applicable product data sheet(s) for dry time/temperature requirements. Disinfection (if specified) shall be in compliance with AWWA C652, or as instructed by Engineer.

D. Interface with Other Work:

1. Allow a minimum of seven days at 70 Degrees F (substrate temperature) curing time after application of final coat to tank interior before flushing, disinfecting or filling with water. Winter work will require much more time than this even if winter-grade epoxies are chosen. The new lining will be able to pass a 100 MEK Double-Rub test before disinfecting and returning to service

3.04 REPAIR/RESTORATION

A. At completion of Work, touch-up and restore finishes where damaged.

B. Defects in Finished Surfaces:
   1. When stain, dirt, or undercoats show through final coat, correct defects and cover with additional coats until coating is of uniform finish, color, appearance and coverage.

C. 1. Touch-up of minor damage shall be acceptable where result is not visibly different from surrounding surfaces. Where result is visibly different, either in color, sheen, or texture, recoat entire surface.

3.05 FIELD QUALITY CONTROL

A. Inspector's Services:
   1. Documents:
      a. Review Contract Documents and applicable sections of referenced standards.
   2. Field Painting Inspection:
      a. Verify cleaning operations to surfaces are to condition specified.
      b. Verify conformance of paint to specification.
      c. Check for thickness of each coating, final thickness and holidays.
      d. Check touch-up for final finish.

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e. Contractor will have both wet and dry film gauges onsite for inspector's use.

3. Reports:

a. Submit written progress reports describing inspections made and showing action taken to correct non-conforming work.

B. Manufacturer's Service:

1. A representative of the paint manufacturer shall be periodically available upon request to provide on-site technical assistance, and guidance for application of the paint system as needed. This representative shall witness the final cure test procedure.

3.06 PROTECTION

A. Protect painted areas against damage until paint system is fully cured.

3.07 WASTE MANAGEMENT

A. General Requirements:

1. Place materials defined as hazardous or toxic waste in designated containers.

2. Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal.

3. Do not dispose of paints or solvents by pouring on ground. Place in designated containers for proper disposal.

B. Containment/Disposal Requirements:

1. Surface Preparation Debris Containment:

a. When required by federal, state or local regulation, entire tank and structure shall be enclosed and surface preparation debris contained.

b. Refer to SSPC 61 Guides for Containing Debris Generated during Paint Removal Operations.

2. Disposal of Surface Preparation Debris:

a. Refer to SSPC 71 Guides for the Disposal of Lead-Contaminated Surface Preparation Debris.

b. Surface preparation debris shall be disposed of in compliance with applicable federal, state and local regulations.

3. Containment/Disposal Costs:

a. Painter shall be responsible for costs associated with containment and waste disposal that may result from execution of this Project.

Roof and Support System – Interior Coating System

Aromatic Urethane, Organic Zinc-Rich Primer, epoxy stripe coat & then 2 C of High-Solids Epoxy ANSI/NSF Standard 61 Recommended Interior System for Lining a Welded Steel Potable Water Storage Tank

Exterior Overcoat System

Power-Wash, SSPC-SP3 spot surface preparation, spot roller with Epoxy Mastic Primer and roller application of Hydrophobic Acrylic Polymer Emulsion Finish

3.08 ONE YEAR ANNIVERSARY INSPECTION

A. Owner shall set a date for a one-year inspection.

B. Inspection will be attended by an owner's representative, painting contractor and material supplier(s).

C. Any deficiencies in the coatings system will be repaired at the contractor's expense.

END OF SECTION

RILEY INDUSTRIAL
SERVICES, INC.

Water Tank Services Group
401 N Alma School Road, Unit # 3
Chandler, AZ 85224
Office 480-899-1228
Cell 505-608-4067
www.rileyindustrial.com
russellb@rileyindustrial.com

Chaparral City Water Company Reservoir # 2
Total Renovation Prices

Weld Repairs	$ 90,040.50	
Pre- Full Blast Prep	$ 56,818.07	($2.05/sq.ft.)
Blast & Line the Tank Interior	$271,456.16	($9.77/sq.ft.)
Prepare & Overcoat the Exterior	$ 35,286.19	($2.13/sq.ft.)
Total Price	$453,600.92	

Notes:

-Main inlet valve needs work. Our handling it is not in the price.
-Drainage needs to be enhanced just outside the cleanout door
-The tank interior lead test results were less than Federal number making it non-hazardous waste
-These prices are based on a two year AWWA warranty. The tank would be fully inspected and then touched up if required 24 months after date of substantial completion
-No taxes are included in these numbers
-Prices are based on starting the renovation on October 15, 2012
-Price is based on an early P. O. from CCWC along with a 10% check to Allow us to buy all materials and protect their cost until the job starts. These project materials can be kept in your care or stored in our facility until job startup

2012 Is our 42nd Year of Service to Industry & Municipalities

Client Cost Estimating Worksheet

File # 1.5M gal Tank Chor-rid wash
Company: Chaparral City Water Company
Phone:
Contact: Lee Jenkins/James F. Moore

Project Name: Fountain Hills, Az Reservoir # 2
Job Description: Brush-off blast and Chlor-rid wash interior
Notes:

Nate Engels

Task #	Schedule & work description	# of days	Crew Sizes P	S	F	J	O	H	Hours ST	OT	DT	TT	Total hrs
1	Brush off blast	8		1		3		2	8	2			480
2	Clor-rid wash	1		1		3		2	8	2			60
3		0											0
4		0											0
5		0											0
6		0											0
7		0											0
8		0											0
9		0											0
10		0											0
11		0											0
12		0											0
13		0											0
14		0											0
15		0											0
16		0											0
17		0											0
18		0											0
19		0											0
20		0											0
21		0											0
22		0											0
23		0											0
24		0											0
25		0											0

Estimated Equipment		hrs/days	Cost	Subtotal	Notes
1	1 ton crew Caps (2 @ $65.00 per shift)	9 shifts	$130.00	$1,170.00	
2	-miles	270 miles	$0.60	$162.00	
3	Pressuer washers (2 @ $ 38.00 each)	8 hrs.	$76.00	$608.00	
4		0	$0.00	$0.00	
5		0	$0.00	$0.00	
6	Sandblast unit	64 hrs.	$83.00	$5,312.00	
7	Nozzle lights (3 @ $17.00 each)	8 shifts	$51.00	$408.00	
8	500 watt lights (2 @ $ 28.00 each)	9 shifts	$56.00	$504.00	
9		0	$0.00	$0.00	
10	Generator	72 hrs.	$22.50	$1,620.00	
11	Steel Grit Reclaimer	32 hrs.	$132.50	$4,240.00	
12		0	$0.00	$0.00	
13		0	$0.00	$0.00	
14	Exhaust Fan - 10,000 cfm	9 shifts	$84.75	$762.75	
15	Forklift	15 hrs.	$45.50	$682.50	
16	Scaffolding	9 shifts	$150.00	$1,350.00	
17		0	$0.00	$0.00	
18	**Fuel Surcharge**	**1 LS**	**$1,892.44**	$1,892.44	
			Total	$18,711.69	

Estimated Materials & Equipment		Quantity	Cost	Subtotal	Notes
1	Mis. Supplies and PPE	9 shifts	$100.00	$900.00	
2	Steel Grit Loss	7000 lb	$0.49	$3,430.00	
3	Chlor-rid	60 gal	$65.17	$3,910.20	
4		0	$0.00	$0.00	
5		0	$0.00	$0.00	
6		0	$0.00	$0.00	
7		0	$0.00	$0.00	
8	Filter bag	1 each	$400.00	$400.00	
9		0	$0.00	$0.00	
10		0	$0.00	$0.00	
11		0	$0.00	$0.00	
12		0	$0.00	$0.00	
13		0	$0.00	$0.00	
14		0	$0.00	$0.00	
15		0	$0.00	$0.00	
16		0	$0.00	$0.00	
			Total	$8,640.20	

Nate Engels

		ST	OT	DT	TT
Project Manager	(P)	$ 61.50	$ 92.25	$ 123.00	$ 184.50
Superintendent	(S)	$ 57.50	$ 86.25	$ 115.00	$ 172.50
Foreman	(F)	$ 48.25	$ 72.38	$ 96.50	$ 144.75
Journeyman	(J)	$ 43.00	$ 64.50	$ 86.00	$ 129.00
Operator	(O)	$ 45.00	$ 67.50	$ 90.00	$ 135.00
Helper	(H)	$ 33.75	$ 50.63	$ 67.50	$ 101.25

Total Manhours

	ST	OT	DT	TT
(P)	0	0	0	0
(S)	72	18	0	0
(F)	0	0	0	0
(J)	216	54	0	0
(O)	0	0	0	0
(H)	144	36	0	0

Subtotals

	ST	OT	DT	TT
(P)	$0.00	$0.00	$0.00	$0.00
(S)	$4,140.00	$1,552.50	$0.00	$0.00
(F)	$0.00	$0.00	$0.00	$0.00
(J)	$9,288.00	$3,483.00	$0.00	$0.00
(O)	$0.00	$0.00	$0.00	$0.00
(H)	$4,860.00	$1,822.68	$0.00	$0.00

Subsistence for out of town work

		# of men	# of days	cost /day	Subtotal
Project Managers	(P)	0	0	$100.00	$0.00
Superintendents	(S)	1	9	$80.00	$720.00
Foremans	(F)	0	0	$80.00	$0.00
Journeymans	(J)	3	9	$80.00	$2,160.00
Operators	(O)	0	0	$80.00	$0.00
Helpers	(H)	2	9	$80.00	$1,440.00
				Total	$4,320.00

Subcontracts	Description	Units	Cost	Total
1		0	$0.00	$0.00
2		0	$0.00	$0.00
3		0	$0.00	$0.00
4		0	$0.00	$0.00
5		0	$0.00	$0.00
6		0	$0.00	$0.00
7		0	$0.00	$0.00
8		0	$0.00	$0.00
9		0	$0.00	$0.00

Project Total

		Price
Straight Time	(ST)	$18,288.00
Overtime	(OT)	$6,858.18
Double Time	(DT)	$0.00
Triple Time	(TT)	$0.00
LABOR	TOTAL	$25,146.18
SUBSISTENCE	TOTAL	$4,320.00
EQUIPMENT	TOTAL	$18,711.69
MATERIALS	TOTAL	$8,640.20
SUBCONTRACTS	TOTAL	$0.00
Grand Total		$56,818.07

Client Cost Estimating Worksheet

File # 1.5M gal Tank, HB, SB, & coat
Company: Chaparral City Water Company
Phone:
Contact: Lee Jenkins/James F. Moore

Project Name: Fountain Hills, Az Reservoir # 2
Job Description: Hydroblast, Sandblast, and coat interior of tank
Notes:

Nate Engels

Task #	Schedule & work description	# of days	Crew Sizes P	S	F	J	O	H	Hours ST	OT	DT	TT	Total hrs
1	Shop Load	2		1				1	8	2			40
2	Travel from Show Low, AZ to Fountain Hills, AZ	1				1		2	8	2			30
3	Travel from Farmington, NM to Fountain Hills, AZ	1		1		2			8	2			30
4	Build scafolding and rid up hydroblast pump	1		1		3		2	8	2			60
5	Hydrobast	2		1		3		2	8	2			120
6	Rigdown hydroblast & rigup sandblast	1		1		3		2	8	2			60
7	Abrasive Blast to SSPC-SP10 near white metal	13		1		3		2	8	2			780
8	Prime Roof with Zinc	1		1		3		2	8	2			60
9	Apply 1st coat Epoxy to roof	1		1		3		2	8	2			60
10	Apply 2nd coat Epoxy to roof	1		1		3		2	8	2			60
11	Test and touch up roof	1		1		3		2	8	2			60
12	Sand edge of Epoxy to produce achor pattern	1		1		3		2	8	2			60
13	Apply Polibrid to walls and floor	3		1		3		2	8	2			180
14	Test and touch up walls and floor	1		1		3		2	8	2			60
15	Disinfect	1		1		3		2	8	2			60
16	Rigdown and load up	1		1		3		2	8	2			60
17	Travel back to Show Low, AZ	1				1		2	8	2			30
18	Travel back to farmington, NM	1		1		2			8	2			30
19		0											0
20	Weekend OT	10		1		3		2	4				240
21		0											0
22	Truck driver to deliver loads	4					2		8	4			96
23		0											0
24		0											0
25		0											0

Estimated Equipment	hrs/days	Cost	Subtotal	Notes
1 1 ton crew Caps (2 @ $65.00 per shift)	30 shifts	$130.00	$3,900.00	
2 -miles	2880 miles	$0.60	$1,728.00	
3 30 Tons (5 @ $105.50 per shift)	2 shifts	$527.50	$1,055.00	
4 -miles	4880 miles	$1.40	$6,832.00	
5 Hydroblast unit (300)	32 hrs.	$137.50	$4,400.00	
6 Sandblast unit	104 hrs.	$83.00	$8,632.00	
7 Nozzle lights (3 @ $17.00 each)	13 shifts	$51.00	$663.00	
8 500 watt lights (2 @ $ 28.00 each)	25 shifts	$56.00	$1,400.00	
9 Explosion proof lights (2 @ $ 91.50 each)	7 shifts	$183.00	$1,281.00	
10 Generator	480 hrs.	$22.50	$10,800.00	
11 Steel Grit Reclaimer	52 hrs.	$132.50	$6,890.00	
12 Airless paint Unit	24 hrs.	$43.75	$1,050.00	
13 Polibraid spray unit	24 hrs.	$87.25	$2,094.00	
14 Exhaust Fan - 10,000 cfm	28 shifts	$84.75	$2,373.00	
15 Forklift	25 hrs.	$45.50	$1,137.50	
16 Scaffolding	28 shifts	$150.00	$4,200.00	
17 disinfection unit	1 shifts	$533.00	$533.00	
18 **Fuel Surcharge**	**1 LS**	**$6,685.19**	$6,685.19	
		Total	$65,653.69	

Estimated Materials & Equipment	Quantity	Cost	Subtotal	Notes
1 Mis. Supplies and PPE	28 shifts	$100.00	$2,800.00	
2 Steel Grit Loss	7000 lb	$0.49	$3,430.00	
3 Zinc Primer	40 gal	$89.64	$3,585.60	
4 Epoxy	140 gal	$42.90	$6,006.00	
5 Polibrid	730 gal	$79.30	$57,889.00	
6 thinners	15 gal	$21.00	$315.00	
7 MEK of clean up	60 gal	$13.25	$795.00	
8 Filter bag	1 each	$400.00	$400.00	
9 Haz-waste disposal	55 gal	$13.25	$728.75	
10 Hand sanders (4 @ $ 24.25 each)	1 shifts	$97.00	$97.00	
11	0	$0.00	$0.00	
12	0	$0.00	$0.00	
13 DH unit	28 shifts	$106.00	$2,968.00	
14 Propane	3000 gal	$4.00	$12,000.00	
15	0	$0.00	$0.00	
16	0	$0.00	$0.00	
		Total	$91,014.35	

Nate Engels

		ST	OT	DT	TT
Project Manager	(P)	$ 61.50	$ 92.25	$ 123.00	$ 184.50
Superintendent	(S)	$ 57.50	$ 86.25	$ 115.00	$ 172.50
Foreman	(F)	$ 48.25	$ 72.38	$ 96.50	$ 144.75
Journeyman	(J)	$ 43.00	$ 64.50	$ 86.00	$ 129.00
Operator	(O)	$ 45.00	$ 67.50	$ 90.00	$ 135.00
Helper	(H)	$ 33.75	$ 50.63	$ 67.50	$ 101.25

Total Manhours

	ST	OT	DT	TT
(P)	0	0	0	0
(S)	296	64	0	0
(F)	0	0	0	0
(J)	840	180	0	0
(O)	64	32	0	0
(H)	576	124	0	0

Subtotals

	ST	OT	DT	TT
(P)	$0.00	$0.00	$0.00	$0.00
(S)	$17,020.00	$5,520.00	$0.00	$0.00
(F)	$0.00	$0.00	$0.00	$0.00
(J)	$36,120.00	$11,610.00	$0.00	$0.00
(O)	$2,880.00	$2,160.00	$0.00	$0.00
(H)	$19,440.00	$6,278.12	$0.00	$0.00

Subsistence for out of town work

		# of men	# of days	cost /day	Subtotal
Project Managers	(P)	0	0	$100.00	$0.00
Superintendents	(S)	1	28	$80.00	$2,240.00
Foremans	(F)	0	0	$80.00	$0.00
Journeymans	(J)	3	28	$80.00	$6,720.00
Operators	(O)	2	2	$80.00	$320.00
Helpers	(H)	2	28	$80.00	$4,480.00
				Total	$13,760.00

Subcontracts	Description	Units	Cost	Total
1		0	$0.00	$0.00
2		0	$0.00	$0.00
3		0	$0.00	$0.00
4		0	$0.00	$0.00
5		0	$0.00	$0.00
6		0	$0.00	$0.00
7		0	$0.00	$0.00
8		0	$0.00	$0.00
9		0	$0.00	$0.00

Project Total

		Price
Straight Time	(ST)	$75,460.00
Overtime	(OT)	$25,568.12
Double Time	(DT)	$0.00
Triple Time	(TT)	$0.00
LABOR	TOTAL	$101,028.12
SUBSISTENCE	TOTAL	$13,760.00
EQUIPMENT	TOTAL	$65,653.69
MATERIALS	TOTAL	$91,014.35
SUBCONTRACTS	TOTAL	$0.00
Grand Total		$271,456.16

Client Cost Estimating Worksheet

File # 1.5M gal Tank exterior paint
Company: Chaparral City Water Company
Phone:
Contact: Lee Jenkins/James F. Moore

Project Name: Fountain Hills, Az Reservoir # 2
Job Description: Power wash and paint exterior
Notes:

Nate Engels

Task #	Schedule & work description	# of days	Crew Sizes P	S	F	J	O	H	Hours ST	OT	DT	TT	Total hrs
1	Pressure wash exterior surfaces	3		1		3		2	8	2			180
2	Power tool clean & spot prime bare metal	1		1		3		2	8	2			60
3	Apply 1 coat Spraylastic	2		1		3		2	8	2			120
4		0											0
5		0											0
6		0											0
7		0											0
8		0											0
9		0											0
10		0											0
11		0											0
12		0											0
13		0											0
14		0											0
15		0											0
16		0											0
17		0											0
18		0											0
19		0											0
20		0											0
21		0											0
22		0											0
23		0											0
24		0											0
25		0											0

Estimated Equipment	hrs/days	Cost	Subtotal	Notes
1 1 ton crew Caps (2 @ $65.00 per shift)	6 shifts	$65.00	$390.00	
2 -miles	180 miles	$0.60	$108.00	
3 Pressuer washers (2 @ $ 38.00 each)	24 hrs.	$76.00	$1,824.00	
4 Scaffolding	7 shifts	$25.00	$175.00	
5 Skyclimber Units (2 @ $ 81.75 each)	6 shifts	$163.50	$981.00	
6 Airless paint unit (no a/c)	16 hrs.	$17.50	$280.00	
7 Brush and roller unit	8 hrs.	$11.25	$90.00	
8 750 A/C	48 hrs.	$69.50	$3,336.00	
9	0	$0.00	$0.00	
10	0	$0.00	$0.00	
11	0	$0.00	$0.00	
12	0	$0.00	$0.00	
13	0	$0.00	$0.00	
14	0	$0.00	$0.00	
15	0	$0.00	$0.00	
16	0	$0.00	$0.00	
17	0	$0.00	$0.00	
18 **Fuel Surcharge**	1 LS	**$863.07**	$863.07	
		Total	$8,047.07	

Estimated Materials & Equipment	Quantity	Cost	Subtotal	Notes
1 Mis. Supplies and PPE	7 shifts	$100.00	$700.00	
2 Carbolin # 3 surface cleaner	40 gal	$14.00	$560.00	
3 *Macropoxy 646 primer*	10 gal	$42.00	$420.00	
4 S/w Spraylastic dryfall	130 gal	$45.50	$5,915.00	
5	0	$0.00	$0.00	
6	0	$0.00	$0.00	
7	0	$0.00	$0.00	
8	0	$0.00	$0.00	
9	0	$0.00	$0.00	
10	0	$0.00	$0.00	
11	0	$0.00	$0.00	
12	0	$0.00	$0.00	
13	0	$0.00	$0.00	
14	0	$0.00	$0.00	
15	0	$0.00	$0.00	
16	0	$0.00	$0.00	
		Total	$7,595.00	

Nate Engels

		ST	OT	DT	TT
Project Manager	(P)	$ 61.50	$ 92.25	$ 123.00	$ 184.50
Superintendent	(S)	$ 57.50	$ 86.25	$ 115.00	$ 172.50
Foreman	(F)	$ 48.25	$ 72.38	$ 96.50	$ 144.75
Journeyman	(J)	$ 43.00	$ 64.50	$ 86.00	$ 129.00
Operator	(O)	$ 45.00	$ 67.50	$ 90.00	$ 135.00
Helper	(H)	$ 33.75	$ 50.63	$ 67.50	$ 101.25

Total Manhours					Subtotals				
	ST	OT	DT	TT		ST	OT	DT	TT
(P)	0	0	0	0	(P)	$0.00	$0.00	$0.00	$0.00
(S)	48	12	0	0	(S)	$2,760.00	$1,035.00	$0.00	$0.00
(F)	0	0	0	0	(F)	$0.00	$0.00	$0.00	$0.00
(J)	144	36	0	0	(J)	$6,192.00	$2,322.00	$0.00	$0.00
(O)	0	0	0	0	(O)	$0.00	$0.00	$0.00	$0.00
(H)	96	24	0	0	(H)	$3,240.00	$1,215.12	$0.00	$0.00

Subsistence for out of town work

		# of men	# of days	cost /day	Subtotal
Project Managers	(P)	0	0	$100.00	$0.00
Superintendents	(S)	1	6	$80.00	$480.00
Foremans	(F)	0	0	$80.00	$0.00
Journeymans	(J)	3	6	$80.00	$1,440.00
Operators	(O)	0	0	$80.00	$0.00
Helpers	(H)	2	6	$80.00	$960.00
				Total	$2,880.00

Subcontracts	Description	Units	Cost	Total
1		0	$0.00	$0.00
2		0	$0.00	$0.00
3		0	$0.00	$0.00
4		0	$0.00	$0.00
5		0	$0.00	$0.00
6		0	$0.00	$0.00
7		0	$0.00	$0.00
8		0	$0.00	$0.00
9		0	$0.00	$0.00

Project Total

		Price
Straight Time	(ST)	$12,192.00
Overtime	(OT)	$4,572.12
Double Time	(DT)	$0.00
Triple Time	(TT)	$0.00
LABOR	**TOTAL**	$16,764.12
SUBSISTENCE	**TOTAL**	$2,880.00
EQUIPMENT	**TOTAL**	$8,047.07
MATERIALS	**TOTAL**	$7,595.00
SUBCONTRACTS	**TOTAL**	$0.00
Grand Total		$35,286.19

EXHIBIT ICC-6

No.	Location	Diameter (inches)	Operator	Control	Manufacturer/ Model
1	Treatment unit No.1 clarifier effluent (right side)	16	Pneumatic open/close	Automatic activation	Bray valve and actuator
2	Treatment unit No.1 clarifier effluent (left side)	16	Pneumatic open/close	Automatic activation	Bray valve and actuator
3	Treatment unit No.1 filter influent (right side)	24	Pneumatic open/close	Automatic activation	Bray valve and Bi-Torq actuator
4	Treatment unit No.1 filter influent (left side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
5	Treatment unit No.1 clarifier transfer (right side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
6	Treatment unit No.1 clarifier transfer (left side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
7	Air scour blower discharge	6	Pressure relief valve	Set at 10 psi	
8	Air scour blower discharge	6	Pressure relief valve	Set at 10 psi	
9	Air scour blower discharge	6	Pressure relief valve	Set at 10 psi	
10	Treatment unit No.2 clarifier effluent (right side)	16	Pneumatic open/close	Automatic activation	Bray valve and actuator
11	Treatment unit No.2 clarifier effluent (left side)	16	Pneumatic open/close	Automatic activation	Bray valve and actuator
12	Treatment unit No.2 filter influent (right side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
13	Treatment unit No.2 filter influent (left side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
14	Treatment unit No.2 clarifier transfer (right side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
15	Treatment unit No.2 clarifier transfer (left side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
16	Treatment unit No.3 clarifier effluent (right side)	16	Pneumatic open/close	Automatic activation	Bray valve and actuator
17	Treatment unit No.3 clarifier effluent (left side)	16	Pneumatic open/close	Automatic activation	Bray valve and actuator
18	Treatment unit No.3 filter influent (right side)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
19	Treatment unit No.3 clarifier transfer (left)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
20	Treatment unit No.3 clarifier transfer (right)	24	Pneumatic open/close	Automatic activation	Bray valve and actuator
21	Backwash pump no.1 discharge	18	Silent globe style check valve		Val-Matic Series 1800

22	Backwash pump no.2 discharge	18	Silent globe style check valve		Val-Matic Series 1800
23	High service pump no.3 discharge	10	Silent globe style check valve		Val-Matic Series 1800
24	High service pump no.4 discharge	10	Silent globe style check valve		Val-Matic Series 1800
25	Air scour blower no. 1 discharge	6	Silent globe style check valve		Val-Matic Series 1800
26	Air scour blower no.2 discharge	6	Silent globe style check valve		Val-Matic Series 1800
27	Air scour blower no.3 discharge	6	Silent globe style check valve		Val-Matic Series 1800
28	Treatment unit No.1 filter to waste (Right side)	10	Check valve		Kennedy
29	Treatment unit No.1 filter to waste (left side)	10	Check valve		Kennedy
30	Treatment unit No.2 filter to waste (right side)	10	Check valve		Kennedy
31	Treatment unit No.2 filter to waste (left side)	10	Check valve		Kennedy
32	Treatment unit No.3 filter to waste (right side)	10	Check valve		Kennedy
33	Treatment unit No.3 filter to waste (left side)	10	Check valve		Kennedy

EXHIBIT ICC-7

TABLE I (Page 1 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**309 Supply *Mains***	Pipe length	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
none										
Subtotal Cost (estimate)										

TABLE I (Page 2 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**331 T&D Mains**	Pipe length / Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
331-1	331	28	6", 8", 12"	Valve	$5,560	AZ0022381	Palomino	12/2014	$155,680	Replace 23-6", 1-8", 4-12" valves (28 total) on Palomino between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-2	331	32	6"	Valve	$5,560	AZ0022381	Mustang	12/2014	$177,920	Replace 31-6", 1-4" valves (32 total) on Mustang between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-3	331	3	6"	Valve	$5,560	AZ0022381	Spotted Horse	12/2014	$16,680	Replace 3-6" valves on Spotted Horse between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-4	331	10	6"	Valve	$5,560	AZ0022381	Buffalo	12/2014	$55,600	Replace 10-6" valves on Buffalo between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age.

										These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-5	331	1	6"	Valve	$5,560	AZ0022381	Garland	12/2014	$5,560	Replace 1-6" valve on Garland between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-6	331	10	6"	Valve	$5,560	AZ0022381	Pinto	12/2014	$55,600	Replace 10-6" valves on Pinto between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-7	331	16	6", 8", 12"	Valve	5,560	AZ0022381	Ocotillo	12/2014	$88,960	Replace 14-6", 2-8" valves (16 total) on Ocotillo between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
Subtotal Cost (estimate)									$556,000	

TABLE I (Page 3 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**333 Services**	Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
333-1	333	20	¾" & 1"	Black Poly	$3,544	AZ0022381	Ocotillo	12/2014	$70,880	Replace 20 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-2	333	111	¾" & 1"	Black Poly	$3,544	AZ0022381	Mustang	12/2014	$393,384	Replace 111 residential services (3/4" or 1") on Mustang between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-3	333	14	¾" & 1"	Black Poly	$3,544	AZ0022381	Spotted Horse	12/2014	$49,616	Replace 14 residential services (3/4" or 1") on Spotted Horse between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.

333-4	333	40	¾" & 1"	Black Poly	$3,544	AZ0022381	Buffalo	12/2014	$141,760	Replace 40 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-5	333	11	¾" & 1"	Black Poly	$3,544	AZ0022381	Garland	12/2014	$38,984	Replace 11 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-6	333	54	¾" & 1"	Black Poly	$3,544	AZ0022381	Pinto	12/2014	$191,376	Replace 54 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)									$886,000	

TABLE I (Page 4 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)			PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**334 Meters**	Size	Quantity	Cost/Unit			Expected In-Service Date	Cost (estimated)	
334-1	334	¾" to >2"	1,481	Varies by size $180-$450	AZ0022381	Meter Routes 9, 24, 8	12/2014	$290,390	Replace 1,078 - ¾", 362 – 1", 22 – 1.5", 16 – 2", and 3 - >2" (1,481 total) meters in CCWC meter routes 9, 24, 8. The meters are greater than 10 years old and a rapidly declining in meter accuracy and are manual read meters. New meters will help reduce system water loss to below 10% and increase meter reading efficiency with new AMR meters. The meters replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)								$290,390	

TABLE I (Page 5 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)		PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**335 Hydrants**	Quantity	Cost/Unit			Expected In-Service Date	Cost (estimated)	
335-1	335	10	$1,600	AZ0022381	Palomino	12/2014	$16,000	Replace 10 fire hydrants on Palomino between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-2	335	10	$1,600	AZ0022381	Mustang	12/2014	$16,000	Replace 10 fire hydrants on Mustang between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-3	335	1	$1,600	AZ0022381	Spotted Horse	12/2014	$1,600	Replace 1 fire hydrants on Spotted Horse between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-4	335	6	$1,600	AZ0022381	Buffalo	12/2014	$9,600	Replace 6 fire hydrants on Buffalo between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-5	335	1	$1,600	AZ0022381	Garland	12/2014	$1,600	Replace 10 fire hydrants on Garland between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their

								useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-6	335	4	$1,600	AZ0022381	Pinto	12/2014	$6,400	Replace 4 fire hydrants on Pinto between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-7	335	9	$1,600	AZ0022381	Sunburst	12/2014	$14,400	Replace 9 fire hydrants on Sunburst between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-8	335	3	$1,600	AZ0022381	Burro	12/2014	$4,800	Replace 3 fire hydrants on Burro between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-9	335	6	$1,600	AZ0022381	Ocotillo	12/2014	$9,600	Replace 6 fire hydrants on Ocotillo between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)							$80,000	

TABLE I (Page 6 of 6, Summary)

Information to be included with DSIC-Eligible Completed Project Filings

Project No.	PWSID No.	Project Description	Cost (estimated)
331-1	AZ0022381	Replace 23-6", 1-8", 4-12" valves (28 total) on Palomino between Palisades and Fountain Hills Blvd.	$155,680
331-2	AZ0022381	Replace 31-6", 1-4" valves (32 total) on Mustang between Palisades and Fountain Hills Blvd.	$177,920
331-3	AZ0022381	Replace 3-6" valves on Spotted Horse between Palisades and Fountain Hills Blvd.	$16,680
331-4	AZ0022381	Replace 10-6" valves on Buffalo between Palisades and Fountain Hills Blvd.	$55,600
331-5	AZ0022381	Replace 1-6" valve on Garland between Palisades and Fountain Hills Blvd.	$5,560
331-6	AZ0022381	Replace 10-6" valves on Pinto between Palisades and Fountain Hills Blvd.	$55,600
331-7	AZ0022381	Replace 14-6", 2-8" valves (16 total) on Ocotillo between Palisades and Fountain Hills Blvd	$88,960
333-1	AZ0022381	Replace 20 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd.	$70,880
333-2	AZ0022381	Replace 111 residential services (3/4" or 1") on Mustang between Palisades and Fountain Hills Blvd.	$393,384
333-3	AZ0022381	Replace 14 residential services (3/4" or 1") on Spotted Horse between Palisades and Fountain Hills Blvd.	$49,616
333-4	AZ0022381	Replace 40 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd.	$141,760
333-5	AZ0022381	Replace 11 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd.	$38,984
333-6	AZ0022381	Replace 54 residential services (3/4" or 1") on Ocotillo between Palisades and Fountain Hills Blvd	$191,376
334-1	AZ0022381	Replace 1,078 - ¾", 362 – 1", 22 – 1.5", 16 – 2", and 3 - >2" (1,481 total) meters in CCWC meter routes 9, 24, 8.	$290,390
335-1	AZ0022381	Replace 10 fire hydrants on Palomino between Palisades and Fountain Hills Blvd.	$16,000

335-2	AZ0022381	Replace 10 fire hydrants on Mustang between Palisades and Fountain Hills Blvd.	$16,000
335-3	AZ0022381	Replace 1 fire hydrants on Spotted Horse between Palisades and Fountain Hills Blvd.	$1,600
335-4	AZ0022381	Replace 6 fire hydrants on Buffalo between Palisades and Fountain Hills Blvd	$9,600
335-5	AZ0022381	Replace 10 fire hydrants on Garland between Palisades and Fountain Hills Blvd.	$1,600
335-6	AZ0022381	Replace 4 fire hydrants on Pinto between Palisades and Fountain Hills Blvd.	$6,400
335-7	AZ0022381	Replace 9 fire hydrants on Sunburst between Palisades and Fountain Hills Blvd.	$14,400
335-8	AZ0022381	Replace 3 fire hydrants on Burro between Palisades and Fountain Hills Blvd.	$4,800
335-9	AZ0022381	Replace 6 fire hydrants on Ocotillo between Palisades and Fountain Hills Blvd.	$9,600
Total Cost (estimate)			$1,812,390

TABLE I (Page 1 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**309 Supply Mains**	Pipe length	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
none										
Subtotal Cost (estimate)										

TABLE I (Page 2 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**331 T&D Mains**	Pipe length / Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
331-1	331	17	4", 6", 12"	Valve	$5,560	AZ0022381	Sycamore	12/2015	$94,520	Replace 1-4", 10-6", 6-12" valves (17 total) on Sycamore between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-2	331	6	6"	Valve	$5,560	AZ0022381	Winchester	12/2015	$33,360	Replace 6 - 6" valves on Winchester between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-3	331	9	6"	Valve	$5,560	AZ0022381	Ridgeway	12/2015	$50,040	Replace 9 - 6" valves on Ridgeway between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-4	331	41	6"	Valve	$5,560	AZ0022381	Sunburst	12/2015	$227,960	Replace 17 - 6" valves on Sunburst between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age.

										These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-5	331	15	6"	Valve	$5,560	AZ0022381	Greystone	12/2015	$83,400	Replace 15 - 6" valves on Greystone between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-6	331	8	6"	Valve	$5,560	AZ0022381	Telegraph	12/2015	$44,480	Replace 8 - 6" valves on Telegraph between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-7	331	4	6"	Valve	5,560	AZ0022381	Tacony	12/2015	$22,240	Replace 4 - 6" valves on Tacony between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
Subtotal Cost (estimate)									$556,000	

TABLE I (Page 3 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**333 Services**	Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
333-1	333	50	¾" & 1"	Black Poly	$3,544	AZ0022381	Sycamore	12/2015	$177,200	Replace 50 residential services (3/4" or 1") on Sycamore between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-2	333	14	¾" & 1"	Black Poly	$3,544	AZ0022381	Winchester	12/2015	$49,616	Replace 14 residential services (3/4" or 1") on Winchester between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-3	333	31	¾" & 1"	Black Poly	$3,544	AZ0022381	Ridgeway	12/2015	$109,864	Replace 31 residential services (3/4" or 1") on Ridgeway between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-4	333	58	¾" & 1"	Black Poly	$3,544	AZ0022381	Sunburst	12/2015	$205,552	Replace 58 residential services (3/4" or 1") on Sunburst between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for

										each customer. The service line replacements are for existing customers and not related to new growth.
333-5	333	30	¾" & 1"	Black Poly	$3,544	AZ0022381	Burro	12/2015	$106,320	Replace 30 residential services (3/4" or 1") on Burro between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-6	333	30	¾" & 1"	Black Poly	$3,544	AZ0022381	Greystone	12/2015	$106,320	Replace 30 residential services (3/4" or 1") on Greystone between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-7	333	29	¾" & 1"	Black Poly	$3,544	AZ0022381	Telegraph	12/2015	$102,776	Replace 29 residential services (3/4" or 1") on Telegraph between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-8	333	8	¾" & 1"	Black Poly	$3,544	AZ0022381	Tacony	12/2015	$28,352	Replace 8 residential services (3/4" or 1") on Tacony between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)									$886,000	

TABLE I (Page 4 of 6)

Information to be included with DSIC-Eligible Project Notification

Project No.	NARUC Acct No. (DSIC-eligible plant) **334 Meters**	Replacement Plant Description (DSIC-eligible plant) Size	Quantity	Cost/Unit	PWSID No.	Site (location description)	Replacement Plant Expected In-Service Date	Cost (estimated)	1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
334-1	334	¾" to >2"	1,351	Varies by size $180-$450	AZ0022381	Meter Routes 69, 88, 63, 22	12/2015	$286,035	Replace 462 - ¾",871 – 1", 3 – 1.5", 13 – 2", and 2 - >2" (1,351 total) meters in CCWC meter routes 69, 88, 63, 22. The meters are greater than 10 years old and a rapidly declining in meter accuracy and are manual read meters. New meters will help reduce system water loss to below 10% and increase meter reading efficiency with new AMR meters. The meters replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)								$286,035	

TABLE I (Page 5 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)		PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**335 Hydrants**	Quantity	Cost/Unit			Expected In-Service Date	Cost (estimated)	
335-1	335	8	$1,600	AZ0022381	Sycamore	12/2015	$12,800	Replace 8 fire hydrants on Sycamore between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-2	335	2	$1,600	AZ0022381	Winchester	12/2015	$3,200	Replace 2 fire hydrants on Winchester between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-3	335	6	$9,600	AZ0022381	Ridgeway	12/2015	$9,600	Replace 6 fire hydrants on Ridgeway between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-4	335	21	$1,600	AZ0022381	Sunburst	12/2015	$33,600	Replace 21 fire hydrants on Sunburst between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-5	335	7	$1,600	AZ0022381	Greystone	12/2015	$11,200	Replace 7 fire hydrants on Greystone between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their

								useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-6	335	4	$1,600	AZ0022381	Telegraph	12/2015	$6,400	Replace 4 fire hydrants on Telegraph between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-7	335	2	$1,600	AZ0022381	Tacony	12/2015	$3,200	Replace 2 fire hydrants on Tacony between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)							$80,000	

TABLE I (Page 6 of 6, Summary)

Information to be included with DSIC-Eligible Completed Project Filings

Project No.	PWSID No.	Project Description	Cost (estimated)
331-1	AZ0022381	Replace 1-4", 10-6", 6-12" valves (17 total) on Sycamore between Palisades and Fountain Hills Blvd	$94,520
331-2	AZ0022381	Replace 6 - 6" valves on Winchester between Palisades and Fountain Hills Blvd.	$33,360
331-3	AZ0022381	Replace 9 - 6" valves on Ridgeway between Palisades and Fountain Hills Blvd.	$50,040
331-4	AZ0022381	Replace 17 - 6" valves on Sunburst between Palisades and Fountain Hills Blvd.	$227,960
331-5	AZ0022381	Replace 15 - 6" valves on Greystone between Palisades and Fountain Hills Blvd.	$83,400
331-6	AZ0022381	Replace 8 - 6" valves on Telegraph between Palisades and Fountain Hills Blvd.	$44,480
331-7	AZ0022381	Replace 4 - 6" valves on Tacony between Palisades and Fountain Hills Blvd.	$22,240
333-1	AZ0022381	Replace 50 residential services (3/4" or 1") on Sycamore between Palisades and Fountain Hills Blvd.	$177,200
333-2	AZ0022381	Replace 14 residential services (3/4" or 1") on Winchester between Palisades and Fountain Hills Blvd.	$49,616
333-3	AZ0022381	Replace 31 residential services (3/4" or 1") on Ridgeway between Palisades and Fountain Hills Blvd.	$109,864
333-4	AZ0022381	Replace 58 residential services (3/4" or 1") on Sunburst between Palisades and Fountain Hills Blvd.	$205,552
333-5	AZ0022381	Replace 30 residential services (3/4" or 1") on Burro between Palisades and Fountain Hills Blvd.	$106,320
333-6	AZ0022381	Replace 30 residential services (3/4" or 1") on Greystone between Palisades and Fountain Hills Blvd.	$106,320
333-7	AZ0022381	Replace 29 residential services (3/4" or 1") on Telegraph between Palisades and Fountain Hills Blvd.	$102,776
333-8	AZ0022381	Replace 29 residential services (3/4" or 1") on Telegraph between Palisades and Fountain Hills Blvd.	$28,352

334-1	AZ0022381	Replace 462 - ¾",871 – 1", 3 – 1.5", 13 – 2", and 2 - >2" (1,351 total) meters in CCWC meter routes 69, 88, 63, 22.	$286,035
335-1	AZ0022381	Replace 8 fire hydrants on Sycamore between Palisades and Fountain Hills Blvd.	$12,800
335-2	AZ0022381	Replace 2 fire hydrants on Winchester between Palisades and Fountain Hills Blvd.	$3,200
335-3	AZ0022381	Replace 6 fire hydrants on Ridgeway between Palisades and Fountain Hills Blvd.	$9,600
335-4	AZ0022381	Replace 21 fire hydrants on Sunburst between Palisades and Fountain Hills Blvd.	$33,600
335-5	AZ0022381	Replace 7 fire hydrants on Greystone between Palisades and Fountain Hills Blvd.	$11,200
335-6	AZ0022381	Replace 4 fire hydrants on Telegraph between Palisades and Fountain Hills Blvd.	$6,400
335-7	AZ0022381	Replace 2 fire hydrants on Tacony between Palisades and Fountain Hills Blvd.	$3,200
Total Cost (estimate)			$1,808,035

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Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**309 Supply Mains**	Pipe length	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
none										
Subtotal Cost (estimate)										

TABLE I (Page 2 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**331 T&D Mains**	Pipe length / Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
331-1	331	8	6", 12"	Valve	$5,560	AZ0022381	Mimosa	12/2016	$44,480	Replace 4-6" & 4-12" valves (8 total) on Mimosa between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-2	331	17	6", 8"	Valve	$5,560	AZ0022381	Cholla	12/2016	$94,520	Replace 13 - 6" & 4 – 8" (17 total) valves on Cholla between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-3	331	9	6", 12"	Valve	$5,560	AZ0022381	Chicory	12/2016	$50,040	Replace 7 - 6" & 2 – 12" (9 total) valves on Chicory between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-4	331	8	6", 8"	Valve	$5,560	AZ0022381	Verbana	12/2016	$44,480	Replace 7 - 6" & 1 – 8" (8 total) valves on Verbana between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of

										tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-5	331	12	6", 12"	Valve	$5,560	AZ0022381	Sage	12/2016	$66,720	Replace 9 - 6" and 3 -12" (12 total) valves on Sage between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-6	331	8	6"	Valve	$5,560	AZ0022381	Ironwood	12/2016	$44,480	Replace 8 - 6" valves on Ironwood between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-7	331	20	6", 8", 12"	Valve	5,560	AZ0022381	Thistle	12/2016	$111,200	Replace 16 - 6", 3 – 8", 1-12" (20 total) valves on Thistle between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-8	331	18	6", 8"	Valve	5,560	AZ0022381	El Lago	12/2016	$100,080	Replace 13 - 6", 5 - 8" (18 total) valves on El Lago between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
Subtotal Cost (estimate)									$556,000	

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Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**333 Services**	Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
333-1	333	51	¾" & 1"	Black Poly	$3,544	AZ0022381	Sycamore	12/2016	$180,744	Replace 51 residential services (3/4" or 1") on Sycamore between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-2	333	104	¾" & 1"	Black Poly	$3,544	AZ0022381	Cholla	12/2016	$368,576	Replace 104 residential services (3/4" or 1") on Cholla between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-3	333	63	¾" & 1"	Black Poly	$3,544	AZ0022381	Chicory	12/2016	$223,272	Replace 63 residential services (3/4" or 1") on Chicory between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-4	333	32	¾" & 1"	Black Poly	$3,544	AZ0022381	Verbena	12/2016	$113,408	Replace 32 residential services (3/4" or 1") on Verbena between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old.

										Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)									$886,000	

TABLE I (Page 4 of 6)

Information to be included with DSIC-Eligible Project Notification

Project No.	NARUC Acct No. (DSIC-eligible plant) **334 Meters**	Replacement Plant Description (DSIC-eligible plant) Size	Quantity	Cost/Unit	PWSID No.	Site (location description)	Replacement Plant Expected In-Service Date	Cost (estimated)	1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
334-1	334	¾" to 2"	1,316	Varies by size $180-$450	AZ0022381	Meter Routes 10, 29, 87, 36, 23	12/2015	$248,085	Replace 1,202 - ¾", 79 – 1", 18 – 1.5", and 17 – 2" (1,316 total) meters in CCWC meter routes 10, 29, 87, 36, 23. The meters are greater than 10 years old and a rapidly declining in meter accuracy and are manual read meters. New meters will help reduce system water loss to below 10% and increase meter reading efficiency with new AMR meters. The meters replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)								$248,085	

TABLE I (Page 5 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)		PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**335 Hydrants**	Quantity	Cost/Unit			Expected In-Service Date	Cost (estimated)	
335-1	335	8	$1,600	AZ0022381	Mimosa	12/2016	$12,800	Replace 8 fire hydrants on Mimosa between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-2	335	8	$1,600	AZ0022381	Cholla	12/2016	$12,800	Replace 8 fire hydrants on Cholla between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-3	335	5	$1,600	AZ0022381	Chicory	12/2016	$8,000	Replace 5 fire hydrants on Chicory between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-4	335	3	$1,600	AZ0022381	Verbana	12/2016	$4,800	Replace 3 fire hydrants on Verbana between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-5	335	3	$1,600	AZ0022381	Sage	12/2016	$4,800	Replace 3 fire hydrants on Sage between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system,

								~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-6	335	1	$1,600	AZ0022381	Sierra Norte	12/2016	$1,600	Replace 1 fire hydrant on Sierra Norte between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-7	335	3	$1,600	AZ0022381	Ironwood	12/2016	$4,800	Replace 3 fire hydrants on Ironwood between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-8	335	2	$1,600	AZ0022381	Organ Pipe	12/2016	$3,200	Replace 2 fire hydrants on Organ Pipe between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-9	335	9	$1,600	AZ0022381	Thistle	12/2016	$14,400	Replace 9 fire hydrants on Thistle between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-10	335	8	$1,600	AZ0022381	El Lago	12/2016	$12,800	Replace 8 fire hydrants on El Lago between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)							$80,000	

Information to be included with DSIC-Eligible Completed Project Filings

Project No.	PWSID No.	Project Description	Cost (estimated)
331-1	AZ0022381	Replace 4-6" & 4-12" valves (8 total) on Mimosa between Palisades and Fountain Hills Blvd.	$44,480
331-2	AZ0022381	Replace 13 - 6" & 4 – 8" (17 total) valves on Cholla between Palisades and Fountain Hills Blvd.	$94,520
331-3	AZ0022381	Replace 7 - 6" & 2 – 12" (9 total) valves on Chicory between Palisades and Fountain Hills Blvd.	$50,040
331-4	AZ0022381	Replace 7 - 6" & 1 – 8" (8 total) valves on Verbana between Palisades and Fountain Hills Blvd.	$44,480
331-5	AZ0022381	Replace 9 - 6" and 3 -12" (12 total) valves on Sage between Palisades and Fountain Hills Blvd.	$66,720
331-6	AZ0022381	Replace 8 - 6" valves on Ironwood between Palisades and Fountain Hills Blvd.	$44,480
331-7	AZ0022381	Replace 16 - 6", 3 – 8", 1-12" (20 total) valves on Thistle between Palisades and Fountain Hills Blvd.	$111,200
331-8	AZ0022381	Replace 13 - 6", 5 - 8" (18 total) valves on El Lago between Palisades and Fountain Hills Blvd.	$100,080
333-1	AZ0022381	Replace 51 residential services (3/4" or 1") on Sycamore between Palisades and Fountain Hills Blvd.	$180,744
333-2	AZ0022381	Replace 104 residential services (3/4" or 1") on Cholla between Palisades and Fountain Hills Blvd.	$368,576
333-3	AZ0022381	Replace 63 residential services (3/4" or 1") on Chicory between Palisades and Fountain Hills Blvd.	$223,272
333-4	AZ0022381	Replace 32 residential services (3/4" or 1") on Verbena between Palisades and Fountain Hills Blvd.	$113,408
334-1	AZ0022381	Replace 1,202 - ¾", 79 – 1", 18 – 1.5", and 17 – 2" (1,316 total) meters in CCWC meter routes 10, 29, 87, 36, 23.	$248,085
335-1	AZ0022381	Replace 8 fire hydrants on Mimosa between Palisades and Fountain Hills Blvd.	$12,800
335-2	AZ0022381	Replace 8 fire hydrants on Cholla between Palisades and Fountain Hills Blvd.	$12,800

335-3	AZ0022381	Replace 5 fire hydrants on Chicory between Palisades and Fountain Hills Blvd.	$8,000
335-4	AZ0022381	Replace 3 fire hydrants on Verbana between Palisades and Fountain Hills Blvd.	$4,800
335-5	AZ0022381	Replace 3 fire hydrants on Sage between Palisades and Fountain Hills Blvd.	$4,800
335-6	AZ0022381	Replace 1 fire hydrant on Sierra Norte between Palisades and Fountain Hills Blvd.	$1,600
335-7	AZ0022381	Replace 3 fire hydrants on Ironwood between Palisades and Fountain Hills Blvd.	$4,800
335-8	AZ0022381	Replace 2 fire hydrants on Organ Pipe between Palisades and Fountain Hills Blvd.	$3,200
335-9	AZ0022381	Replace 9 fire hydrants on Thistle between Palisades and Fountain Hills Blvd.	$14,400
335-10	AZ0022381	Replace 8 fire hydrants on El Lago between Palisades and Fountain Hills Blvd.	$12,800
Total Cost (estimate)			$1,812,390

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Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**309 Supply Mains**	Pipe length	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
none										
Subtotal Cost (estimate)										

TABLE I (Page 2 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**331 T&D Mains**	Pipe length / Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
331-1	331	22	6", 8"	Valve	$5,560	AZ0022381	El Lago	12/2017	$122,320	Replace 16-6" & 6-8" valves (22 total) on El Lago between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-2	331	8	6"	Valve	$5,560	AZ0022381	Cavern	12/2017	$44,480	Replace 8 - 6" valves on Cavern between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-3	331	8	6", 8"	Valve	$5,560	AZ0022381	Mimosa	12/2017	$44,480	Replace 4 - 6" & 4 - 8" (8 total) valves on Mimosa between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-4	331	12	6", 8", 12"	Valve	$5,560	AZ0022381	Mountainside	12/2017	$66,720	Replace 5 - 6", 4 – 8", 3 – 12" (12 total) valves on Mountainside between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer

										functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-5	331	5	6"	Valve	$5,560	AZ0022381	Echo Hill	12/2017	$27,800	Replace 5 - 6" valves on Echo Hill between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-6	331	11	6"	Valve	$5,560	AZ0022381	Tumbleweed	12/2017	$61,160	Replace 11 - 6" valves on Tumbleweed between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-7	331	22	6" & 8"	Valve	$5,560	AZ0022381	Ponderosa	12/2017	$122,320	Replace 14 - 6" and 8 – 8" valves on Ponderosa between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-8	331	12	6" & 8"	Valve	$5,560	AZ0022381	Sunflower	12/2017	$66,720	Replace 8 - 6" and 4 – 8" valves on Ponderosa between Palisades and Fountain Hills Blvd. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
Subtotal Cost (estimate)									$556,000	

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Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**333 Services**	Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
333-1	333	72	¾" & 1"	Black Poly	$3,544	AZ0022381	El Lago	12/2017	$255,168	Replace 72 residential services (3/4" or 1") on El Lago between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-2	333	45	¾" & 1"	Black Poly	$3,544	AZ0022381	Cavern	12/2017	$159,480	Replace 45 residential services (3/4" or 1") on Cavern between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-3	333	70	¾" & 1"	Black Poly	$3,544	AZ0022381	Mimosa	12/2017	$248,080	Replace 70 residential services (3/4" or 1") on Mimosa between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-4	333	45	¾" & 1"	Black Poly	$3,544	AZ0022381	Mountainside	12/2017	$159,480	Replace 45 residential services (3/4" or 1") on Mountainside between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for

										each customer. The service line replacements are for existing customers and not related to new growth.
333-5	333	18	¾" & 1"	Black Poly	$3,544	AZ0022381	Echo Hill	12/2017	$63,792	Replace 18 residential services (3/4" or 1") on Echo Hill between Palisades and Fountain Hills Blvd. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)									$886,000	

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Information to be included with DSIC-Eligible Project Notification

Project No.	NARUC Acct No. (DSIC-eligible plant) **334 Meters**	Replacement Plant Description (DSIC-eligible plant) Size	Quantity	Cost/Unit	PWSID No.	Site (location description)	Replacement Plant Expected In-Service Date	Cost (estimated)	1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
334-1	334	¾" to >2"	1,353	Varies by size $180-$450	AZ0022381	Meter Routes 98, 17, 68	12/2017	$281,970	Replace 599 - ¾", 724 – 1", 18 – 1.5", and 11 – 2", and 1 >2" (1,353 total) meters in CCWC meter routes 98, 17, 68. The meters are greater than 10 years old and a rapidly declining in meter accuracy and are manual read meters. New meters will help reduce system water loss to below 10% and increase meter reading efficiency with new AMR meters. The meters replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)								$281,970	

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)		PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**335 Hydrants**	Quantity	Cost/Unit			Expected In-Service Date	Cost (estimated)	
335-1	335	7	$1,600	AZ0022381	El Lago	12/2017	$11,200	Replace 7 fire hydrants on El Lago between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-2	335	4	$1,600	AZ0022381	Cavern	12/2017	$6,400	Replace 4 fire hydrants on Cavern between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-3	335	8	$1,600	AZ0022381	Mimosa	12/2017	$12,800	Replace 8 fire hydrants on Mimosa between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-4	335	12	$1,600	AZ0022381	Mountainside	12/2017	$19,200	Replace 12 fire hydrants on Mountainside between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-5	335	3	$1,600	AZ0022381	Echo Hill	12/2017	$4,800	Replace 3 fire hydrants on Echo Hill between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a

								priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-6	335	6	$1,600	AZ0022381	Tumbleweed	12/2017	$9,600	Replace 6 fire hydrants on Tumbleweed between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-7	335	4	$1,600	AZ0022381	Sunflower	12/2017	$6,400	Replace 4 fire hydrants on Sunflower between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-8	335	6	$1,600	AZ0022381	Ponderosa	12/2017	$9,600	Replace 6 fire hydrants on Ponderosa between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)							$80,000	

TABLE I (Page 6 of 6, Summary)

Information to be included with DSIC-Eligible Completed Project Filings

Project No.	PWSID No.	Project Description	Cost (estimated)
331-1	AZ0022381	Replace 16-6" & 6-8" valves (22 total) on El Lago between Palisades and Fountain Hills Blvd.	$122,320
331-2	AZ0022381	Replace 8 - 6" valves on Cavern between Palisades and Fountain Hills Blvd.	$44,480
331-3	AZ0022381	Replace 4 - 6" & 4 - 8" (8 total) valves on Mimosa between Palisades and Fountain Hills Blvd.	$44,480
331-4	AZ0022381	Replace 5 - 6", 4 – 8", 3 – 12" (12 total) valves on Mountainside between Palisades and Fountain Hills Blvd.	$66,720
331-5	AZ0022381	Replace 5 - 6" valves on Echo Hill between Palisades and Fountain Hills Blvd.	$27,800
331-6	AZ0022381	Replace 11 - 6" valves on Tumbleweed between Palisades and Fountain Hills Blvd.	$61,160
331-7	AZ0022381	Replace 14 - 6" and 8 – 8" (22 total) valves on Ponderosa between Palisades and Fountain Hills Blvd.	$122,320
331-8	AZ0022381	Replace 8 - 6" and 4 – 8" (12 total) valves on Ponderosa between Palisades and Fountain Hills Blvd.	$66,720
333-1	AZ0022381	Replace 72 residential services (3/4" or 1") on El Lago between Palisades and Fountain Hills Blvd.	$255,168
333-2	AZ0022381	Replace 45 residential services (3/4" or 1") on Cavern between Palisades and Fountain Hills Blvd.	$159,480
333-3	AZ0022381	Replace 70 residential services (3/4" or 1") on Mimosa between Palisades and Fountain Hills Blvd.	$248,080
333-4	AZ0022381	Replace 45 residential services (3/4" or 1") on Mountainside between Palisades and Fountain Hills Blvd.	$159,480
333-5	AZ0022381	Replace 18 residential services (3/4" or 1") on Echo Hill between Palisades and Fountain Hills Blvd.	$63,792
334-1	AZ0022381	Replace 599 - ¾", 724 – 1", 18 – 1.5", and 11 – 2", and 1 >2" (1,353 total) meters in CCWC meter routes 98, 17, 68.	$281,970
335-1	AZ0022381	Replace 7 fire hydrants on El Lago between Palisades and Fountain Hills Blvd.	$11,200

335-2	AZ0022381	Replace 4 fire hydrants on Cavern between Palisades and Fountain Hills Blvd.	$6,400
335-3	AZ0022381	Replace 8 fire hydrants on Mimosa between Palisades and Fountain Hills Blvd.	$12,800
335-4	AZ0022381	Replace 12 fire hydrants on Mountainside between Palisades and Fountain Hills Blvd.	$19,200
335-5	AZ0022381	Replace 3 fire hydrants on Echo Hill between Palisades and Fountain Hills Blvd.	$4,800
335-6	AZ0022381	Replace 6 fire hydrants on Tumbleweed between Palisades and Fountain Hills Blvd.	$9,600
335-7	AZ0022381	Replace 4 fire hydrants on Sunflower between Palisades and Fountain Hills Blvd.	$6,400
335-8	AZ0022381	Replace 6 fire hydrants on Ponderosa between Palisades and Fountain Hills Blvd.	$9,600
Total Cost (estimate)			$1,803,970

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Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**309 Supply Mains**	Pipe length	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
none										
Subtotal Cost (estimate)										

TABLE I (Page 2 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**331 T&D Mains**	Pipe length / Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
331-1	331	38	6", 8", 12"	Valve	$5,560	AZ0022381	El Pueblo	12/2018	$211,280	Replace 19-6", 11-8", 8-12" valves (38 total) on El Pueblo between Fountain Hills Blvd and El Pueblo. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-2	331	16	6"	Valve	$5,560	AZ0022381	Cavern	12/2018	$88,960	Replace 16 - 6" valves on Cavern between Fountain Hills Blvd and El Pueblo. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-3	331	14	6"	Valve	$5,560	AZ0022381	Alamosa	12/2018	$77,840	Replace 14 - 6" valves on Alamosa between Fountain Hills Blvd and El Pueblo. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.

331-4	331	8	6"	Valve	$5,560	AZ0022381	Caliente	12/2018	$44,480	Replace 8 – 6" valves on Caliente between Fountain Hills Blvd and El Pueblo. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-5	331	10	6"	Valve	$5,560	AZ0022381	El Sobrante	12/2018	$55,600	Replace 10 - 6" valves on El Sobrante between Fountain Hills Blvd and El Pueblo. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-6	331	10	6"	Valve	$5,560	AZ0022381	Calle Del Prado	12/2018	$55,600	Replace 10 - 6" valves on Calle Del Prado between Fountain Hills Blvd and El Pueblo. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
331-7	331	4	6"	Valve	$5,560	AZ0022381	Ocotillo	12/2018	$22,240	Replace 4 - 6" valves on Ocotillo between Fountain Hills Blvd and El Pueblo. Replace distribution system valves that are no longer functioning because of tuberculation and age. These valves are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the valves decreases time required to shutdown water main in the event of main break or other system maintenance which reduces customer service disruption and decreases water loss during a main breaks. The valve replacements are not related to new growth.
Subtotal Cost (estimate)									$556,000	

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Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)				PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**333 Services**	Quantity	Diameter	Material	Cost/Unit			Expected In-Service Date	Cost (estimated)	
333-1	333	42	¾" & 1"	Black Poly	$3,544	AZ0022381	El Pueblo	12/2018	$148,848	Replace 42 residential services (3/4" or 1") on El Pueblo between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-2	333	51	¾" & 1"	Black Poly	$3,544	AZ0022381	Oro Grande	12/2018	$180,744	Replace 51 residential services (3/4" or 1") on Oro Grande between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-3	333	38	¾" & 1"	Black Poly	$3,544	AZ0022381	Alamosa	12/2018	$134,672	Replace 38 residential services (3/4" or 1") on Alamosa between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-4	333	35	¾" & 1"	Black Poly	$3,544	AZ0022381	Caliente	12/2018	$124,040	Replace 35 residential services (3/4" or 1") on Caliente between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for

										each customer. The service line replacements are for existing customers and not related to new growth.
333-5	333	18	¾" & 1"	Black Poly	$3,544	AZ0022381	El Sobrante	12/2018	$63,792	Replace 18 residential services (3/4" or 1") on El Sobrante between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-6	333	22	¾" & 1"	Black Poly	$3,544	AZ0022381	Mirage Crossing	12/2018	$77,968	Replace 22 residential services (3/4" or 1") on Mirage Crossing between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-7	333	31	¾" & 1"	Black Poly	$3,544	AZ0022381	Calle Del Prado	12/2018	$109,864	Replace 31 residential services (3/4" or 1") on Calle Del Prado between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
333-8	333	13	¾" & 1"	Black Poly	$3,544	AZ0022381	Tejon	12/2018	$46,072	Replace 18 residential services (3/4" or 1") on Tejon between Fountain Hills Blvd and El Pueblo. The services are branched black poly lines (one service for two customers) that are failing at a high rate. These services are a priority because it is the oldest portion of the CCWC system, ~30-40 years old. Replacing the services will help reduce system water loss and improve customer pressure and flow with a single service for each customer. The service line replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)									$886,000	

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Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)			PWSID No.	Site (location description)	Replacement Plant		
Project No.	**334 Meters**	Size	Quantity	Cost/Unit			Expected In-Service Date	Cost (estimated)	1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
334-1	334	¾" to >2"	1,405	Varies by size $180-$450	AZ0022381	Meter Routes 4, 3, 12, 31	12/2018	$267,485	Replace 1217 - ¾", 147 – 1", 13 – 1.5", and 24 – 2", and 4 >2" (1,405 total) meters in CCWC meter routes 4, 3, 12 ,31. The meters are greater than 10 years old and a rapidly declining in meter accuracy and are manual read meters. New meters will help reduce system water loss to below 10% and increase meter reading efficiency with new AMR meters. The meters replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)								$267,485	

TABLE I (Page 5 of 6)

Information to be included with DSIC-Eligible Project Notification

	NARUC Acct No. (DSIC-eligible plant)	Replacement Plant Description (DSIC-eligible plant)		PWSID No.	Site (location description)	Replacement Plant		1. Provide narrative why Replacement Plant is necessary - replacement of existing plant that has exceeded its designated useful life and has worn out or is in deteriorating condition due to no fault of the utility - replacement of existing plant to address excessive water loss (10% or more) - replacement of existing plant for other reasons supported by persuasive showing by utility 2. Provide narrative explaining why this segment of plant is a priority. 3. Provide narrative explaining how replacing this plant will benefit existing customers. 4. Provide affirmation that Replacement Plant does not include the costs for extending or expanding facilities to serve new customers.
Project No.	**335 Hydrants**	Quantity	Cost/Unit			Expected In-Service Date	Cost (estimated)	
335-1	335	17	$1,600	AZ0022381	El Pueblo	12/2018	$27,200	Replace 17 fire hydrants on El Pueblo between Fountain Hills Blvd and El Pueblo. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-2	335	6	$1,600	AZ0022381	Oro Grande	12/2018	$9,600	Replace 6 fire hydrants on Oro Grande between Fountain Hills Blvd and El Pueblo. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-3	335	7	$1,600	AZ0022381	Alamosa	12/2018	$11,200	Replace 7 fire hydrants on Alamosa between Fountain Hills Blvd and El Pueblo. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-4	335	6	$1,600	AZ0022381	Caliente	12/2018	$9,600	Replace 6 fire hydrants on Caliente between Fountain Hills Blvd and El Pueblo. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-5	335	7	$1,600	AZ0022381	El Sobrante	12/2018	$11,200	Replace 7 fire hydrants on El Sobrante between Fountain Hills Blvd and El Pueblo. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system,

								~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-6	335	3	$1,600	AZ0022381	Calle Del Prado	12/2018	$4,800	Replace 3 fire hydrants on Calle Del Prado between Palisades and Fountain Hills Blvd. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
335-7	335	4	$1,600	AZ0022381	Tejon	12/2018	$6,400	Replace 4 fire hydrants on Tejon between Fountain Hills Blvd and El Pueblo. The fire hydrants are in deteriorating condition and at the end of their useful life and need to be replaced. Repair or maintenance parts are no longer available because of the make and age of the hydrants. These hydrants are a priority because they are located in the oldest portion of the CCWC system, ~30-40 years old. Replacing the hydrants will improve fire flow availability and response times in the event of fire at a customer's home or business. The hydrant replacements are for existing customers and not related to new growth.
Subtotal Cost (estimate)							$80,000	

Information to be included with DSIC-Eligible Completed Project Filings

Project No.	PWSID No.	Project Description	Cost (estimated)
331-1	AZ0022381	Replace 19-6", 11-8", 8-12" valves (38 total) on El Pueblo between Fountain Hills Blvd and El Pueblo.	$211,280
331-2	AZ0022381	Replace 16 - 6" valves on Cavern between Fountain Hills Blvd and El Pueblo.	$88,960
331-3	AZ0022381	Replace 14 - 6" valves on Alamosa between Fountain Hills Blvd and El Pueblo	$77,840
331-4	AZ0022381	Replace 8 – 6" valves on Caliente between Fountain Hills Blvd and El Pueblo.	$44,480
331-5	AZ0022381	Replace 10 - 6" valves on El Sobrante between Fountain Hills Blvd and El Pueblo.	$55,600
331-6	AZ0022381	Replace 10 - 6" valves on Calle Del Prado between Fountain Hills Blvd and El Pueblo.	$55,600
331-7	AZ0022381	Replace 4 - 6" valves on Ocotillo between Fountain Hills Blvd and El Pueblo.	$22,240
333-1	AZ0022381	Replace 42 residential services (3/4" or 1") on El Pueblo between Fountain Hills Blvd and El Pueblo.	$148,848
333-2	AZ0022381	Replace 51 residential services (3/4" or 1") on Oro Grande between Fountain Hills Blvd and El Pueblo	$180,744
333-3	AZ0022381	Replace 38 residential services (3/4" or 1") on Alamosa between Fountain Hills Blvd and El Pueblo.	$134,672
333-4	AZ0022381	Replace 35 residential services (3/4" or 1") on Caliente between Fountain Hills Blvd and El Pueblo.	$124,040
333-5	AZ0022381	Replace 18 residential services (3/4" or 1") on El Sobrante between Fountain Hills Blvd and El Pueblo.	$63,792
333-6	AZ0022381	Replace 22 residential services (3/4" or 1") on Mirage Crossing between Fountain Hills Blvd and El Pueblo.	$77,968
333-7	AZ0022381	Replace 31 residential services (3/4" or 1") on Calle Del Prado between Fountain Hills Blvd and El Pueblo.	$109,864
333-8	AZ0022381	Replace 18 residential services (3/4" or 1") on Tejon between Fountain Hills Blvd and El Pueblo.	$46,072

334-1	AZ0022381	Replace 1217 - ¾", 147 – 1", 13 – 1.5", and 24 – 2", and 4 >2" (1,405 total) meters in CCWC meter routes 4, 3, 12 ,31.	$267,485
335-1	AZ0022381	Replace 17 fire hydrants on El Pueblo between Fountain Hills Blvd and El Pueblo.	$27,200
335-2	AZ0022381	Replace 6 fire hydrants on Oro Grande between Fountain Hills Blvd and El Pueblo.	$9,600
335-3	AZ0022381	Replace 7 fire hydrants on Alamosa between Fountain Hills Blvd and El Pueblo.	$11,200
335-4	AZ0022381	Replace 6 fire hydrants on Caliente between Fountain Hills Blvd and El Pueblo.	$9,600
335-5	AZ0022381	Replace 7 fire hydrants on El Sobrante between Fountain Hills Blvd and El Pueblo.	$11,200
335-6	AZ0022381	Replace 3 fire hydrants on Calle Del Prado between Palisades and Fountain Hills Blvd.	$4,800
335-7	AZ0022381	Replace 4 fire hydrants on Tejon between Fountain Hills Blvd and El Pueblo.	$6,400
Total Cost (estimate)			$1,789,485

EXHIBIT ICC -8

CHAPARRAL METER REPLACEMENT PROGRAM

Route	Average Meter Age	Meters in Route	# Meters To Replace	3/4"	1"	1.5"	2"	>2"	Cost (M&L)
09	10.5	820	820	613	197	8	2	0	$ 158,365
24	9	166	166	120	22	11	13	0	$ 36,250
08	14	495	495	345	143	3	1	3	$ 95,775
69	13.3	100	100	36	64	0	0	0	$ 20,880
88	12.6	210	210	201	6	0	2	1	$ 38,430
63	11.8	773	773	8	760	3	2	0	$ 174,390
22	11.5	268	268	217	41	0	9	1	$ 52,335
10	11.8	739	739	664	64	5	6	0	$ 138,370
29	11.5	142	142	137	5	0	0	0	$ 25,785
87	11.5	192	192	176	8	5	3	0	$ 36,580
36	11.4	124	124	123	1	0	0	0	$ 22,365
23	11	119	119	102	1	8	8	0	$ 24,985
98	11.4	584	584	133	432	7	11	1	$ 128,540
17	11	424	424	333	91	0	0	0	$ 80,415
68	10.9	345	345	133	201	11	0	0	$ 73,015
04	11	744	744	669	63	6	4	2	$ 138,495
03	10.5	143	143	116	1	7	19	0	$ 32,105
12	10.5	241	241	215	23	0	1	2	$ 44,325
31	10.2	277	277	217	60	0	0	0	$ 52,560
96	10	256	256	83	168	0	4	1	$ 54,540
13	10	334	334	189	143	1	0	1	$ 66,545
20	10	302	302	189	83	21	8	1	$ 63,645
02	10	405	405	372	31	2	0	0	$ 74,635
01	10	211	211	199	9	2	1	0	$ 38,995
44	10	285	285	254	31	0	0	0	$ 52,695
37	10	338	338	124	209	3	1	1	$ 70,845
05	10	481	481	428	53	0	0	0	$ 88,965
19	10	169	169	124	42	3	0	0	$ 32,820
15	10	457	457	294	150	3	10	0	$ 92,220
14	9.5	424	424	323	99	2	0	0	$ 81,115
21	9	302	302	242	60	0	0	0	$ 57,060
16	9	501	501	383	117	1	0	0	$ 95,615
11	9	463	463	427	33	0	2	1	$ 85,185
97	8.8	231	231	4	226	1	0	0	$ 51,920
42	8.7	108	108	108	0	0	0	0	$ 19,440
91	8.4	132	132	54	57	14	7	0	$ 30,595
90	8.2	303	303	79	157	31	35	1	$ 76,145
45	8.1	58	58	51	2	0	3	2	$ 10,980
28	8	225	225	179	32	5	9	0	$ 45,220
99	8	46	46	5	22	0	1	18	$ 6,300
25	7.5	206	206	3	203	0	0	0	$ 46,215
27	6.5	417	417	1	404	8	2	2	$ 94,780
30	6	151	151	0	150	0	0	1	$ 33,750
07	4	5	5	1	3	1	0	0	$ 1,205
06	3.5	57	57	0	47	10	0	0	$ 14,075
Total	10.2	13773	13773	8674	4714	182	184	39	$ 2,759,470